Kingfisher
Building Products Ltd
www.kingfisheruk.com

The Professional Manual of Chemical D.P.C. Injection

Rising Damp

Rising damp is caused by the direct or indirect contact of brick or stone walls with the ground. Absorption and capillary action cause moisture to be drawn from the ground in a continuous process, wetting the wall to varying degrees depending on the prevailing conditions.

Why?

* Inefficient, damaged or non-existent damp proof course.
* Insufficient ventilation.
* Situations where the ground is higher than the damp proof course.
* Aluminium and bitumenised paper wall coverings.
* Cavity insulating materials where no damp proof course exists.
* Poor property maintenance.

Combinations of the above will aggravate the situation. The hiding of rising damp by means of lath and plaster, aluminium paper etc., only creates a chimney effect, thereby forcing rising damp even higher than would normally be anticipated.

The actual level at which moisture is visible is governed by the rate of evaporation from the inner surface of the wall. Here the moisture is evaporating from the wall at the same rate as the wall is absorbing water at ground level. The use of impervious membranes or insulating materials as described above inhibits the rate of evaporation thus causing the damp to rise to a greater height.

Why not just ignore it?

Rising damp can sustain a level of water in walls to such a degree as to stimulate the growth of wood destroying fungi. Skirting boards, joists, floorboards, architraves, door casements, window frames and all timbers used within the fabric of the building can be attacked. Plaster, bricks, mortar joints, decoration and wall coverings can be similarly seriously affected by the growth of dry rot fungus or associated moulds which start and then thrive in wet conditions. Without the presence of water, timber decaying fungi cannot develop.

Analysis

It is vital to be able to recognise the differences between the four main causes of structural dampness:-
Rising damp.
Lateral damp.
Condensation.
Vertical penetrating damp. (e.g. roof defects, gutters, downspouts, window sills, etc.)

Rising Damp

Normally a very definite damp line can be seen on the internal surface of the wall and the moisture reading above this line will be substantially lower than the readings taken below. Where existing damp proof courses are present, similar evidence can be obtained if bridging of the damp proof course has taken place. This can be caused by overextended rendering or raised internal or external floor level.

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Lateral Damp

This can only occur on external walls and is usually apparent throughout the complete elevation of the external wall. Areas of walls giving high readings on a moisture meter, completely disassociated from any window, floor or roof can usually be assessed as lateral damp. These predominately occur on areas exposed to inclement weather. The most likely causes of lateral damp are bricks that have become porous with age, deterioration of mortar joints and/or cracked renders and pebble-dashing.

Condensation

Condensation is surface moisture and will usually be found at the lower temperature points in a room or the area of least ventilation, eg., windows, external walls, behind furniture, in rooms where ventilation is inadequate, situations where flueless flame heating appliances are in use, ie., gas, oil or paraffin burners.

Diagnosing condensation can be more difficult especially when taken in conjunction with the previously mentioned facets of dampness. The most obvious evidence is visible on non-absorbent surfaces, eg., windows, vinyl wall coverings, ceramic tile walls, cement rendered walls and painted surfaces and this appears as small beads of moisture or if of recent occurrence a thin continuous film of moisture.

It is only when readings from every room at each level are compared and assessment of other external features are taken into consideration that the correct diagnosis can be made.

Vertical Penetrating Damp

Obvious visible signs are easy to see - broken and leaking gutters, downspouts etc.

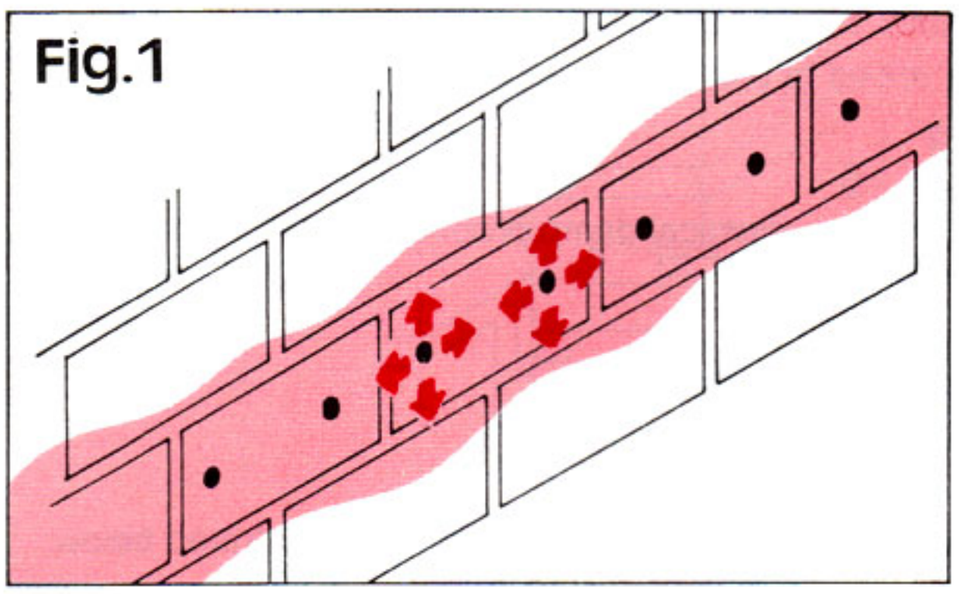
Injection - Where and how much?

The following scale is suggested as a reasonable assessment of the amount of fluid required for estimating purposes based on many years practical experience using most of the common types of bricks found throughout the country. Local variations can be expected.

4 1/2" brick (115mm)	3.35 metres/5 litres	(10ft/gallon)
9" brick (230mm)	1.68 metres/5 litres	(5ft/gallon)
13 1/2" brick (340mm)	1.1 metres/5 litres	(3.3ft/gallon)

Random stone walling must be viewed from a different aspect as there is no uniformity in construction. This can significantly differ from the figures given above for brickwork.

Regardless of the porosity of the brickwork or stonework employed in the construction, saturation must be ensured. This applies to whichever method of injection is recommended. It is this saturation, on a continuous basis, that guarantees an effective chemical D.P.C.

