

# **The need to get the salt out:**

## Dealing with rising damp and salt attack

David Young OAM BAppSc  
Heritage Consultant  
PO Box 203, Clifton Hill VIC 3068  
[david.young@netspeed.com.au](mailto:david.young@netspeed.com.au)

### **Introduction**

There is a need to rethink our approach to the treatment of rising damp and salt attack. We have tended to see the deterioration at the base of walls as a problem related only to the phenomenon of rising damp and so the focus of remedial treatments has been the installation of damp-proof courses (DPCs). This is not surprising given the cool damp climate of Britain from where most of our building traditions are derived.

However in this country we have hotter, drier climates and more saline soils leading to greater rates of 'transpiration' through the walls and to the accumulation of soluble salts at the evaporation zone in the masonry. The result is that we often have two problems to address: rising damp *and* salt attack. When we install a DPC we may stop the damp rising, but we won't stop the salt attacking unless we remove it from our walls.

This paper assumes that we are dealing with buildings that either have no DPC or that have early DPCs that are now ineffective.

### **Traditional treatment of rising damp**

Rising damp is the capillary suction of porous masonry materials which draws moisture up into walls from the soils and sub-soils beneath. Moisture rises against the force of gravity causing dampness in walls, musty smells in rooms and unhealthy living environments. That it generally only rises to about one to one-and-a-half metres above ground level is because the moisture evaporates from the surface of the walls. Some treatments have sought to prevent the damp evaporating by rendering the external surface in relatively-hard, impermeable cement renders. These simply trap moisture in the wall, forcing it to rise further and to evaporate from above the rendered base. The treatment is disfiguring, and at best, buys time.

More effective treatments for buildings lacking a functioning damp-proof course have focussed on cutting off the water source through the installation of a new DPC. These treatments have included both mechanical and chemical methods:

- undersetting – the technique of progressively rebuilding the base of the walls and the incorporation of a DPC membrane;
- slot sawing – where a mortar joint is removed to allow insertion of a DPC membrane; and
- chemical impregnation – where a DPC is formed by injecting or gravity feeding chemicals into a series of drilled holes to produce a water-repellent zone.

Like our building tradition, these treatments originate from Europe (Ashurst & Ashurst, 1988; Oliver, 1997; Richardson, 2001). There the climate is cooler and wetter than ours and so the rate of transpiration of moisture through walls is lower, though the walls themselves may be wetter. The damper climate also leads to the downward flushing of soluble salts. Consequently, remedial treatments are principally aimed at dealing with dampness in walls, at preventing soil moisture from rising through porous masonry. These are the treatments that we have inherited and have adopted as our standard practice.

### **Rising damp and salt attack**

In contrast to Britain and other cooler parts of Europe, the hotter and drier, temperate Australian climate promotes rapid evaporation from wall surfaces and hence greater rates of transpiration of moisture due to rising damp. When coupled with very saline soils, most notably in Adelaide, the result is extensive decay of the base of walls due to a combination of rising damp *and* salt attack. Rising damp carries salts up into the walls where cyclic wetting and drying leads to their crystallisation within the pores of the masonry and consequent fretting and crumbling of the wall at the point or zone of evaporation. Though Adelaide is the city with most damage, the problem of rising damp and salt attack is common across much of dry temperate Australia and is increasing as dryland salinity delivers more salts to the land surface.

To effectively deal with the problem we need to deal with both rising damp *and* salt attack. This may seem obvious, yet because of our building tradition we have tended to focus on the damp and until recently, largely ignored the salt. We have wrongly assumed that by cutting off the rising damp, we would stop the damage caused by the salts.

This is not so, for though cut off from soil moisture, salts can still cycle in and out of solution due to changes in atmospheric humidity. The hygroscopic nature of the salts attracts water from humid atmospheres leading to their solution and to an apparently dry wall becoming suddenly damp. During the next dry period the salts recrystallise causing ongoing damage to the masonry. While the rate of decay may be slower than before, it will continue while salts remain. And so we need to remove the salts as well as dealing with the rising damp.

### **Removing salts – desalination**

There are four principle ways of removing salts from damp affected masonry:

- undersetting – in which affected masonry is replaced with new material;
- washing, sponging – to dissolve and flush salt out;
- sacrificial plasters – to move the evaporation zone outside the existing wall; and
- absorbent poultices – to draw dissolved salt into highly absorbent materials.

