

Rising Damp & its Control



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Rising Damp & its Control

Preface

Rising damp is not the most common form of dampness encountered in buildings; this is left to condensation. However, a high proportion of older buildings are affected by rising damp to some degree or another.

This manual has been produced to enlighten and inform those who are in some way involved with the control of rising damp in buildings. It assumes the reader already possesses a basic knowledge of the subject and therefore hopes to expand upon this.

The manual deals with the most common situations encountered with regard to rising damp and remedial action. It does not cover structural waterproofing (tanking). An outline of the identification of dampness problems in buildings is given. This book should be read thoroughly to become familiar with the systems prior to undertaking any works.

It is also important that the user of Safeguard damp-proofing systems is thoroughly familiar with **relevant national standards covering the treatment of rising damp – e.g. BS 6576:2005**, “Code of practice for diagnosis of rising damp in walls of buildings and installation of chemical damp-proof courses”.

Finally, the installer of any damp-proof course system must be aware of any risk and hazards which the processes might cause, and therefore be aware of their duties under **health and safety regulations**. Also it is prudent to ensure that the property owners have **obtained the necessary permissions where walls to be treated are shared with adjoining properties (known as party walls)**.

Note on British Standards/Publications referred to in this document:

The following publications are referred to throughout this book:

BS 6576
BS CP102 1973
BRE Digest 245

Although these publications were produced in the UK, the techniques and methods described can be used in any country.

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Rising Damp & its Control

Rising Dampness Part 1



Part 1

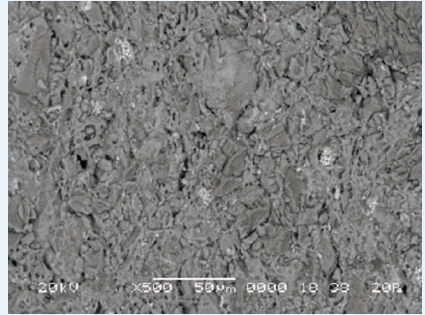
Rising Dampness

What is Rising Damp?

Rising damp in buildings may be defined as the upwards flow of **moisture** through a permeable wall structure, the moisture being derived from groundwater. The moisture rises through the pores (capillaries) in the masonry by a process loosely termed 'capillarity', which causes the masonry to act like a wick.



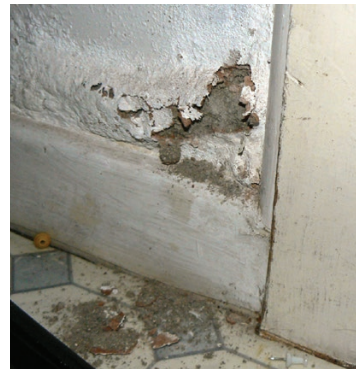
Figure 1: Rising damp.



Electron microscope image showing pores in a brick.

Rising damp (see Figure 1) varies in severity depending on several factors including the level of groundwater, the pore structure of the masonry materials (brick, stone, mortar etc...) and the rate of evaporation away from the wall surface. It often requires treatment because it has a number of undesirable effects on the performance of buildings, including:

1. **Decorative Spoiling** – Moisture and ground salts introduced by rising damp can cause wallpaper to peel, plaster to deteriorate, and paint to blister.



Part 1

Rising Dampness

SALT ACCUMULATION

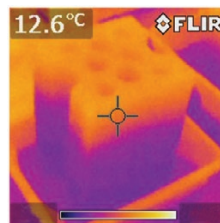
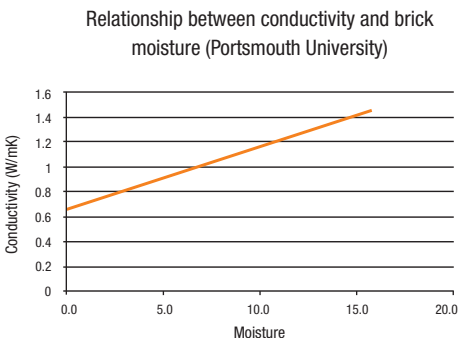
"...in 100 years, groundwater containing as little as 100ppm of dissolved salts transports 4.2 kg of salt into each metre length of wall"

Source: Proceedings of the Royal Society - Moisture dynamics in walls: response to micro-environment and climate change - Hall, Hamilton, Huff, Viles, and Eklund. Example based on London conditions.

- Erosion of the Building Fabric** – Ground salts introduced into the wall by rising damp can attack and dissolve the binders in brick, stone, and mortar causing them to lose their strength and structural integrity. Crystallising salts can exert such forces that the mortar, brick, or stone microstructure is destroyed.



- Increased Heat Loss** – Dampness in porous building materials causes a reduction of insulation properties as air in the pores is replaced by more conductive water. For example, the thermal conductivity of a wet brick has been found to be approximately twice that of a dry brick (see Figure 2).



Thermal image of concrete block resting in water. Lower part of image is cooler as rising damp has led to evaporative cooling.

"Heat loss caused by rising damp lowers the surface temperature of walls - increasing condensation risk"

Figure 2: Correlation between thermal conductivity and brick moisture.

Part 1

Rising Dampness

DAMP AND HEALTH

"In Europe, an estimated 10-50% (depending on the country) of the indoor environments where human beings live, work and play are damp. Too much moisture makes a home stuffy and gives it a faint odour. Humid walls create a coldness that makes more heating necessary and increases energy bills."

Source: World Health Organization Information Brochure "Damp, mould, health risks, prevention and remedial actions".

¹ **WHO Guidelines for Indoor Air Quality: Dampness and Mould** (World Health Organisation)
ISBN 978-92-890-4168-3

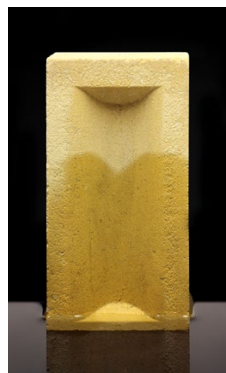
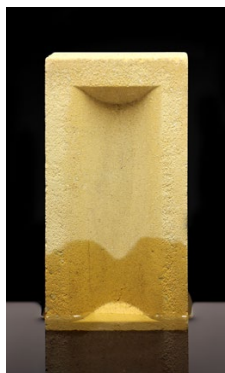
² **Rising damp in masonry walls and the importance of mortar properties:**
Construction and Building Materials, Volume 24, Issue 10, October 2010, Pages 1815-1820, Dr. Eric Rirsch, Dr. Zhongyi Zhang

- Health Effects** – It has been widely documented that excessive dampness in buildings can have negative effects on the health of the building's occupants¹.



What Causes Rising Damp?

Rising damp occurs when moisture from the ground is "sucked" into the porous building materials from which walls are constructed through a process known as "capillarity." This effect can be demonstrated by placing a sample of brick, mortar, or porous stone in a shallow tray of water:



The potential height to which the damp will rise in a full-sized masonry wall will largely depend on the absorbency of the components from which it is constructed. The absorbency of the mortar is of particular importance². The pore structure of some kinds of masonry materials (e.g. old lime mortars, under-fired bricks, and certain types of sedimentary stone) results in a high degree of absorbency and masonry built using these materials is particularly susceptible to rising damp.

Part 1

Rising Dampness

The rate of flow of water through the structure is dependent on pore size, shape, and connectivity. Smaller pores have greater potential for capillary rise, but larger pores have more rapid flow. So the maximum rise is determined by the distribution of pore sizes.

In practice, this potential height of rise is moderated by the fact that moisture introduced into the wall through rising damp will evaporate before it has had a chance to rise to the full potential height. For this reason, rising damp to heights exceeding 1.5 m is relatively rare except where the wall has been covered by vapour impermeable coverings such as polymer membranes, vinyl wallpapers, and certain types of wall insulation.

The height of rise also tends to be higher in other situations in which evaporation is inhibited – e.g.:

- **Local Climate** – rising damp will often rise higher in colder locations
- **Winter vs Summer** – In a European climate damp tends to rise higher during the wetter, colder winter months.
- **Northerly Aspect** – height of rise tends to be higher on walls with a northerly aspect (in Northern Hemisphere) as these walls are cooler than those with a southerly aspect
- **Unheated house** – evaporation is lower in unheated (or unoccupied) homes than in heated homes
- **Thick walls** – have lower evaporation rates than thin walls as their surface area is proportionally lower (see Figure 3).

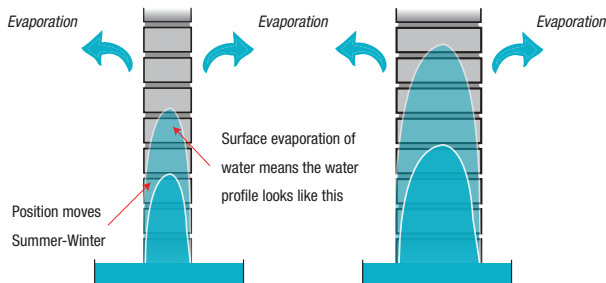


Figure 3: Less surface area results in a slower rate of evaporation.

Groundwork and Hygroscopic Salts

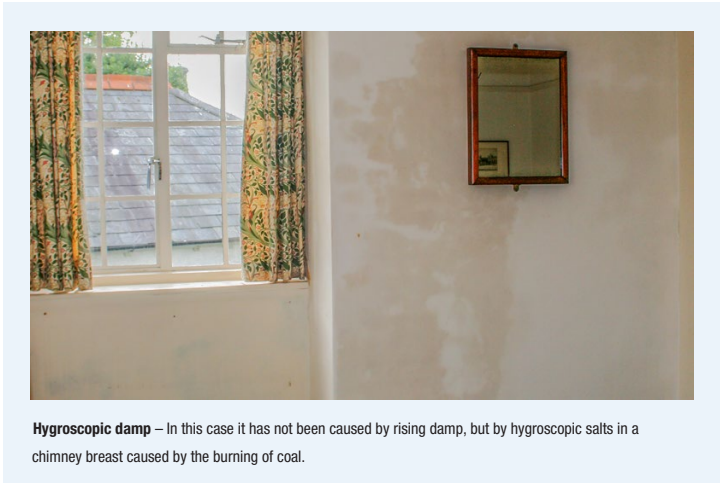
Although rising damp is caused by the process of “capillarity” described above, it is inextricably linked with another form of dampness – hygroscopic damp.