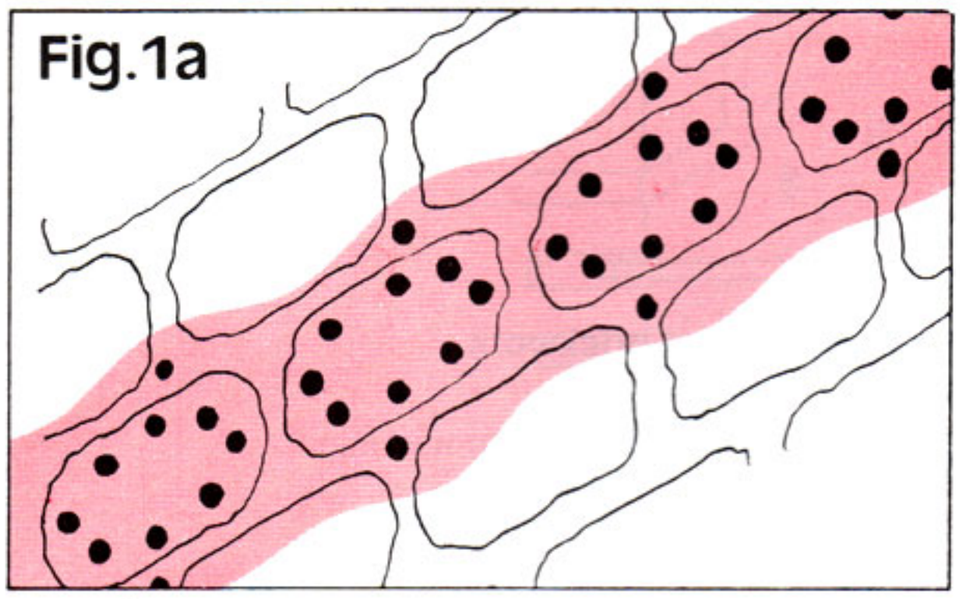


There are two principal methods of injection:

1. High pressure injection of the main fabric of the building, ie., individual brick or stone: see Fig. 1. and Fig. 1a.

2. Low pressure injection leading to the total envelopment of the main fabric of the building via saturation of the jointing medium: see Fig. 2. and Fig. 2a.

The above mentioned methods are equally effective if followed fully.



No. of holes/brick. Fig. 1

2 holes/brick are normally recommended. If the brickwork is particularly dense, 3 holes/brick may be required to equalise the distribution of the fluid thereby achieving total saturation of the selected brick course.

Fig. 1a

It is not important that the centre of dressed stonework is fully saturated. It is important that the entire individual stone be enveloped in injection fluid together with surrounding mortar joints.

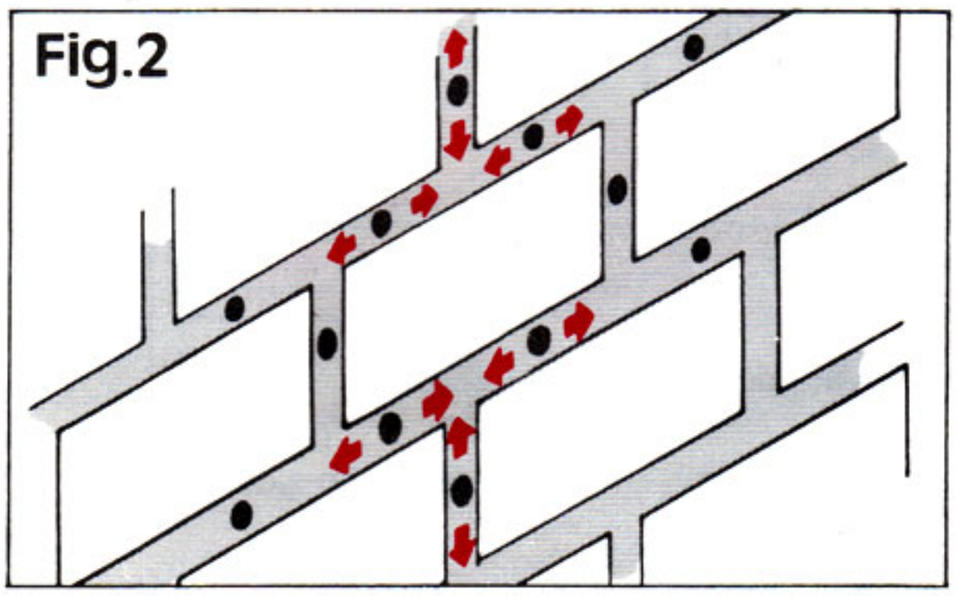
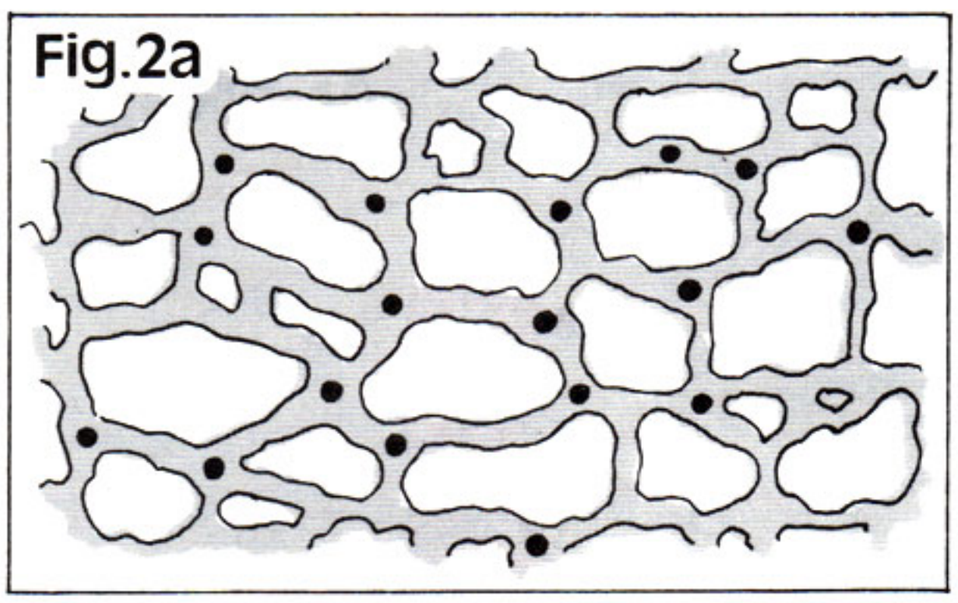


Fig. 2. Dense brickwork

Some bricks, eg. engineering, blue bricks etc., often do not allow the passage of water, yet rising damp still occurs. It will be found that in these cases the moisture is rising through the mortar joints. The density of the construction of this brickwork will not normally allow good saturation by injection. In these cases it is permissible to inject the surrounding mortar joints.



Random stone walling. Fig. 2a.

Random walling is usually composed of rubble and mortar to a degree greater than that of individual stone. In these cases greater efficiency will be obtained by flooding the mortar and rubble as illustrated. This applies particularly if the stone itself is non-porous, ie., granite, flint or slate, but damp is rising through and between the mortar joints.
A much lower injection pressure is employed for this method.