### **Undersetting**

Though expensive, this technique has the advantage of combining the removal of salt-affected masonry with the insertion of a new DPC. From a heritage point of view, a disadvantage of this technique is the loss of original material, the aim of conservation often being retention of as much original fabric as possible (Australia ICOMOS, 1999).

### **Washing, sponging**

Walls are wetted in a controlled way with low volume water sprays or misting devices, then allowed to dry for a period so that salts are drawn to the surface from where they can be either flushed with water or damp sponged from the wall. This technique has been used on major buildings in Sydney without great success.

### **Sacrificial plasters, renders and mortars**

By applying a weak porous plaster or render to the wall surface, the point at which water evaporates and salt precipitates can be moved outwards into the render. The render will deteriorate with time and may need reapplication, but will protect the wall behind. Sacrificial plasters and renders are made of lime and sand and can usefully incorporate porous aggregates such as crushed limestone in order to provide more 'storage space' for the salts. They may not be aesthetically pleasing and so have more application to cellars and basements than to dining rooms. The same approach can be used with sacrificial mortars in joints between brickwork and stonework, but more of this later.

### **Absorbent poultices**

A wet paste of absorbent material is applied to the wall surface and allowed to dry. The contained water soaks into the masonry, dissolves the salts and then dries back out through the poultice, bringing the salts with it and leaving them in the absorbent material. A commercial product "Cocoon", marketed for this purpose, is an adaptation of a filtering medium and contains paper pulp and diatomaceous earth. Experience suggests that two or three cycles of poulticing may be necessary to remove high salt concentrations.

### **Combining salt-removal with damp-proofing**

Desalination techniques such as sacrificial plasters and absorbent poultices should be combined with damp-proofing treatments such as slot sawing, chemical impregnation and the modern version of electro-osmosis so that both rising damp and salt attack are dealt with. Unfortunately for our building stock, salt-removal in combination with damp-proofing is the exception rather than the rule.

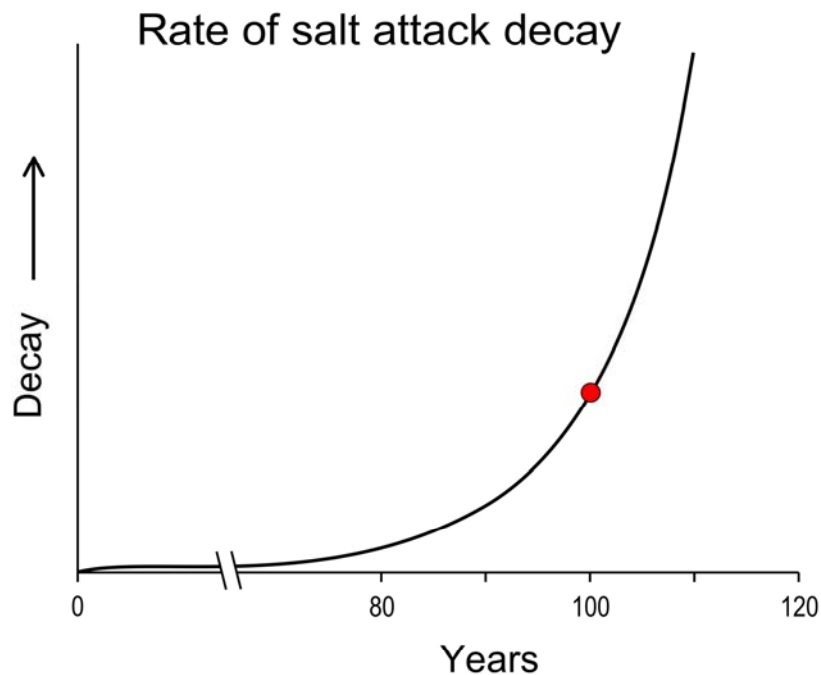
### **Are there alternatives to salt-removal?**

Perhaps not realising the importance of removing high salt concentrations, many damp-proofing contractors install chemical or slot-sawn DPCs into interior walls and then seek to isolate remaining salts using dense cement plasters often containing water-repellent or salt-retarding additives. At best, when well done, these treatments will buy time for the owner. Their relative cost and the reduction in disruption time during which the occupants are living elsewhere, makes them attractive to house owners.