This is because rising damp transports hygroscopic (moisture attracting) salts from the ground into the building structure where they accumulate. Once present inside the fabric of the building at sufficient concentration they can cause “hygroscopic dampness” by attracting moisture from the air.

Part 1

Rising Dampness

When hygroscopic damp has taken hold in a wall it becomes a cause of dampness in its own right and can therefore continue to be a problem even though the rising damp has been rectified (e.g. by installation of a new damp-proof course). This is one of the reasons that it is sometimes necessary to carry out specialist replastering as part of a rising damp treatment. Options for replastering walls affected by rising damp are discussed later in this guide.



Salt Damage

The salts responsible for hygroscopic damp (see Figure 4) can also cause damage to the masonry and plaster due to their “*expansive crystallisation effects*” – a term used to describe the tendency of certain salts to expand in size when they crystallise. When this occurs inside the pores of masonry materials the expansive forces can cause damage to the masonry material (e.g. plaster, brick, mortar or stone).

Treating the rising damp using an effective replacement damp-proof course such as Dryzone or Dryrods will prevent further build-up of salts. However plaster and masonry that has already been damaged by salts may need to be repaired or replaced.

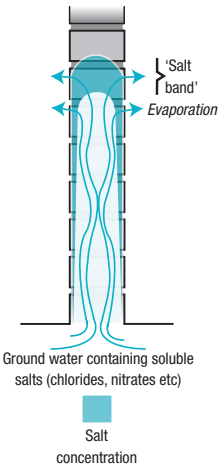
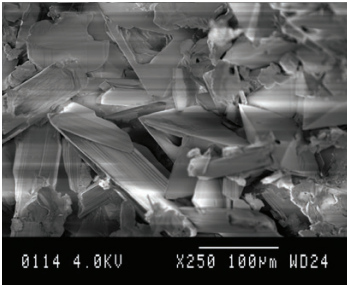


Figure 4: Hygroscopic damp caused by soluble salts rising up the wall.



Assessment of Dampness in Buildings

Part 2



Part 2

Assessment of Dampness in Buildings

Surveying Types of Dampness

Before treating a wall for rising damp, it is essential to determine whether the dampness in the wall can be solely attributed to rising damp – or whether other causes such as condensation or rain penetration may be contributing to the dampness. The solutions described in this guide are solely for the treatment of rising damp. Solutions for other types of dampness can be found at www.safeguardeurope.com

The Survey

It is essential when investigating the potential for rising dampness to eliminate other sources of water ingress. Care must be taken to eliminate other potential sources of moisture, especially condensation in the colder months, and it is therefore essential to ensure that a full investigation is always undertaken. If any other sources are identified then these must be first eliminated before a proper assessment of any rising dampness can be made as it can be very difficult to distinguish between two or more interfering sources of water ingress.

Should it be noted that previous damp-proofing works have been undertaken then it is essential to take great care ensuring that the evidence of dampness is correctly evaluated. The following gives a guide to on-site routine procedures for the survey:

1. External Examination:

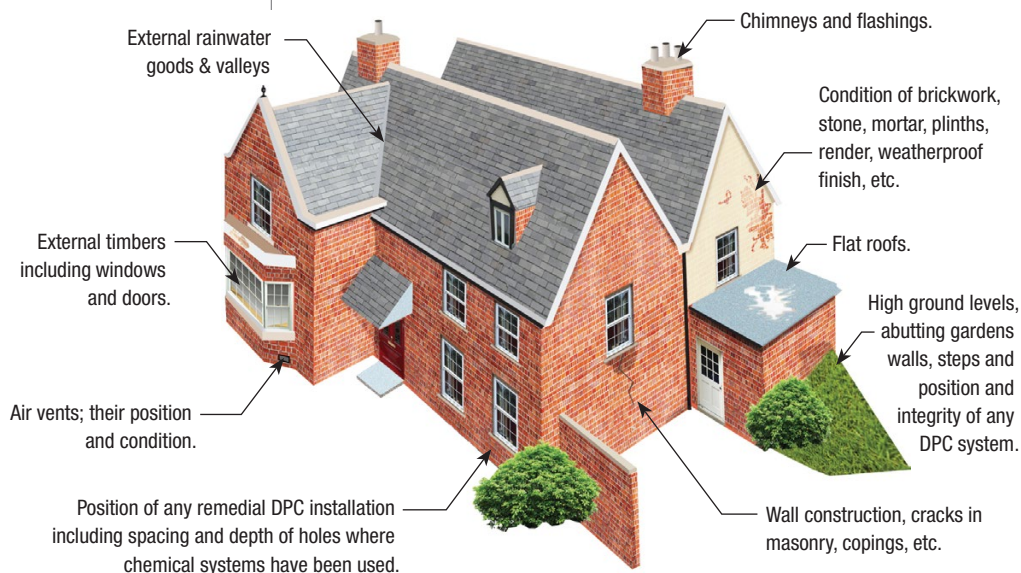


Figure 5: External examination.

Part 2

Assessment of Dampness in Buildings

2. Primary Internal Examination (Visible Signs):

- a. Fungal decay in skirting and/or other timbers.
- b. Peeling/blistering wallpaper, peeling/blistering paintwork.
- c. Efflorescence.
- d. Mould growth, staining.
- e. Damp/wet patches, water droplets, water runs.

3. Secondary Internal Examination:

(assuming correct use of properly functioning and calibrated electrical moisture meter)

- f. Examine both perimeter and centre of solid/timber suspended floors.
- g. Check moisture content of timber skirting (top and base).
- h. Examine and check condition of the floor/wall junction, edge of DPM of floor.
- i. Check any remedial damp-proof course installation including position and depth of holes (if inserted from inside).
- j. Note **distribution** of moisture meter readings both vertically and horizontally on the surface of walls.
- k. Check for efflorescence beneath wallpaper finishes.
- l. Note any use of polystyrene sheet/foil backing beneath wallpaper.
- m. Note any new plasterwork, height of replastering, its condition and if possible its type, e.g. renovating, sand/cement, lightweight premix gypsum, etc.
- n. Lift floorboards and thoroughly examine timbers and subfloor.
- o. Check for suitable subfloor ventilation.
- p. Look for internal plumbing defects and water dripping from cold pipes as the result of condensation.

4. Tertiary Internal Examination:

- q. Check (if possible) on history and use of property.
- r. Evaluate 'lifestyle', e.g. use of central heating, paraffin or flueless gas heaters, drying, washing and cooking, degree of ventilation, etc.

Once any form of dampness has been identified then it is essential that the risk of decay to any timbers is assessed and appropriate remedial measures undertaken.

REMEMBER: a combination of dampness and wood leads to potential rot.

The primary task of the investigator is to correctly identify the source of dampness. This is best achieved by a process of investigation and elimination. Extreme care must be taken, for example, in the winter months to eliminate condensation as one of the potential causes of dampness. A basic guide to dampness problems is given in Table 1 on the next page.

Part 2

Assessment of Dampness in Buildings

Symptom	Diagnosis
Decayed skirtings, damp base of wall, damp around edge of solid floor	<ol style="list-style-type: none"> 1. Rising dampness 2. Rising dampness + defect in floor/wall junction 3. Faulty edge to DPM of floor 4. High ground level/failed tanking skirting/floor
Surface efflorescence just above skirting/floor	<ol style="list-style-type: none"> 1. Gypsum finishing in direct contact with damp solid floor or damp masonry at base of wall 2. Gypsum finish/porous plasterwork taken below timber suspended floor and subfloor and condensation at floor/wall junction
Dampness at base of wall up to 1.5 m* in horizontal band	<ol style="list-style-type: none"> 1. Rising dampness 2. Low level rain penetration (splashback)
Stains, especially in horizontal band, noticeably damp in humid conditions	<ol style="list-style-type: none"> 1. Heavy contamination with hygroscopic salts
Damp patches on surface increasing in size during/ following rain; sometimes heavy efflorescence	<ol style="list-style-type: none"> 1. Rainwater penetration; external defect
Stains/damp/efflorescence on chimney breast	<ol style="list-style-type: none"> 1. Contaminated plasterwork from combustion products 2. Condensation in flue 3. Water running down chimney flue
Mould growth on cold surfaces, window reveals, ceiling/wall junction, etc	<ol style="list-style-type: none"> 1. Condensation
Free surface water, water run marks, water droplets, dripping water	<ol style="list-style-type: none"> 1. Condensation 2. Severe rainwater penetration 3. Severe plumbing leak
Damp timber floorboards around edge of floor but not in centre	<ol style="list-style-type: none"> 1. Subfloor condensation at floor/wall junction 2. Floorboards in direct contact with damp masonry or damp joists
Floorboards damp away from wall	<ol style="list-style-type: none"> 1. Subfloor condensation
Damp at first floor level and above	<ol style="list-style-type: none"> 1. Condensation 2. Rainwater penetration 3. Plumbing defects

* May rise higher depending on conditions

Note: disintegration of cementitious renders may be due to sulphate attack.

Table 1: A basic guide to dampness problems.

Part 2

Assessment of Dampness in Buildings

It is essential that the survey is carried out thoroughly and that all potential areas of dampness are noted. Special vigilance must be taken where dampness, and hence decay, may be unseen such as beneath timber suspended floors. Wherever timber and dampness coexist the risk of decay should always be reported and the client must be put on notice to that effect.

Comparisons of different types of dampness are given in Table 1. During the survey, there may be several signs of dampness and it is important that they should all be identified as far as possible.

Where there is more than one source of water ingress then it may be difficult to distinguish between their origins. Generally, the presence of active rising dampness is indicated by excessive moisture at the base of the wall which slowly declines further up. This moisture gradient is usually observed up to heights of 1.5 metres but, depending on conditions and the structure of the masonry, it may rise to greater heights. Sometimes, a ‘tidemark’ can be observed running almost horizontally along the wall and the area below it being obviously damp.

Masonry contamination with a ‘band’ of hygroscopic salts will also confirm the presence of a rising damp but will not differentiate between an active or past complex.