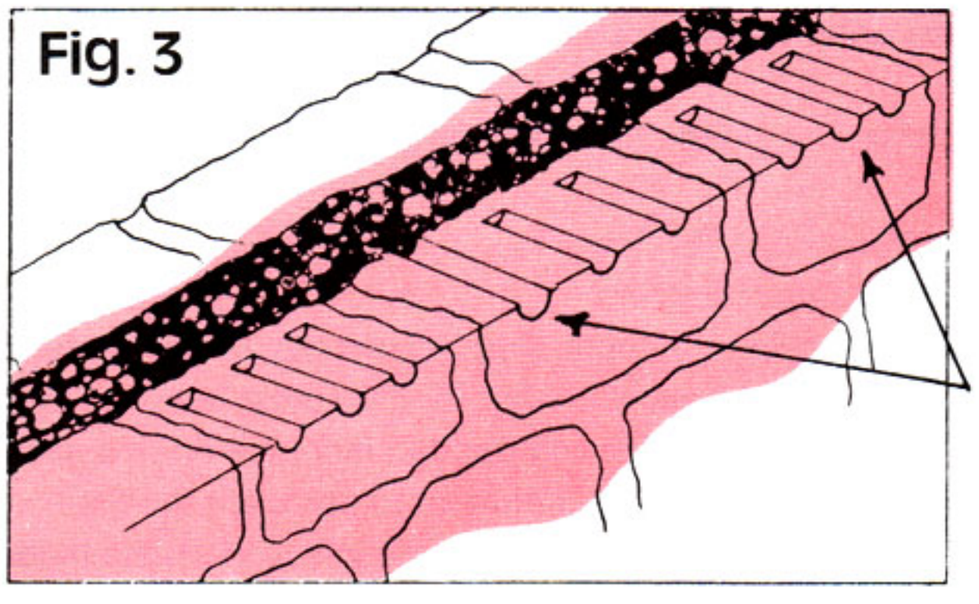


Fig. 3

Holes to show where injection has taken place directly into the rubble infil to ensure complete saturation.

Note! Every fifth hole is extended through the main fabric into the rubble infil.

Drilling - how deep?

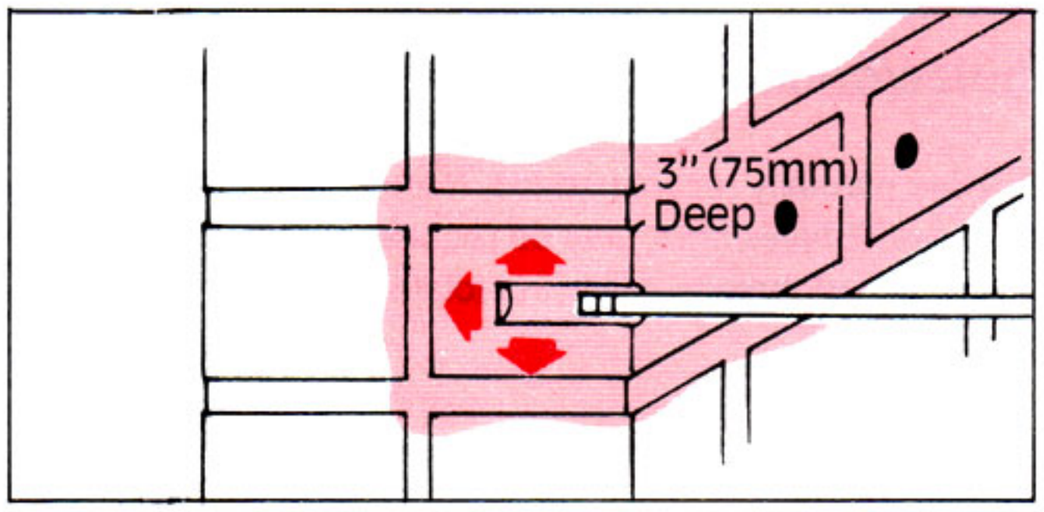
Under normal conditions we recommend that the brick or stone should be drilled to a depth of 2/3 of its thickness.

Injection

The injection of a chemical damp proof course into the wall of a building depends upon:

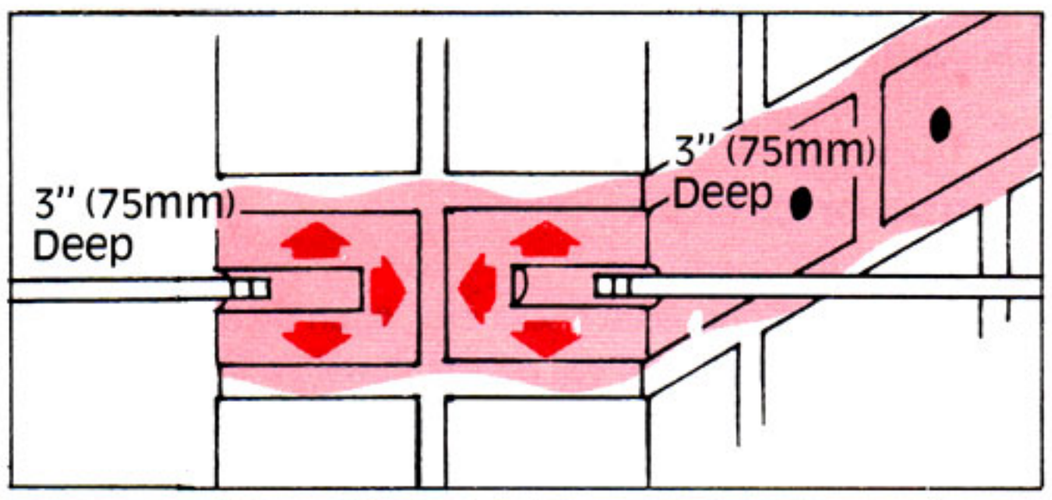
1. Method of construction
2. Wall thickness
3. Accessibility

Examples of the more common methods are illustrated below:



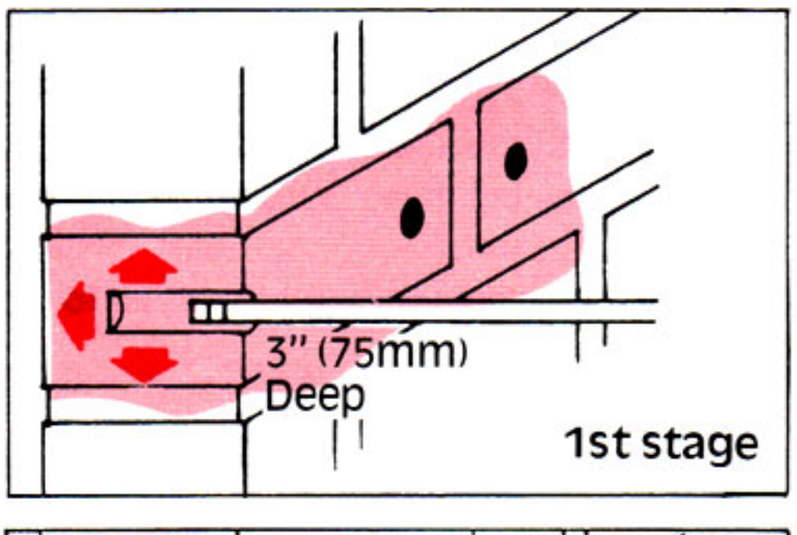
4 1/2" (115mm) single leaf brickwork

Drill the brick to a depth of 3" (75mm) and inject.