### Is salt-removal more important than damp-proofing?

Where the damp is excessive and cannot be controlled by good housekeeping activities like attention to gutters, downpipes, site drainage and underfloor ventilation, then there is little option but to install a new DPC. But what about the situation seen in many country towns across Australia where the damp itself is not severe but salts have decayed the mortar from the bottom courses of brickwork?

Consider the example of a 100 year old house. It is well built, with brick walls and lime mortar, and sits up on a well drained block with no ponding of surface water against the house. Yet the lime mortar of the lower 5-10 courses of brickwork is eroding and in places the loss is up to 50 mm from the wall face. The bricks are in reasonable condition, showing only the first signs of deterioration. There is no damp-proof course and not a lot of dampness in the walls. On the inside the plasterwork is in good condition with only a few areas of blistering beneath paint coatings. It is tempting to think that as the house has lasted 100 years, the decay will not be much worse after another 20 or 30 years. Postponing action on this basis would be wrong, as the following graph shows.



Rate of salt attack decay. While this a notional example, it illustrates how it would be wrong to think that because decay has taken 100 years to get to the present state (as shown by the dot on the graph), there is no urgency about taking remedial action. In this case decay would be nearly three times worse in only ten more years.

This is a situation where although there is not a lot of salt in the soils, it is very effectively drawn into the walls and concentrated by the strong evaporative conditions of hot dry summers. In a case like this where the dampness alone is not causing problems (the interiors are not unhealthily damp) inserting a remedial DPC may be unnecessary. Instead, attention should be focussed on removing the salts from the lower parts of the walls and repairing the mortar joints. In the simplest method described below, the two processes are combined.

Repairing mortar joints (known as repointing) should be done in a mortar that will act sacrificially like the plasters and renders mentioned before. Unlike the all too common approach of impervious, hard cement, it should be made of lime and sand and, ideally, there should be some porous aggregates such as crushed limestone replacing some of the sand in a mix of something like 1:3 to 1:5 lime:sand. Stronger mixes should be used on the weather side of the house, while weaker mixes might be used on sheltered sides.

This sacrificial mortar will last for a variable period depending on how much salt remains in the walls (in the remaining mortar and in the adjacent bricks) and on how well the repointing has been carried out. If there is substantial salt remaining in the bricks this will migrate into the new mortar and cause it to decay in not many years. A second round of repointing may be necessary after 5-10 years, but this should substantially reduce the salt burden in the walls. In doing so, it effectively resets the position on the graph above back to a point where there's little decay.

We must be clear that this treatment does not cure the damp – instead it is a maintenance approach of managing the damp and preventing it from getting worse. Like any maintenance it will require periodic renewal.

Importantly, salt-removal buys time. By reducing salt concentrations so that decay is minimised, the owners and managers of a building have time to review its moisture regime and to determine an appropriate course of action, which may or may not include insertion of a DPC. This is particularly important where the building is of heritage value and where an objective is minimising invasive works.

## **Conclusion**

I contend that there are many cases such as the example described where it is more important to remove salt from the walls than it is to insert a new DPC. We need to need to rethink our approach to the treatment of salt attack and rising damp. The right answer will be as much about salt as it is about damp.

## **New publications on rising damp and salt attack**

In an effort to improve practice in treating rising damp and salt attack, the heritage agencies from New South Wales, Victoria and South Australia together with the City of Adelaide have combined to commission new technical guides. These will update and add to the existing South Australian document, now 12 years old (Young, 1995). Expected to be available later this year, the guides will aim to convey the message that rising damp and salt attack are separate but interrelated phenomena that are best dealt with by both removing the salt and reducing the moisture stress on walls.

## References

Ashurst, J. & Ashurst, N. 1988. *Practical building conservation*. English Heritage technical handbooks, Volume 2: *Brick, terracotta and earth*. Gower Technical Press, Aldershot, Hants, UK. ISBN 0-291-39746-8.

Australia ICOMOS. 1999. *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 1999*. Australia ICOMOS Inc., Melbourne.

Oliver, A.C. 1997. *Dampness in buildings*. 2nd edn, revised by J. Douglas and J.S. Stirling, Blackwell Science, Oxford. ISBN 0-632-04085-8.

Richardson, Barry. 2001. *Defects and deterioration in buildings: a practical guide to the science of material failure*. 2nd edn, Taylor & Francis, London. ISBN 041925210X.

Young, David. 1995. Rising damp and salt attack. *South Australia, Department of Environment and Natural Resources, and the City of Adelaide, Heritage Conservation: 3.8*. ISSN 1035-5138.