Use of Electrical Moisture Meters

The proper use of a surface electrical moisture meter can give a useful indication as to the existence of a rising damp complex but cannot give absolute proof, especially where remedial works have been previously carried out. (See Property Care Association DP1, *‘The use of electrical moisture meters to establish the presence of rising dampness’*).

Electrical moisture meters should be used to obtain a “moisture profile” by taking readings at regular intervals (usually 100 mm) vertically up the wall being investigated. The typical moisture profile for walls suffering from rising damp is high surface readings on the lower sections of wall followed by a sudden ‘cut-off’ at the top of the rise of moisture.

However, other meter reading patterns can be obtained during investigations. Some possible interpretations are given in the table on the next page. Please note that it is the pattern of the readings which are important.



Part 2

Assessment of Dampness in Buildings

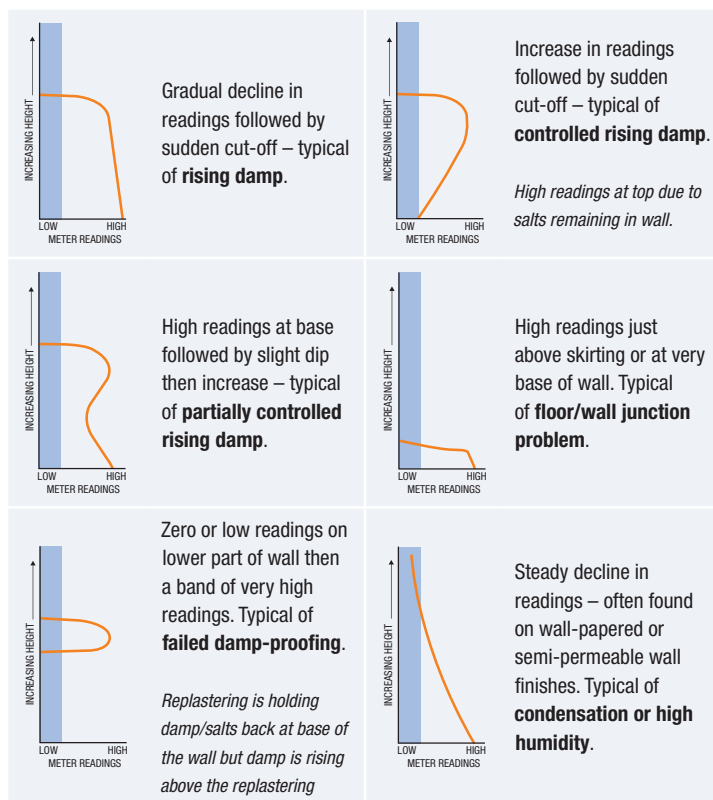


Figure 6: Common Moisture Profiles.

Source: Graham Coleman

Quantitative Measurements

For a precise evaluation of potential rising dampness, quantitative measurements of moisture are required and methods such as those described in Building Research Establishment Digest 245, *'Rising dampness in walls: diagnosis and treatment'*, should be used. This involves the use of drilled samples taken in a vertical series and determining the hygroscopic and capillary moisture content of each sample. The capillary moisture content represents water ingress and therefore its presence and distribution in the vertical profile will indicate whether rising damp is actually occurring or not. This technique will also identify dampness problems caused by heavy contamination with hygroscopic salts rather than water ingress.

Finally, it must be understood that dampness can rise to heights well in excess of 1 metre, a figure frequently quoted as the maximum height to which dampness can rise.

The Property Care Association leaflet DP9, *'Guidelines to Survey Report writing'* should form the basis on which the report should be structured.

Treatment of Rising Damp

Part 3



Part 3

Treatment of Rising Damp

Overview

The process for the treatment of rising damp consists of two main phases;

1. **Stopping the source of the dampness via a remedial chemical damp-proof course using Dryzone Damp-Proofing Cream or Dryrod Damp-Proofing Rods.**
2. **Where necessary, reinstating areas of plaster that are damaged or that have been contaminated with salt, making sure to use appropriate salt and damp-proof plastering methods for a long lasting finish.**

This section of the booklet will cover both the treatment and replastering methods in a step-by-step guide.

Stopping the Source of Dampness

A: Choosing the Correct Damp-Proof Course Solution

In order to stop the progress of rising damp through a wall, it is necessary to create a new damp-proof course. Installing a new physical damp-proof course into an existing wall can be hazardous, expensive and impractical in many situations (e.g. party walls). Older pressure pump injection methods directly into the brick are also time consuming and often ineffective.

The most practical and effective way to create a new damp-proof course in a wall is to make an existing mortar course into a waterproof barrier using high strength damp-proofing creams or rods (see Figure 7).

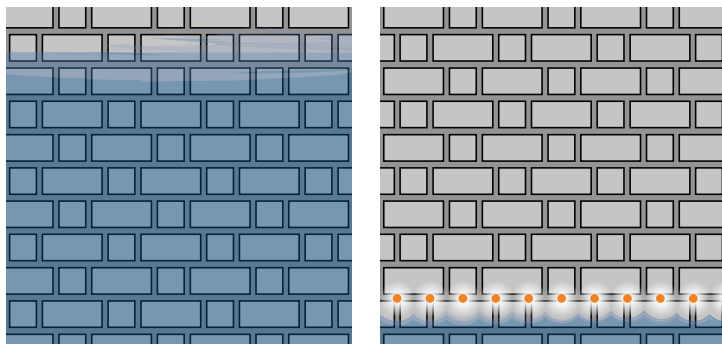


Figure 7: Stop rising damp by creating a waterproof mortar course.

OPTION A



A high-strength silicone-based cream that is injected into holes drilled at regular intervals along a mortar course in order to form a damp-proof course. Once injected, the cream diffuses along the mortar course before curing to form a breathable water-repellent resin – preventing dampness from rising up the wall.



OPTION B



12 mm diameter fibre rods that carry a powerful water-repellent material. They are inserted into holes drilled at regular intervals along a mortar course. Once inserted, the rods diffuse water repellent material along the mortar course, curing to form an effective barrier to rising damp. Dryrods are an alternative to Dryzone cream and are suitable for situations that require maximum performance, guaranteed dosing or increased treatment speed.

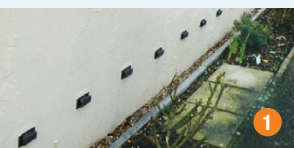


Part 3

Treatment of Rising Damp

LOW VISUAL IMPACT

Because **Dryzone Damp-Proofing Cream** and **Dryrod Damp-Proofing Rods** are drilled into the mortar course rather than the brick they leave very little visual impact compared with other types of damp-proofing. The holes drilled in the mortar course can simply be filled with new mortar after treatment with Dryzone or Dryrod. In many cases Dryzone or Dryrod can be installed from the outside of a building - avoiding the need to remove skirting boards etc...



Pictures of walls with

- 1) "Dutch" method
- 2) Holes drilled in bricks
- 3) Holes drilled in mortar

B: Preparing for Installation

Suitability for Treatment

Most types of traditionally built masonry walls can be treated using **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods**. However, some walls should not or cannot be suitably treated. Special procedures may be required for certain types of masonry, e.g. perforated brick and some types of blockwork. Contact our technical department for information on treating these types of wall.

Earth retaining walls can only be treated above external ground level. The area below ground must be suitably 'tanked' to prevent lateral moisture penetration. Information on waterproofing walls below ground can be found on www.safeguardeurope.com

Pre-Installation Procedures

Important: before undertaking any work it is essential to check the following:

1. Check all cavities, where present, for debris which may cause bridging of the damp-proof course.
2. Ensure subfloor ventilation is adequate where timber suspended floors are installed.
3. Lower ground levels where necessary.
4. Remove perished/damaged external plinths and cut any external rendering back to above the height of the damp-proof course line.
5. Remove all floor coverings and furniture if appropriate.
6. Remove floorboards if appropriate.
7. Remove timber skirtings and architraves if appropriate. If they are to be re-fixed, put to one side; remove all fixings.
8. If replastering is necessary, remove any salt-contaminated or damaged plaster that is to be replaced to a minimum height of 300 mm above the last detectable signs of dampness and/or salt contamination. Please see "Part 4 - Replastering Following Insertion of a Damp-proof Course" chapter of this guide for advice on deciding whether plaster needs to be replaced and details of suitable replastering systems.
9. Ensure that plants, paths and glass are protected from spillage.
10. Check level of any adjoining solid floor which may be present and ensure that proposed damp-proof course line is not bridged.

Safety

Read material safety datasheet for all Safeguard products and related materials before use and carry out a health and safety assessment of the procedures (e.g. drilling holes) necessary for the installation of **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods**.

Party Wall Act

When appropriate ensure that the property owners have complied with the Party Wall Act 1996. Advise interested parties of possible inconvenience of noise and vibration especially neighbours living in an adjoining property which shares a party wall to be treated.

C: Placement of the Damp-Proof Course

In order to install either **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods**, it is necessary to drill holes in a continuous line along a horizontal mortar course. Care must be taken to ensure the correct position of the damp-proof course is chosen and the proper technique is used for the type of wall that is being treated.

Line of the Damp-Proof Course

Where possible, the line of the damp-proof course for external walls should be placed at least 150 mm above external ground level in order to minimise the risk of rain splash-back from external hard surfaces bridging the damp-proof course (see Figure 8).

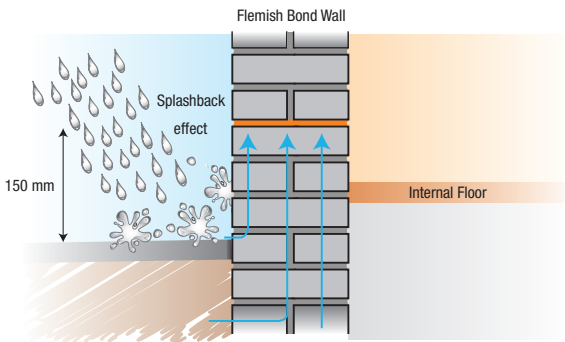


Figure 8: Splashback effect.

The intended line for the damp-proof course should be exposed and clearly defined, taking into consideration internal and external ground levels, party and abutting walls, and changes in ground levels.

Part 3

Treatment of Rising Damp



Injecting a new damp-proof course using **Dryzone Damp-Proofing Cream**.