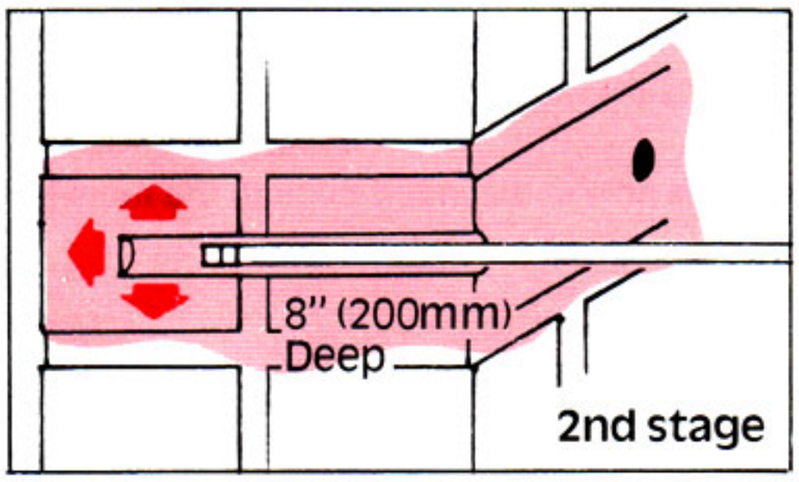
9" (230mm) solid brickwork - two sided

Method as 4 1/2" (115mm). Drill and inject both sides.

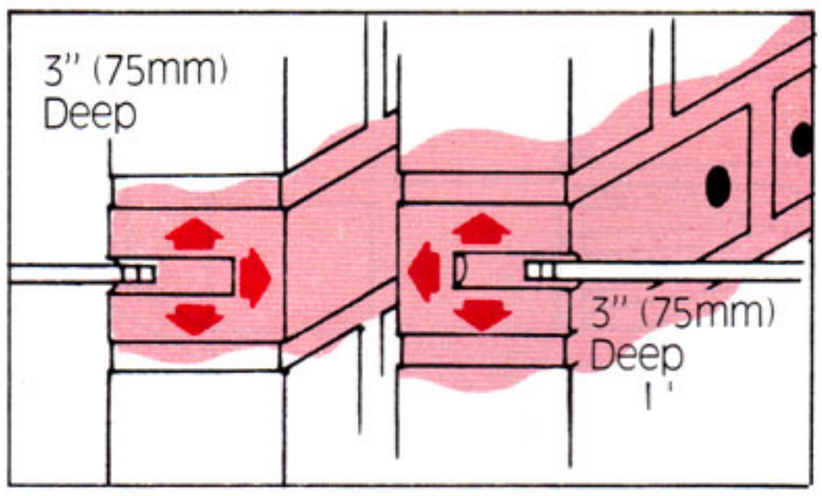


9" (230mm) solid brickwork - one sided

Explanation for one sided drilling and injection.

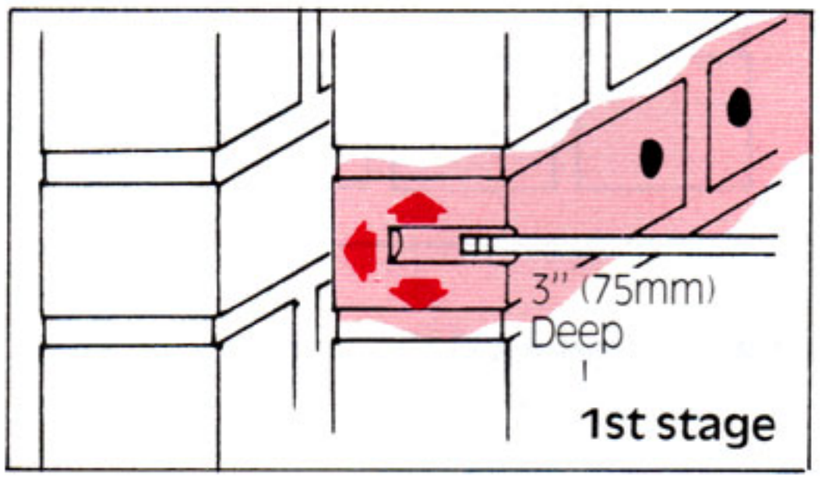


1. Drill 3" (75mm) into first leaf.
2. Inject to saturation first leaf.
3. Re-drill same hole to a depth of approximately 8" (200mm) (an extra 1/2" (12mm) is allowed here for the space between the abutting walls). Insert injection rod through first hole and couple into new drilled hole and inject; it is important to calculate the time injection takes on the first leaf to determine injection on the hidden side of the brickwork.