Part 3

Treatment of Rising Damp

Internally, where a solid floor is present, the damp-proof course should be inserted as close as possible to floor level. In all cases there should be continuity between the injected damp-proof course and any damp-proof membrane of a solid floor, the latter being taken up the wall to overlap with the injected damp-proof course as described in BS CP 102.

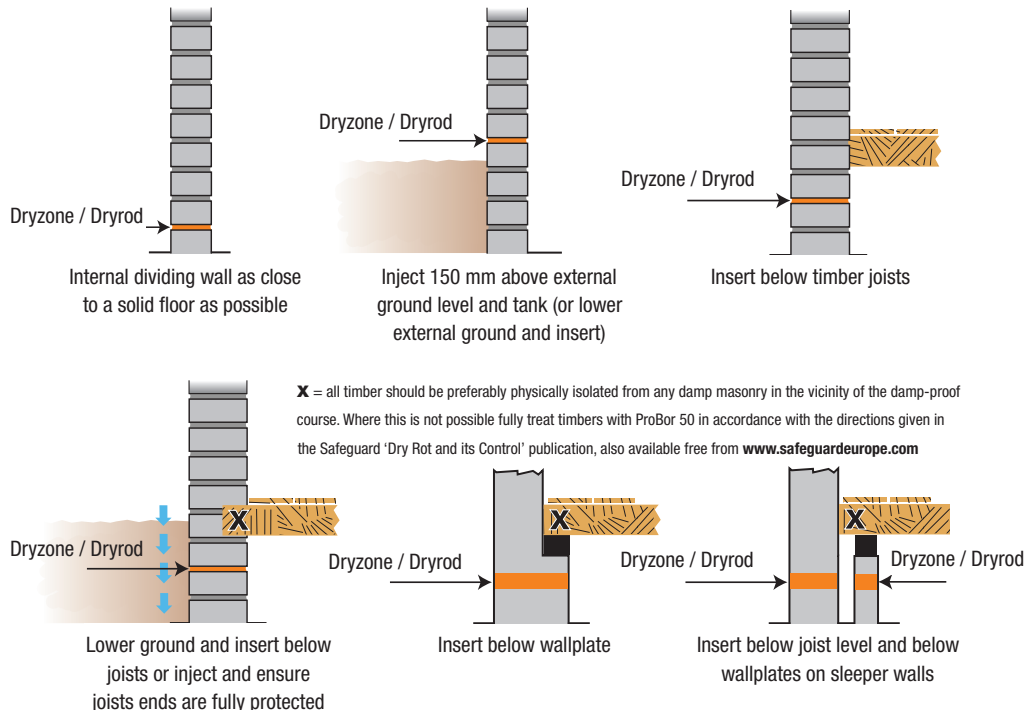
Where suspended timber floors are encountered the damp-proof course should, if possible, be inserted below the timbers.

Positioning of the damp-proof course in relation to timber joists should be in accordance with BS6576:

"Where possible, the proposed damp-proof course should be installed below the level of the timber joists and a check made that the damp-proof course line is not bridged by sleeper walls, etc... If a damp-proof course has to be installed above a timber floor, the client should be informed (in writing) that the floor is at risk of fungal decay."

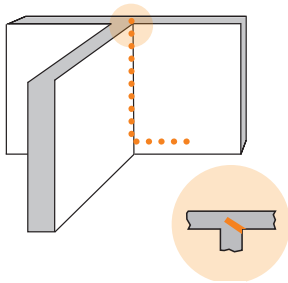
Damp-Proof Course Positions

The diagrams below illustrate the correct positions for injection or insertion into brick walls. The same principals also apply to stone walls.

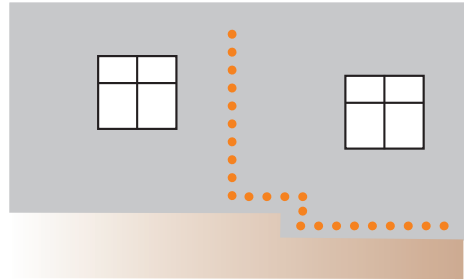


Vertical Isolations

Where adjoining/abutting walls are present which are not to be treated, a vertical damp-proof course must be installed. This should not be less than 1200 mm high and extend not less than 500 mm above the last evidence of dampness/salt contamination.



Vertical damp-proof course to isolate abutting walls etc.



Damp-proof course to accommodate slight changes in ground levels and adjacent untreated sections of wall

Vertical isolations are not capable of withstanding hydrostatic pressures which may be encountered with stepped properties, raised external ground levels, etc.

The Risk of Timber Decay

Where joist ends/timber wall plates are embedded in damp masonry, these must be checked for the presence of fungal decay. Ideally, physically isolate the timbers from the masonry by a damp-proof membrane or joist hangers.

Where this is not possible and where timbers are damp and not decayed or just embedded in masonry, the ends should be given a thorough application of Safeguard ProBor 20 and/or ProBor 50 as described in the Safeguard publication, '*Dry Rot and its Control*'. Any timber remaining damp will always be at risk to decay; proper treatment as described in the above publication will reduce the risk of rot.

Should the damp-proof course have to be above the floor timbers then measures must be taken to ensure that the timbers are not vulnerable to fungal decay. Precautions should be taken as described above especially with reference to the application of ProBor 50.

It should be noted that Probor 50 and Probor 20 are approved for professional use only.

Part 3

Treatment of Rising Damp

Part 3

Treatment of
Rising Damp

D: Drilling Instructions

Drill Hole Size, Depth and Location

For treatment to be fully effective with either **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods**, the system requires 12 mm diameter holes to be drilled at horizontal intervals no greater than 120 mm. The depth of hole required for various thicknesses of solid wall is shown in the table on the next page. For all other walls the depth of hole should be to within 40 mm of the opposite face. In all cases the most effective target site is to drill horizontally directly into the mortar course, preferably at the top of all perpend of the selected course (see Figures 9 and 10).

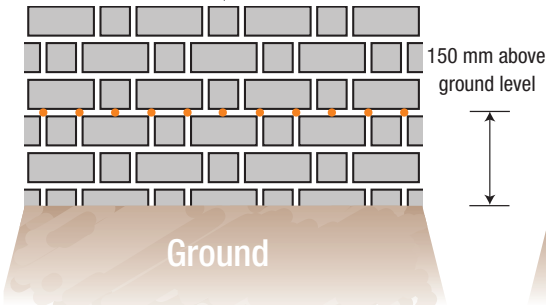


Figure 9: Drilling pattern for Double Flemish Bond.

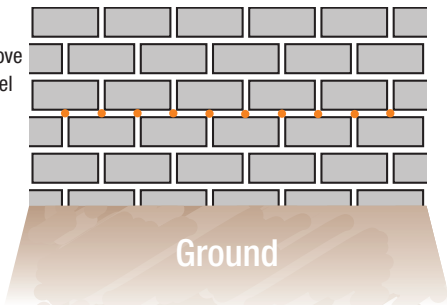


Figure 10: Drilling pattern for Stretching Bond.

DRYZONE SYSTEM
ACCESSORIES



Clearing the Drill Holes

When drilling certain types of mortar, a large amount of debris can remain in the hole after drilling. This can inhibit the application of Dryzone and Dryrods. In these situations, this residue should be removed using a **Dryzone System Hole Clearing Tool** prior to the installation of **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods**.



Drill holes at 120 mm intervals.



Clear the drill holes using the Hole Clearing Tool.

Drill Preparation

Measure the thickness of each wall to be treated. Set the depth gauge of the drill or apply tape to the drill bit in order to identify the correct drilling depth accordingly.

Part 3

Treatment of Rising Damp

Cavity Walls

Cavity walls may be drilled/treated from one side in a single operation when using **Dryzone Damp-Proofing Cream**. If **Dryrod Damp-Proofing Rods** are being used, each leaf should be treated separately. When undertaking treatment from one side, drill completely through the selected mortar course, allow the drill bit to pass across the cavity (see Figure 11) and then drill the other leaf of brickwork to a depth of 90 mm. The viscosity of **Dryzone Damp-Proofing Cream** is such that it is possible to treat each leaf from a single drilling operation. Always ensure that the cavity is clear before treatment.

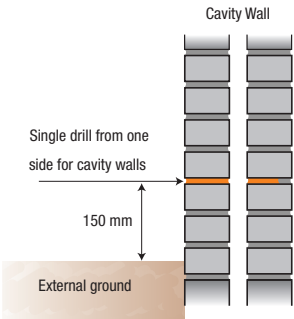


Figure 11: Treating cavity walls.

Drilling Solid Walls

	Wall Thickness			
	4½" (115 mm)	9" (230 mm)	13½" (345 mm)	18" (460 mm)
Depth of Drill Hole	95 mm	210 mm	325 mm	440 mm
Hole Intervals	120 mm	120 mm	120 mm	120 mm

Table 2: Dryzone drill hole depths for walls of various thicknesses.

In virtually all cases solid brick walls may be drilled/ treated from one side only in a single operation (see Figures 12, 13, and 14). Drill the selected mortar course at the prescribed intervals to the appropriate depth in accordance with the table above.

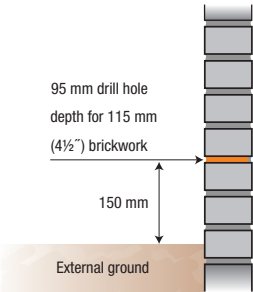


Figure 12.

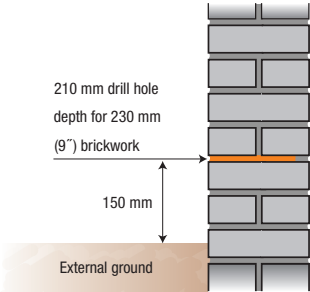


Figure 13.

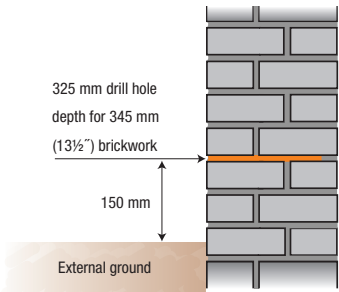


Figure 14.