9" (230mm) cavity brickwork - two sided

Drill and inject both sides

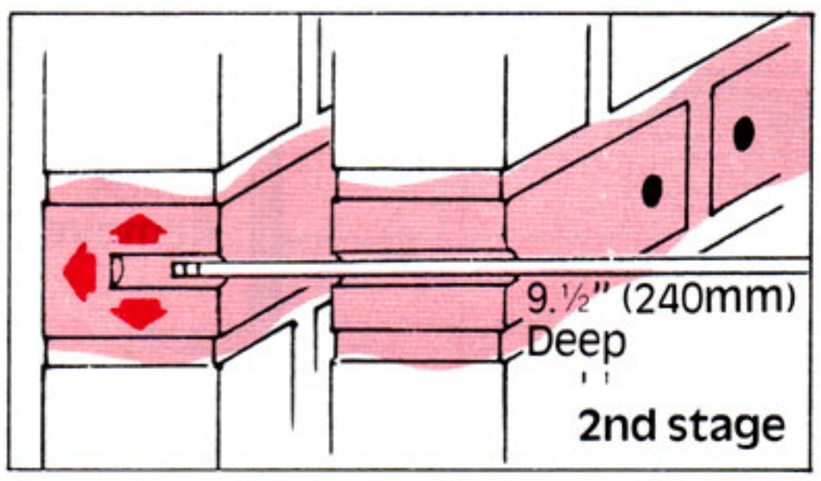


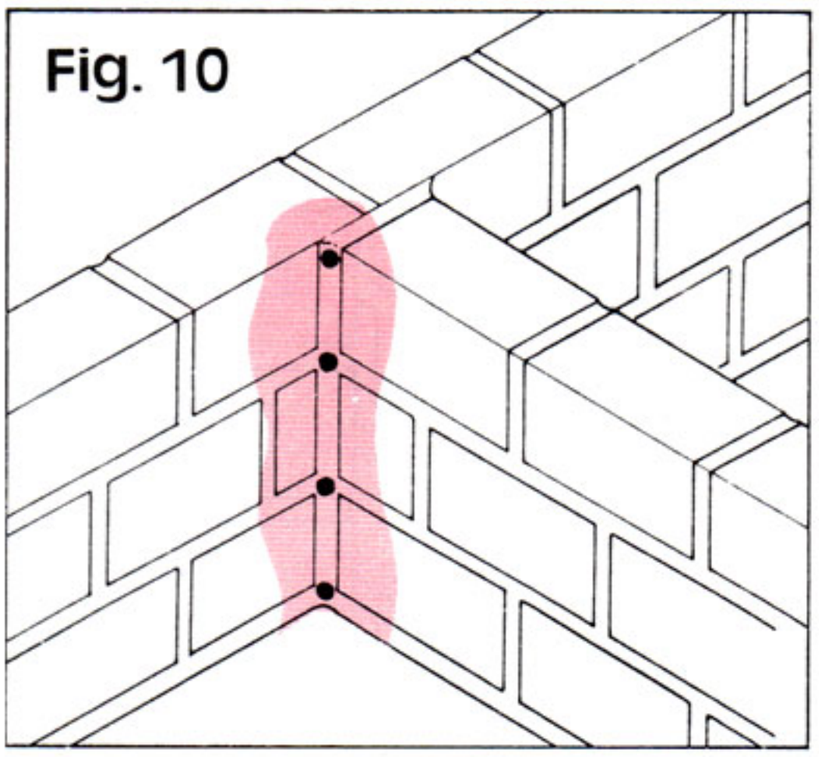
9" (230mm) cavity brickwork- one sided

1. Drill 3" (75mm)

2. Inject to saturation first leaf.

3. Re-drill same hole to a depth of 9 1/2" (240mm). Insert injection rod through first hole and couple into new drilled hole and inject; it is important to calculate the time injection takes on the first leaf to determine injection on the hidden side of brickwork. When double drilling it is advisable to redrill the first hole at a greater diameter to facilitate easy removal of injection rods from the second leaf.





Whichever method is decided upon, it is vital that injection follows a continuous horizontal line along all walls of the building which require a damp proof course. Where an efficient damp proof course exists in part of the property, eg. new extensions, the injected damp proof course must overlap to ensure that no bridging occurs. If the wall to be injected has an abutting wall it is essential that a vertical damp proof course is injected, again to stop bridging (see figure 10.)

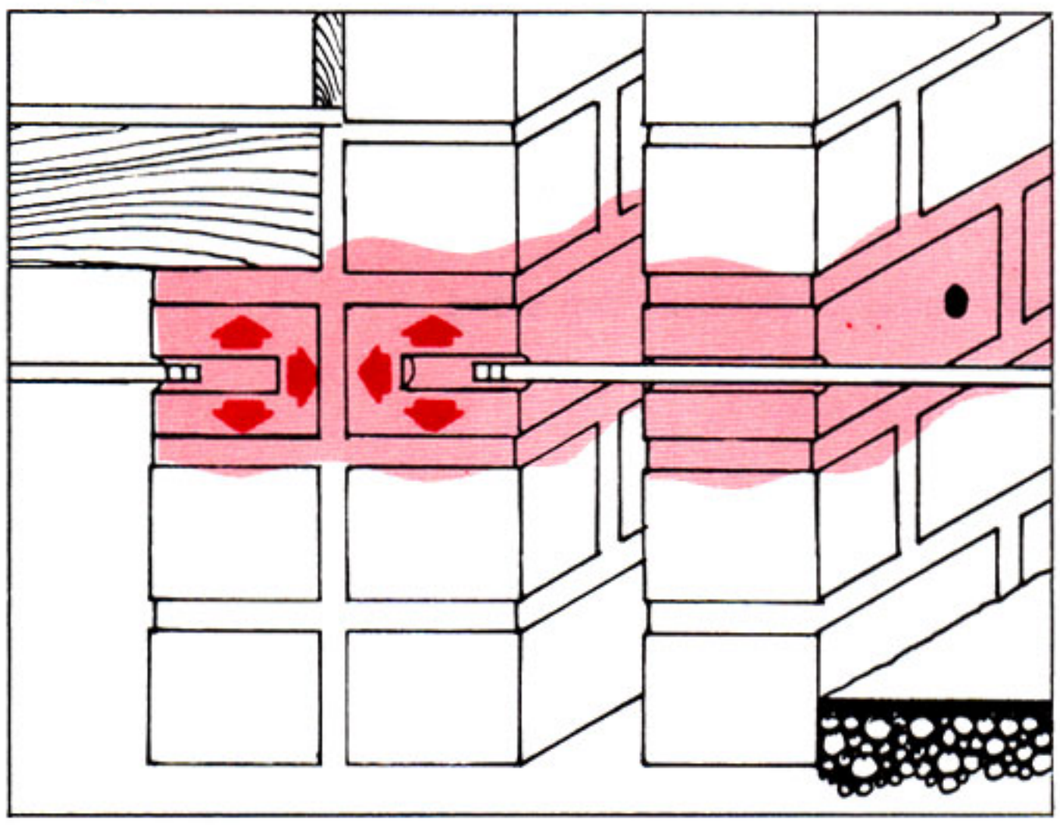
It is advisable on every contract having decided where the injected course is to be, to follow that course around the property where possible and note any areas where vertical courses may be required, eg., abutting walls, changes in levels etc. This can prevent many problems at a later date.