Part 3

Treatment of Rising Damp

Drilling Random Stone and Rubble Infill Walls

It is not generally advisable to use **Dryrod Damp-Proofing Rods** on random stone or rubble infill walls because the lack of material consistency throughout the wall can make debris clearance difficult. The use of **Dryzone Damp-Proofing Cream** is recommended.

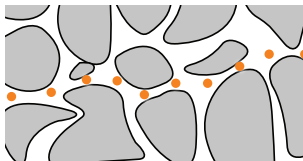


Figure 15: Drilling pattern for irregular stone.

As far as practically possible, follow the mortar course at the appropriate selected level (see Figure 15). The variable thickness of stone walls and the possibility of rubble infill dropping and blocking injection holes cause difficulties for any damp-proofing system. Should these difficulties occur it might be necessary to drill to 50% of the wall thickness, from both sides at a

corresponding height. Alternatively drill additional holes, which do not become obstructed, adjacent to obstructed holes to ensure that an adequate volume of **Dryzone Damp-Proofing Cream** is introduced.

Where there is difficulty locating the mortar course, consideration should be given to reducing the drill hole spacing from 120 mm to 100 mm.

E: Installing Dryzone or Dryrods

Installing Dryzone

600ml foil cartridges: Pierce the end of the foil wrapped sausage and then insert it into the Dryzone application gun. Insert the nozzle of the gun into the full depth of the pre-drilled hole. Gently squeeze the gun trigger and back-fill each hole fully with **Dryzone Damp-Proofing Cream** to within one centimetre of the surface. Periodically wipe clean the outside of the nozzle.

310ml plastic cartridges: Install the mastic cartridge into a standard mastic gun and then attach the supplied nozzle. Insert the nozzle of the gun into the full depth of the pre-drilled hole. Gently squeeze the gun trigger and back-fill each hole fully with **Dryzone Damp-Proofing Cream** to within one centimetre of the surface. Periodically wipe clean the outside of the nozzle.



Part 3

Treatment of
Rising Damp

In order to prevent wastage when treating a cavity wall from one side, it is advisable to mark the delivery tube using tape to indicate the depth of the concealed hole and the width of the cavity.

Dispose of used cartridges in a plastic bag in accordance with local waste disposal regulations.

Material Requirement:

	Wall Thickness			
Wall Length	4½" (115 mm)	9" (230 mm)	13½" (345 mm)	18" (460 mm)
10 m	1.5	3.3	5.1	6.9
20 m	3.0	6.6	10.2	13.8
30 m	4.5	9.9	15.3	20.7

Table 4: Number of 600ml Dryzone cartridges required to treat walls of various length and thickness.

	Wall Thickness			
Wall Length	4½" (115 mm)	9" (230 mm)	13½" (345 mm)	18" (460 mm)
10 m	2.9	6.4	9.9	13.4
20 m	5.8	12.8	19.8	26.8
30 m	8.7	19.2	29.6	40.1

Table 5: Number of 310ml Dryzone cartridges required to treat walls of various length and thickness.

Accidental Spillage: In the event of any accidental spillage of **Dryzone Damp-Proofing Cream**, the spilt material should be wiped up immediately and the wipes placed in a plastic bag and disposed appropriately. Contaminated surfaces should be washed immediately with warm soapy water.



Dryzone 600ml Foil Cartridges.



Dryzone 310ml Plastic Cartridges.

Part 3

Treatment of
Rising Damp



Dryrods can be cut with a Dryrod cutting tool



Installation of Dryrod Damp-Proofing Rods.

Installing Dryrods

Clear any drilled holes with the **Dryzone System Hole Clearing Tool** to remove any debris that may impede rod insertion. Wearing suitable gloves, remove the rods one by one from the packet, inserting a single rod into each hole. Ensure the rods are recessed approximately 5 mm from the brick face while trying not to force the rod into the hole.

When installing internally, performance of the rods will not be affected if the rods protrude slightly where mortar has eroded from the surface, as the rods will be covered during redecoration.

Material Requirement: Dryrod Damp-Proofing Rods come in sealed foil packs of 10 rods. Each rod is designed to treat a 120 mm length of 9 inch double skin brick wall, giving a coverage rate of 1.2 m per foil pack of 10 rods.

For walls less than 9 inches thick, the rods can be cut to the appropriate size using the **Dryzone System Rod Cutting Tool**. For walls thicker than 9 inches, it is possible to combine up to 2 rods per hole, cutting the second rod to fill any excess space left over by the first. The following tables can be used as a coverage guide for various wall thicknesses:

	Wall Thickness			
	4½" (115 mm)	9" (230 mm)	13½" (345 mm)	18" (460 mm)
Depth of Drill Hole	95 mm	210 mm	325 mm	440 mm
Length of Dryrod	90 mm	180 mm	270 mm	360 mm

Table 6: Dryrod lengths and drill hole depths for walls of various thicknesses.

	Wall Thickness			
Wall Length	4½" (115 mm)	9" (230 mm)	13½" (345 mm)	18" (460 mm)
10 m	42	84	125	167

Table 7: Number of Dryrods required to treat a 10 m long wall of various thicknesses.

Storage: It is advisable to keep the rods inside the foil packs until the time of insertion. If placed on a porous surface, the rod may start to spread water repellent material.

Equipment Cleaning: Any equipment that has come into prolonged contact with the rods should be cleaned regularly using warm water.

F: After Installation

Making Good After Treatment

Important: Once Dryzone or Dryrods have been installed, the dampness that was already present in the wall will need to dry out through evaporation.

Therefore, if possible, it is beneficial to delay the attendant works for as long as is feasible to facilitate the maximum possible period for drying.

1. Provide good ventilation to allow drying of the wall.
2. Ensure that the damp-proof membrane (DPM) of any new solid floor overlaps with the inserted damp-proof course (BS CP 102:1973). If necessary join the DPM with the damp-proof course by the use of **Drybase Liquid-Applied DPM**. If no DPM is present run **Drybase Liquid-Applied DPM** out across the solid floor for 50-100 mm and up the wall to overlap with the damp-proof course (see Figure 16).

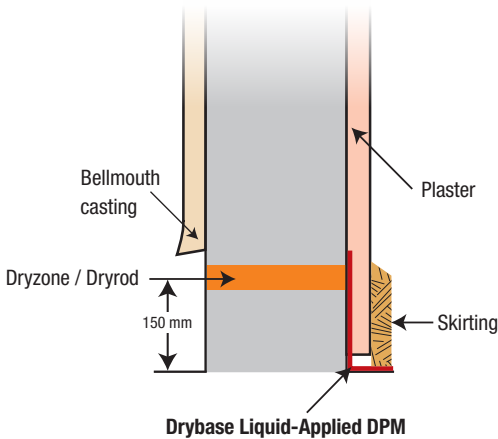


Figure 16: Suggested finishing work.

3. Any replastering should be carried out strictly in accordance with the Safeguard Replastering Specification (see "Part 4 - Replastering Following Insertion of a Damp-proof Course" chapter).
4. Refix timber skirtings after applying a liberal coat of **Drybase Liquid-Applied DPM** to their backs and base.
5. If required form a bell-mouthed casting with the external render (see Figure 16).
6. Fill external holes using a mortar mix to match the existing mortar.

Part 3

Treatment of Rising Damp

Part 3

Treatment of Rising Damp

Redecoration

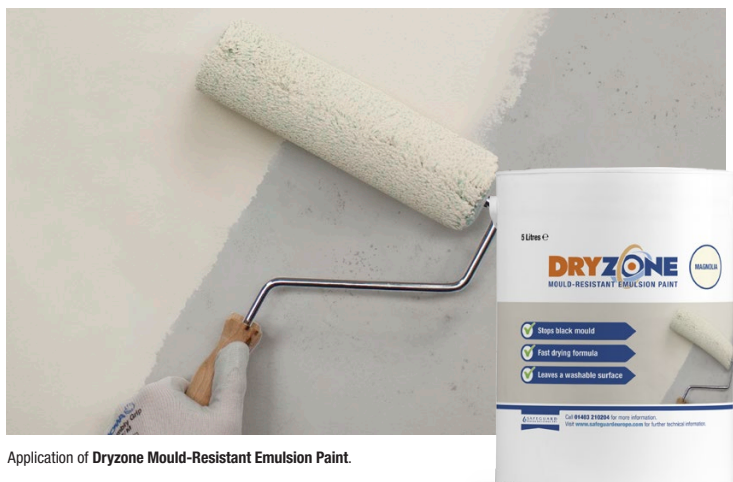
A damp wall takes time to dry out. As a general guide, the drying rate is given as 1 month for every 25 mm of wall thickness (BRE Digest 163, *'Drying out buildings'*). Thus 230 mm will take approximately 9 months to dry. However, the drying processes depend on environmental conditions, ventilation and the type of masonry, so drying may take considerably longer.

It is possible to redecorate within 24 hours of treatment if the **Dryzone Express Replastering System** is used. It allows for the immediate application of plasterboard and, when dry jointing is used, the immediate application of a skim coat. As the wall dries out, it is important to consider the following:

1. Redecorate using a non-vinyl based emulsion e.g. **Dryzone Mould-Resistant Emulsion Paint**.
2. Maintain good ventilation around walls.
3. Fill external holes using a mortar mix to match the existing mortar.

If replastering is not necessary or it is not possible to use the **Dryzone Express Replastering System** (in which case **Dryzone Damp-Resistant Plaster** should be used) the following points should be considered:

1. Delay any decoration for 4 - 6 weeks following the installation of the damp-proof course and any subsequent replastering and allow for good natural ventilation to enhance drying. Do not apply heat or accelerated drying methods.
2. Do not use wallpaper for at least 12 months (longer on thick walls).



Application of **Dryzone Mould-Resistant Emulsion Paint**.

Replastering Following Insertion of a Damp-proof Course

Part 4



Part 4

Replastering Following Insertion of a Damp-proof Course

Replastering Salt Contaminated Walls

A: The Need to Replaster

Why Is Replastering Sometimes Necessary?

Dryzone Damp-Proofing Cream and **Dryrod Damp-Proofing Rods** offer an effective treatment for rising damp in walls of all types. Independent tests demonstrate that once **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods** have been inserted into a mortar course they are able to spread and form an effective damp-proof course – blocking any further rising damp.