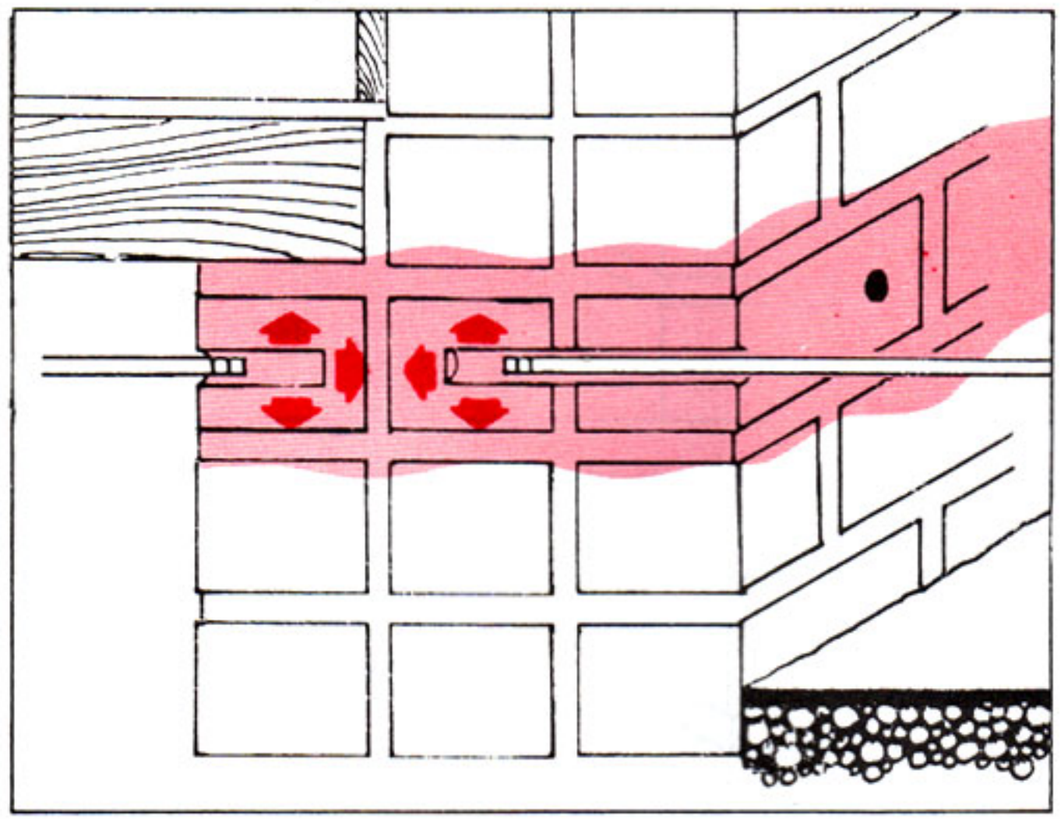
Where should the chemical damp course be?

Having decided that a damp proof course is required, it is extremely important to consider the correct courses for injection. Wherever possible, injection should take place below joist level and above external ground level. Unfortunately this is not always possible on economic or practical grounds and in some cases the construction does not allow this. If injection has to take place above joist level we recommend that the joist ends be treated with either Kingfisher liquid Insecticide/Fungicide or our Mayonaise Timber Paste. (See separate leaflet.)

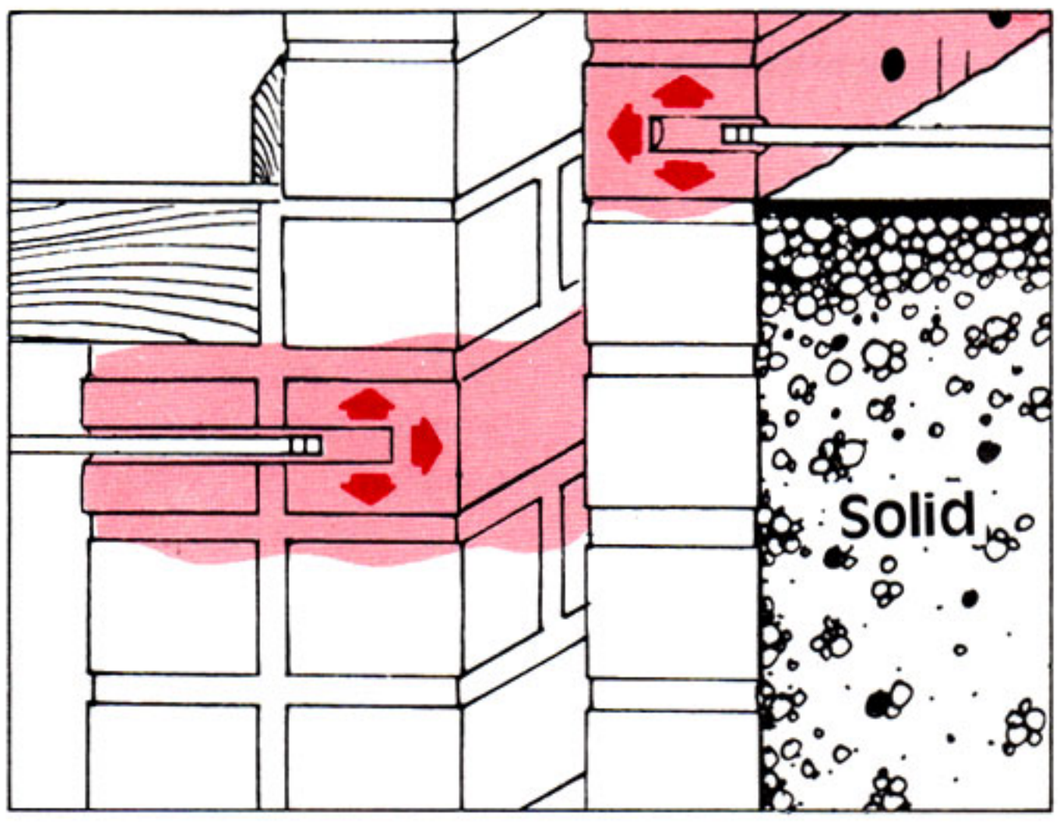
Injection methods where?

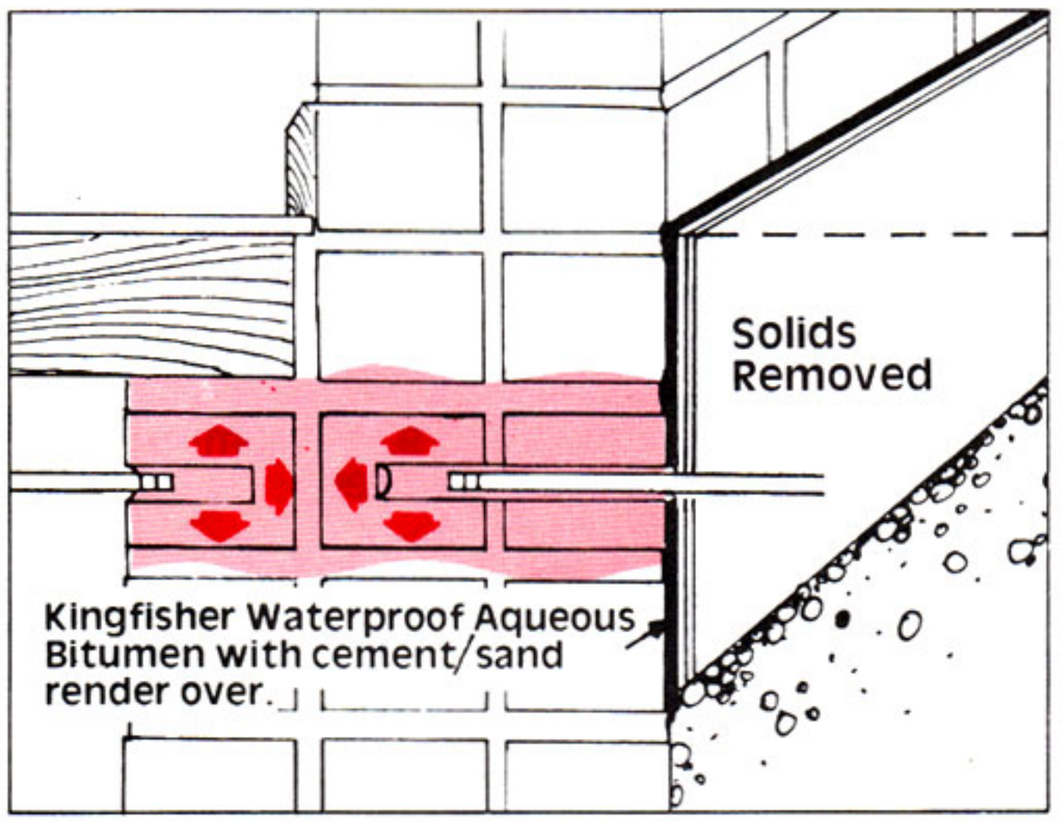
External ground level is below internal floor level.