However, rising damp treatments are unable to undo any salt and moisture damage caused to plaster prior to treatment. Neither will they remove hygroscopic (moisture attracting) salts from the plaster that have accumulated over the years through the wall which was suffering from rising damp. For this reason, sections of plaster will often have to be replaced as part of an effective rising damp treatment strategy.

Deciding Which Plaster Needs Replacing

Deciding which sections of plaster need to be replaced requires specialist knowledge and judgement. This is one of the reasons that it is advantageous to employ the services of a specialist damp-proofing contractor. Highly salt contaminated plaster that is in obvious need of replacement will normally be easy to spot by visual means alone. However moderately salt contaminated plaster that could be storing up future problems is often harder to identify.



Hygroscopic salt contamination – Heavily salt-contaminated plaster will always need to be replaced – irrespective of which damp-proofing system is used.

Part 4

Replastering Following Insertion of a Damp-proof Course

In addition to the level of salt contamination other factors may be taken into account when deciding on the extent of replastering to be carried out. These include:

1. The effectiveness of the remedial damp-proof course.

Dryzone Damp-Proofing Cream and **Dryrod Damp-Proofing Rods** provide a highly effective damp-proof course even in saturated walls. This results in salts in the wall being less mobile and therefore less able to migrate further into the plaster. For this reason the use of either **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods** allows more original plasterwork to be retained than would if less effective rising damp treatments had been used.

2. The existing plaster type.

Is it a gypsum, lime, or cement based plaster? Some types of plaster (e.g. gypsum) are generally less resilient to salts than other types (e.g. cement).

3. Whether the property owner or tenant is willing to wait before replastering.

Where time permits, delaying replastering work for six months or more after the installation of the damp-proof course is beneficial as it allows a more informed decision to be made as to which sections of plaster need to be replaced. BS6576:2005 states that:

"Where the plaster appears to be in sound condition, the extent of plaster to be removed may be minimised by delaying any decision to replaster until the drying period is complete. In such cases the surveyor should offer clear advice on the risks arising of possible damage to decorations in the future."

4. The type of building affected.

In heritage properties, a desire to keep as much of the original plaster as possible may lead to minimal replastering being carried out. This is done with the understanding that this carries a higher risk of future salt damage to decor and moisture problems related to the continuing presence of hygroscopic salts. In properties intended for rental more widespread replastering might be carried out as the main consideration will be to allow the property to be re-introduced to the market as soon as possible.

FASTER REDECORATION

Where it is desirable to redecorate immediately after the insertion of Dryzone / Dryrod (e.g. rented accommodation) consideration should be given to the use of the **Dryzone Express Replastering System** described later in this guide.

B: Choosing a Replastering System for Walls Affected by Rising Damp

The design function of the new plaster system is twofold:

1. It must prevent the passage of residual moisture reaching the decorative surface during the drying process, which can take some considerable time.
2. It must prevent the passage of hygroscopic salts from the underlying masonry to the new decorative surface to prevent further spoiling.

In order to perform these functions the replastering has to be carried out strictly in accordance with one of two Safeguard replastering specifications.

Part 4

Replastering Following Insertion of a Damp-proof Course

Replastering System No.1: Dryzone Express Replastering System

A modern plasterboard-based replastering system that is fully approved by the British Board of Agrément for use in conjunction with **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods** (see Figure 17).

After the removal of existing plaster, the wall is primed using **Dryshield Cream** (salt inhibitor and primer) before plasterboard is bonded to the wall using **Drygrip Adhesive** which has been specifically formulated to resist moisture and salts. The system has the advantage of being breathable and allowing redecoration to be carried out immediately – making it an attractive solution for social housing and other rented accommodation.

A further advantage of the **Dryzone Express Replastering System** is that it can be adapted for use with insulated plasterboard – allowing energy-saving obligations (e.g. those set out in Building Regulations Part L1B) to be met.

The system is quicker and consequently less expensive to install per m² than traditional “wet” plaster systems, and allows the use of cement-based plasters to be avoided when treating rising damp on heritage projects.

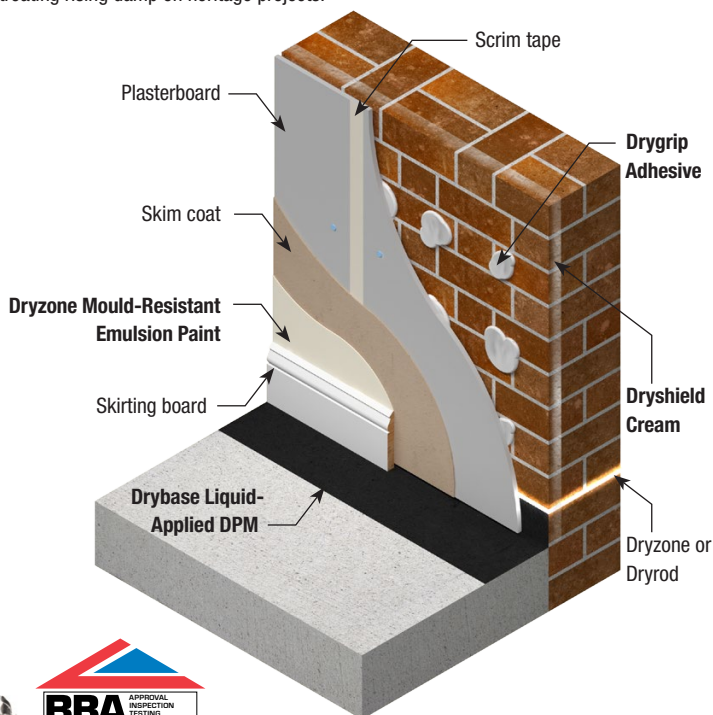


Figure 17: Dryzone Express Replastering System.

Replastering System No.2: Dryzone Damp-Resistant Plaster

The traditional approach to replastering after the installation of a new damp-proof course is to use a specialist salt and moisture resistant plaster such as **Dryzone Damp-Resistant Plaster**. This system has the advantage of being suitable for application onto uneven walls (see Figure 18).

Dryzone Damp-Resistant Plaster benefits from higher water vapour permeability (breathability) compared with sand:cement renders.

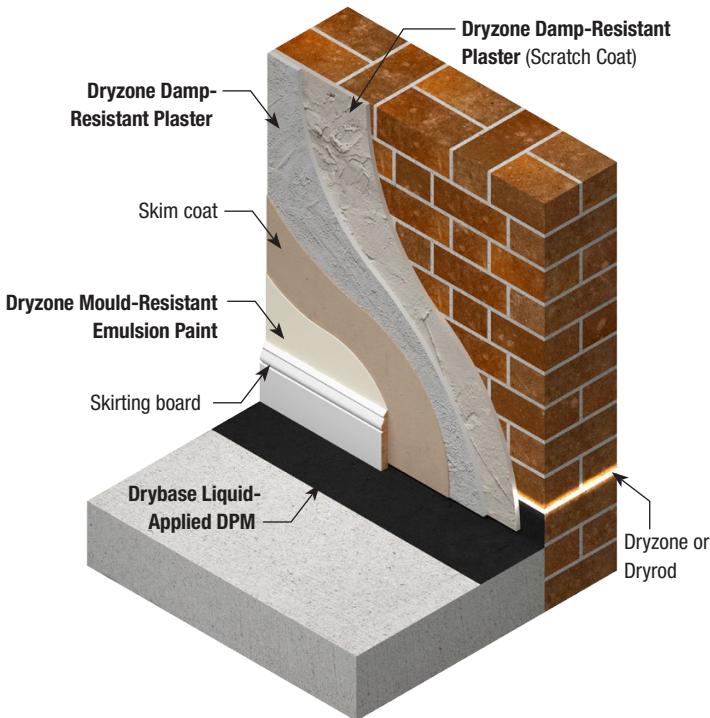


Figure 18: Dryzone Damp-Resistant Plaster.

Part 4

Replastering Following Insertion of a Damp-proof Course



Replastering System No.1: Dryzone Express Replastering System

Part 4A



Application Guidelines



1. Preparatory Work

Fully remove all contaminated plaster, exposing the underlying masonry. All loose material should be fully removed by brushing clean. Proceed with the application of **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods** as per normal.



2. Dryshield Cream: Prime the Wall

Apply Dryshield to wall in a single coat using a large soft brush. Make sure any holes and cracks are filled with cream and that all areas are coated evenly. One 5 litre pack of **Dryshield Cream** covers up to 25 m², depending upon the unevenness and porosity of the substrate. If there are any electrical sockets or light fittings in the wall, unscrew, remove back-plates and apply cream to masonry. Ensure gloves, safety glasses and other appropriate clothing is worn.



3. Dryshield Cream: Absorption

Allow **Dryshield Cream** to soak into the substrate for at least 30 minutes. Do not leave for more than 24 hours before applying **Drygrip Adhesive**. Reinstall any removed fittings and socket fixtures before continuing.



4. Plasterboard: Trim and Fit

If required, prepare the plasterboard by measuring and trimming to size. Check fit by offering board up to wall. A gap of 12 mm should be remaining between the board base and the floor when installed. Also ensure to cut and trim around any electrical sockets and light fittings as needed.



5. Drygrip Adhesive: Prepare Applicator

Drygrip Adhesive can now be used to secure plasterboard to the wall. Prepare adhesive by inserting cartridge into Drygrip applicator gun and cutting it open. Screw nozzle cap into place. Trim nozzle to 10 mm diameter size hole. Tip: If leaving opened cartridge in gun, ensure nozzle is covered with tape or similar to prevent material drying in nozzle and gluing cap in place.

6. Drygrip Adhesive: Apply

Apply small dabs of Drygrip to reverse of plasterboard at regular intervals. Typical consumption should be 1 - 2 Drygrip tubes per sheet of standard size plasterboard. The thickness of Drygrip will allow for some adjustment, permitting the plasterboard to accommodate and cover uneven areas of the wall. Tip: When application is finished, remove nozzle cap and clean gun of all adhesive.



7. Plasterboard: Fit to Wall

Offer the board up to the wall and fit into place. Ensure sufficient contact with **Drygrip Adhesive** whilst allowing an air gap to remain so that the plasterboard is not in contact with the wall. Adjust sections of plasterboard to fit over uneven areas as necessary.