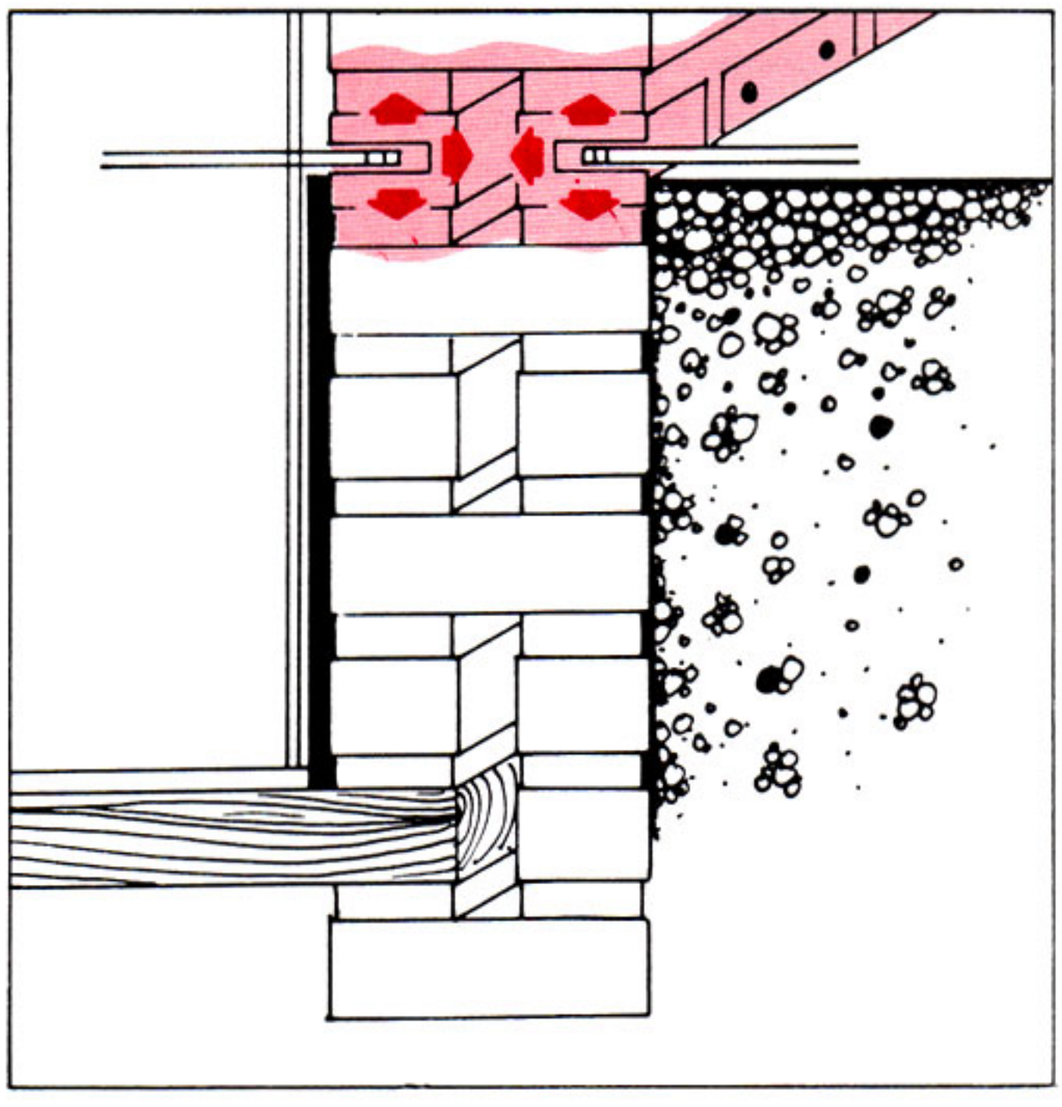


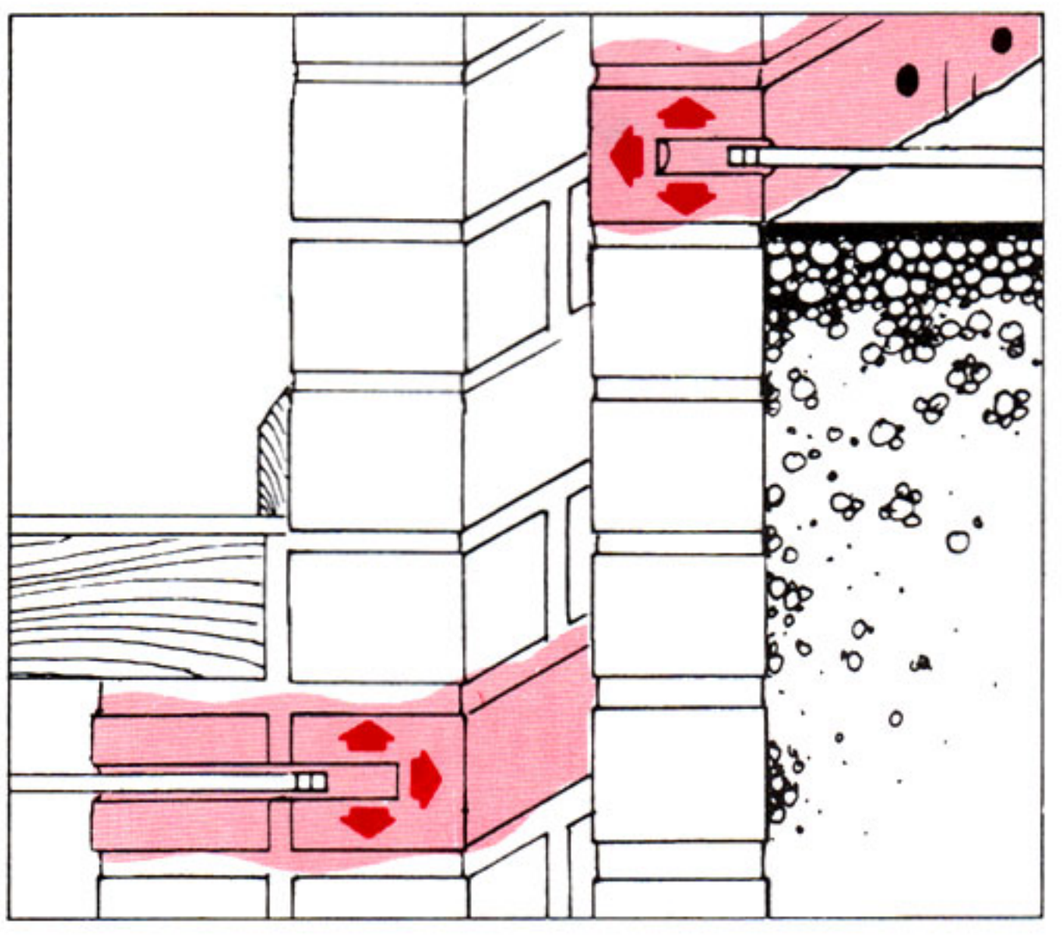
External ground level the same as internal floor level.





External ground level above internal floor level.





The above diagrams illustrate the most acceptable positions for a chemical damp course under varying conditions.

Injection Pressure

Kingfisher Injection pumps are designed to work at around 100 psi. This is the maximum pressure and in many cases it will be found unnecessary to use it. The optimum pressure is where the injection fluid can be seen to completely saturate the brick without pouring from the cracks in the brick. If timings are taken to saturate the bricks at a particular pressure, unseen bricks can be similarly treated with an assurance of saturation providing the same pressure and timings are used.

Preparation

1. Remove all floor coverings and furniture.
2. Remove skirting boards.
3. Remove internal plaster to a minimum height of 18" (455mm) above the damp line.
4. Advise interested parties of possible inconvenience, eg, neighbours, pet owners, asthma sufferers etc.
5. Remove floorboards.
6. Inspect revealed area for evidence of Dry Rot and if found refer to leaflets for Kingfisher Timber Preservatives and Fungicidal Wall Solution. Treatment for eradication and future protection must be carried out at this stage.
7. Ensure that garden plants and paths are protected from spillage of chemicals which may kill plants and damage tar or bitumen based pavings.

After injection

1. Ensure that solvent has evaporated. This may take from two days upwards.
2. Follow the Kingfisher Re-Rendering Specification carefully.
3. Replace skirtings after treatment as necessary with Kingfisher Timber Preservatives.
4. Paint newly replastered walls with emulsion paint only. Do not decorate with wallpaper for a minimum of 6 months after injection.
5. Fill all external holes with the correct coloured Kingfisher Injection Plugs

The treated walls should dry out within 6 -12 months depending on their thickness.

It must be remembered that the amount of water in the wall before injection remains the same immediately after injection. It is this water concentration which diminishes over the 6 -12 month time period as the injection has cut off its source of supply.
If this is remembered and understood many of the questions raised after job completion can be forestalled.

Efflorescence

After injection has been completed the wall begins to dry out. If a wall has been subjected to rising dampness for many years it will contain ground salts dissolved in the water. During the drying out process these salts will crystallise within the wall and cause no further problem. The re-rendering specification used in this respect must allow the wall to dry out but not allow these salts to appear on the surface of the wall. This is done by incorporating a water barrier in the first render coat (ie. Kingfisher Rendermix). This water barrier restricts the movement of liquid water in the wall but allows evaporation as water vapour thus ensuring normal drying conditions will continue. If a vapour barrier was used in this instance, it would prevent the wall breathing and could lead to more serious damage. In extreme cases efflorescence may appear on the wall during the drying out period but this can easily be removed by brush without causing any problems. Efflorescence is normally seen as a dry, white, fluffy covering on the wall and should not be confused with fungal growth.
After complete drying out, normal wall papering can commence if desired.

Re-rendering specifications

When a wall has had a Chemical Damp Proof Course installed, no immediate difference is seen in the level of water in the wall. This water will, however, evaporate at a rate of approximately one inch per month for every inch thickness of the wall. Obviously this amount of water has to evaporate from the surface and the water will migrate to the warmest surface which is usually internal if no rendering was specified, evaporation would take place from the brick/stone surface without inconvenience. In most cases reinstatement of perished plaster has been done and it is most important to ensure that the rendering is not sensitive to moisture, highly absorbent eg. Carlite or similar, the plaster could "blow" and eventually, on drying out, complete areas of plaster could collapse.

Strict adherence therefore to the Kingfisher Re-Rendering Specification will:

1. Allow normal drying out.
2. Stop water from coming through on to the decorations.
3. Not greatly increase the risk of condensation.

Two specifications have been developed to meet these provisions. The first uses a sand : cement rendering, incorporating Kingfisher Rendermix, in the first coat. Kingfisher Rendermix has fungicidal properties and acts as a water barrier as detailed above, thus allowing evaporation to take place without migration of liquid water into the final porous plaster coat.

The second coat allows for the use of a proprietary compatible brand of lightweight plaster when applied in accordance with manufacturers recommendations.