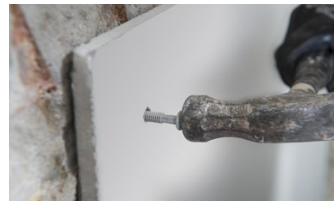
8. Plasterboard: Prop up

It is recommended to prop up the board. Use 12 mm plastic wedges for a precise fit. Alternatively, offcut pieces of plasterboard at 12 mm height or more can be used for the board to rest on. At normal temperatures **Drygrip Adhesive** should set adequately after 1½ hours. At colder temperatures (i.e. sub 10°C), leave for 2 – 3 hours and check adhesion by gently pressing board before further work.



9. Plasterboard: Fix and Set

Use Dryzone System Fixing Plugs to ensure an even flat surface across all boards. Use the provided Dryzone drill bit to drill holes at board corners no closer than 25 mm to edges. Tap in Fixing Plugs with a hammer, ensuring the final surface is even.



10. Finishing Tape and Plaster

Apply scrim tape to all board joins. A skim coat of plaster can now be applied. Proceed with additional replastering or decoration as required. For faster replastering: tape and joint boards using dry jointing method, then apply a coat of plasterboard sealer. This can be immediately painted onto once the sealer is touch-dry.



Part 4A

Replastering System No.1: Dryzone Express Replastering System

FULL HEIGHT AND HALF HEIGHT REPLASTERING

For the best finish, full height (floor to ceiling) replastering is recommended as any attempt to join new plaster to existing plaster will always result in a discernible line where the two plaster systems meet – particularly when rooms are lit using downlighters.

However it is possible to use the **Dryzone Express Replastering System** for half height replastering provided that the existing plaster is of sufficient depth.

The existing plaster should be removed to a height of at least 300 mm above the maximum level of the visual rising dampness and/or salt contamination. Plasterboard should then be measured and trimmed to fit the area where the plaster has been removed before fitting.

Any gaps between the existing plaster and the plasterboard can be filled using a polyurethane foam prior to the application of the scrim and plaster.

Condensation

Calculations show that the overall risk of condensation is reduced when using the **Dryzone Express Replastering System** compared with traditional sand:cement replastering systems. However, when using this type of product, due consideration must be given to the overall design to minimise risk of condensation and the recommendations contained in BS 5250:2011 should be followed. Where higher levels of relative humidity are anticipated other environmental controls should be considered, such as:

- Safeguard Humidistat Fan
- Safeguard Positive Pressure Unit
- Dehumidifiers

Contact Safeguard's technical department for advice on reducing the condensation risk.

Use of Insulated Plasterboard

Most forms of insulated plasterboard can be used with the **Dryzone Express Replastering System**, provided that the normal precautions associated with the installation of internal insulation are adhered to. In particular, care should be taken to ensure that the insulation board is correctly fitted and all gaps filled to prevent moisture migrating from the warm air in the room to the colder solid wall behind the insulation as this will present a condensation risk.

The guidance given in BS5250:2011 “*Code of practice for control of condensation in buildings*” should be followed with particular reference to sections G.3.1.4 “*Solid masonry wall – Internal insulation*” and G.3.2.4 “*Masonry wall with cavity – Internal insulation*”:

“Internally applied thermal insulation isolates the heated interior from the masonry, which will therefore be cold, producing a risk of interstitial condensation behind the thermal insulation; to prevent that, an AVCL (Air and Vapour Control Layer) should be applied on the warm side of the thermal insulation.”

A suitable AVCL can usually be achieved by the application of a skim coat or by taping and jointing the tapered edges of the insulated plasterboards. However, where calculations indicate a risk of persistent condensation, a dedicated AVCL of suitably high vapour resistance should be used – see BS5250:2011 section 4.5.6 for guidance.

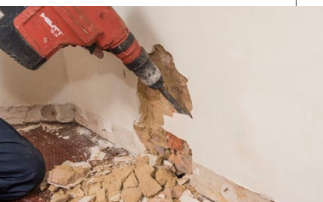
It should also be noted that insulated plasterboard is not “breathable” and therefore its use will cause walls that have been treated for rising damp to take longer to dry out.

Replastering System No.2: Dryzone Damp- Resistant Plaster

Part 4B



Application Guidelines



1. Preparatory Work

Remove all skirtings and architraves as outlined in the survey report. Remove plaster back to masonry to the height specified in the survey report, but this should not be less than 300 mm above the maximum level of the visual rising dampness and/or salt contaminated plaster. Remove any timber fixing grounds that are present in the masonry, then proceed with the application of **Dryzone Damp-Proofing Cream** or **Dryrod Damp-Proofing Rods** as per normal.



2. Mixing

Dryzone Damp-Resistant Plaster should be mixed with a drill mixer. Pour 5 litres of water into a container, then slowly add a 25 kg bag of **Dryzone Damp-Resistant Plaster** to the mix. Once all of the ingredients have been added, start mixing the product at a slow speed to minimise dust generation. As the paste begins to form, the mixing speed may be increased.



3. Rough Coat

Dryzone Damp-Resistant Plaster is applied in two layers. The first layer is a rough coat of 5 mm thickness. This will act as an anchoring layer for the second layer, which should not be applied until the rough coat has become sufficiently firm.



4. Plaster Coat

Apply the second layer of plaster to a minimum thickness of 15 mm giving a total plaster thickness of ≥ 20 mm ^[1], levelling it with a simple straight edge or adjusters to maintain the thickness. **Dryzone Damp-Resistant Plaster** working time is 30 - 60 minutes depending on temperature and humidity. If the product starts to stiffen, do not attempt to rework or remix.



5. Finishing

Dryzone Damp-Resistant Plaster can be left as a decorative finish. Any other finishing (e.g. application of a skim coat) is carried out once the curing process is complete, after at least 14 days. **Dryzone Mould-Resistant Emulsion Paint** can also be used as a finish.

^[1] Thinner thicknesses may be used (e.g. when matching in with existing plasterwork) but maximum moisture and salt resistance is achieved when the plaster thickness is at least 20 mm.

Important Points to Note

Important: Please ensure that you read the section 'Making good after treatment' earlier within this manual.

Where walls are known to be excessively contaminated with hygroscopic salts (e.g. old barns, old kitchens, chimney flues, stables) then consideration should be given to tanking the walls using Vandex BB75 tanking slurry prior to replastering as added protection for the decorative surface. Alternatively the use of the **Dryzone Express Replastering System** should be considered (see Page 36).

Where masonry is unstable, this must be made good prior to the application of the plaster. Where it is not possible to obtain a proper bond between the wall fabric and the plaster, as in the case of cob walling for example, the plaster must be applied direct to the wall face but over expanded metal lath, previously fixed to the wall surface.

Drybase Liquid-Applied DPM should be used to prevent bridging of the DPC where the plaster meets a solid floor (see Figure 18, Page 34).

It should be remembered that the walls will take a considerable time to dry out and it is possible that sufficient moisture could be absorbed by the new joinery to cause fungal decay.

It is important that the replastering specification is strictly adhered to and not varied in any way. No other additives must be added to the mix.

Safety

Read material safety datasheet for **Dryzone Damp-Resistant Plaster** and related materials before use and carry out a health and safety assessment of the procedures (e.g. mixing, and application) necessary for the use of the replastering system.

Part 4B

Replastering System No.2: Dryzone Damp- Resistant Plaster

Research and Development

Part 5



Part 5

Research and Development

Improving Rising Damp Treatments through Innovation

The products and systems described in this book were developed by Safeguard Europe Ltd.

Safeguard was established in 1983 with a vision of providing improved solutions for combatting moisture problems in buildings through investment in product innovation.

As well as solutions for rising damp, Safeguard has developed a range of products for the treatment of other forms of dampness such as rain penetration, condensation, and moisture ingress into basements. Information about these products can be found on the Safeguard website, www.safeguardeurope.com.

1950s

Siliconate diffusion

1960s

High pressure liquid injection

2000s

DRYZONE

2014

DRYZONE

The Development of Dryzone Damp-Proofing Cream

In the late 1990s the development team at Safeguard turned their attention to providing improved solutions for rising damp treatment.

At this time the most commonly used method of rising damp treatment was to inject liquids based on silicones or metal stearates into holes drilled in masonry.

This liquid injection method could be very effective when correctly installed, however it could be very time consuming as each hole needed to be injected for several minutes in order for the correct amount of fluid to be injected. Ensuring a consistent, even application was problematic due to the fact that the liquids would follow the path of least resistance and often disappear through cracks and fissures in the masonry. There were also hazards involved with the injection of these liquids (which were usually caustic or flammable) under pressure, particularly when treating party walls.

When it was launched in 2000, **Dryzone Damp-Proofing Cream** revolutionised the treatment of rising damp by providing an effective solution that avoided the problems inherent in liquid injection systems.

Achieving Dryzone's high level of performance was a considerable task for our research and development department due to the wide range of factors that could affect product performance. It was therefore necessary to screen a large number of possible permutations before a final formulation was decided upon.

Part 5

Research and Development

1. Selection of Active Ingredients

The active ingredients of any injected damp-proof course must be able to:

1. Form a strong bond with the substrate
2. Repel water

The starting point for providing this function are organo-functional silanes and siloxanes. Choosing the correct blend of these silanes and siloxanes was essential to ensure that Dryzone would work in a wide range of mortar types.

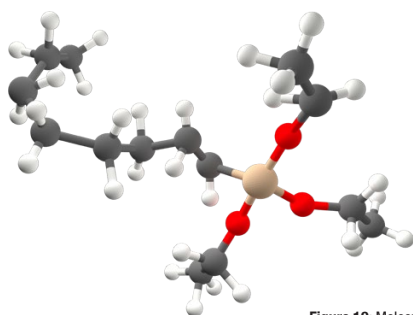
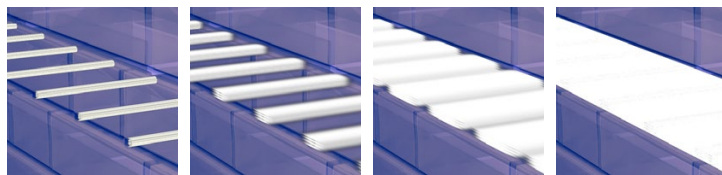


Figure 19: Molecule (n-octyltriethoxysilane).

2. Spread of the Active Ingredients

Getting the product to spread in order to form a continuous barrier provides another technical obstacle.

Liquid damp-proof courses are normally injected under pressure, which assists with the spread, whereas damp-proofing creams are required to migrate (typically 60 mm in each direction) by diffusion alone.



The following factors were crucial in ensuring that Dryzone would spread successfully along the mortar course:

1. Correct blend of active ingredients
2. Adequate concentration of active ingredients (>60%)
3. Careful choice of emulsion system

Part 5

Research and Development

3. Active Ingredients Where They are Needed

There is little benefit in choosing the right molecules and spread behaviour if there is insufficient active material in the formulation.

If only a small proportion of the pore surface becomes coated with the water repellent molecule, there will be insufficient water-repellent force to overcome the effects of capillarity and the damp will continue to rise (see Figure 20).

It is for this reason that Dryzone has been formulated with a high concentration of active ingredients.

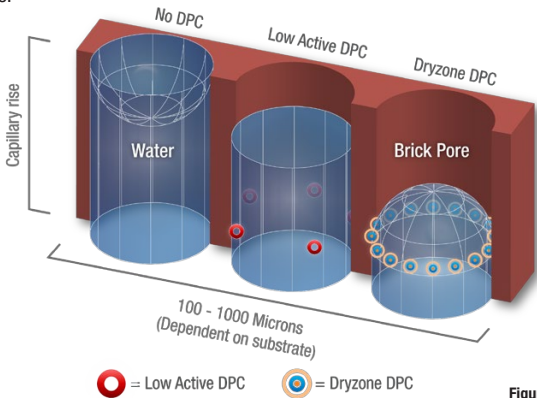
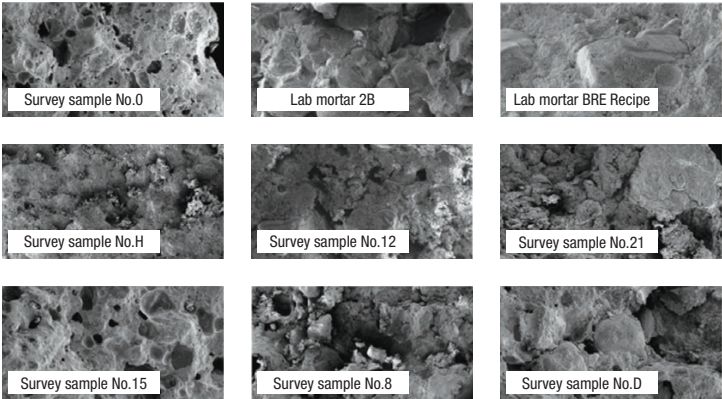


Figure 20: Capillarity.

4. Ability to Work in all Types of Mortar

The pore structure, pH, moisture content etc... of mortar varies considerably from property to property. It was therefore important to ensure that Dryzone would work in all commonly encountered mortar types and conditions. This required careful balancing of the product formulation – particularly with regard to the selection of active ingredients.



└─ 250 microns

Part 5

Research and Development

The Development of Dryrod Damp-Proofing Rods

In 2014, we introduced **Dryrod Damp-Proofing Rods** as the next step in rising damp treatments. The research and development department further developed the technology employed to create Dryzone, utilising a new rod-based delivery system.

Dryrod Damp-Proofing Rods manage to be even more effective than the already class leading performance of **Dryzone Damp-Proofing Cream**. The development team's efforts allowed for a premium product that can be used in more extreme situations. In addition to all the benefits of Dryzone, the advantages of Safeguard's Dryrod technology include:

1. Unique Formulation and Assured Performance

The patented rod delivery mechanism, allowed for an optimal formulation of the active ingredient to be developed. Testing in conditions of up to 95% moisture saturation has shown Dryrod to out-perform all competing products (see Figure 21).

Each rod is pre-dosed with the correct amount of material so the performance of **Dryrod Damp-Proofing Rods** is assured. In situations that require the maximum possible delivery of active ingredient, Dryrod is ideal.



Installation of **Dryrod Damp-Proofing Rods**.

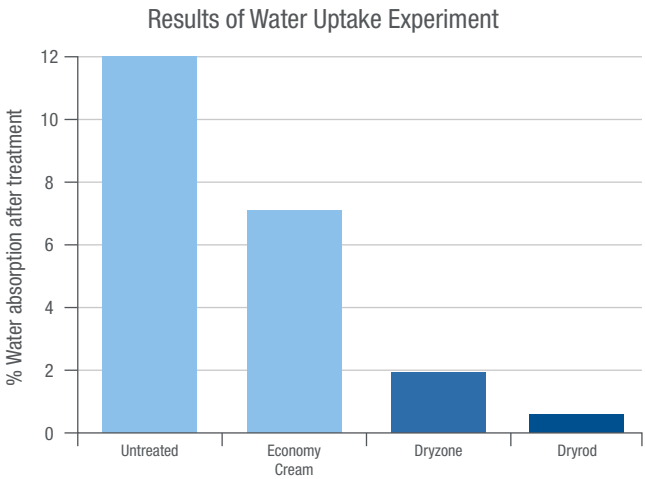


Figure 21: Dryrod out-performs all competing products.

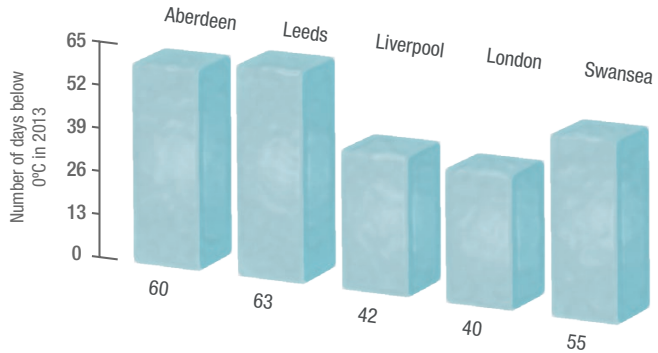
Part 5

Research and Development

2. Resistance to Temperature Variations

Most damp problems make themselves known during the cold and wet winter months. Traditional damp-proofing methods can be sensitive to freezing temperatures, making the coldest months of the year difficult to work in.

Due to the unique formulation and design of **Dryrod Damp-Proofing Rods**, it is possible to use them even in freezing conditions (see Figure 22).



Data source: www.wunderground.com

Figure 22: Number of days below 0°C in 2013.

3. Easy Coverage Estimation

As each rod will treat a set area, it is possible to know the exact number of rods required for each job after measuring the wall to be treated.

Dryrods always come in sealed foil packs of ten, making for coverage of 1.2 m per pack on 9 inch walls. This means it is also possible to calculate usage and treat small areas of rising damp without compromising the shelf life of other packs in supply.



The Development of Improved Replastering Systems

Part 5

Research and Development

Since the 1950s replastering works carried out as part of a rising damp treatment have predominantly been of the traditional sand:cement type.

Whilst this type of replastering system is highly effective at resisting moisture and salts, it also has a number of disadvantages:

- Slow to install (several coats required)
- Dense render results in cold wall surface
- Not appropriate for use on heritage buildings

Responding to demand from homeowners and specialist contractors, Safeguard developed the **Dryzone Express Replastering System** (see page 36). This allowed replastering works to be carried out in a single day and for redecoration to be carried out immediately. For this reason it has proven to be particularly popular for use in tenanted properties where the landlord or social housing provider wishes to minimise disruption to the tenants.

A range of refurbishment plasters including **Dryzone Damp-Resistant Plaster** have also been developed that provide moisture and salt resistance without the disadvantages of sand:cement renders..



Part 5

Research and Development

Since the introduction of **Dryzone Damp-Proofing Cream** in the year 2000, the Dryzone range has been subjected to numerous regimes of testing by independent agencies and is constantly being further developed by our own laboratory.

Both **Dryzone Damp-Proofing Cream** and **Dryrod Damp-Proofing Rods** have been tested by the following organisations:



BBA: British Board of Agrément

As well as passing the old BBA MOAT test, Dryzone and Dryrod have passed the latest, more severe damp-proofing test **demonstrating effectiveness even in saturated walls.**

Certificate number: 97/3363



University of Portsmouth

Test reports compare Dryzone and Dryrod performance to that of a low-strength, economy damp-proofing cream, demonstrating the **far higher efficacy of Dryzone products over low strength creams.**

Professor Mel Richardson, February 2008



Safeguard Europe Ltd

In-house tests at Safeguard have covered test conditions not usually included in standard international tests. These have proven Dryzone's efficacy for **high and low temperatures, rubble-infill walls and salt water conditions.**



WTA: Wissenschaftlich-Technische Arbeitsgemeinschaft

Approved by the German WTA for use as a rising damp treatment in **highly saturated walls (up to 95%)**. Testing was carried out in test walls using an alkaline lime-based mortar.

Dryzone Certificate Number:

PB 5.1/08-358/1

Dryrod Certificate Number:

PB 5.1/15-166-1

In addition to the above testing, **Dryzone Damp-Proofing Cream** has also been awarded the following accreditations from international testing agencies:



OFI: Österreichisches Forschungsinstitut

In Austria, Dryzone was applied to **an entire school building** with rising damp. Testing found it to be a **highly effective treatment**, reducing the maximum moisture content of the walls. Final results far exceeded the pass requirement of the Austrian standard Ö-NORM B 3355.

Report Number: 403.275



ITB: Instytut Techniki Budowlanej

The Polish technical institute tested Dryzone's effectiveness and material spread in a ceramic **brick, lime-cement mortar wall**. Results showed a substantial initial drop in moisture content that increased to a 97% moisture reduction over 3 months.

Report Number: 0976/11/R12NM



EMI: Építészeti Minőségellenőrző Innovációs

Testing by the Hungarian EMI confirmed Dryzone's efficacy in saturation reduction, establishing the damp-proof barrier is **effective in 95% saturation conditions.**

Report Number: A-58/2012



Wetenschappelijk en Technisch Centrum voor het Bouwbedrijf

Testing by the Belgian WTCB showed Dryzone to be **very effective at varying levels of capillary saturation**. Substrate diffusion characteristics and moisture absorption reduction are rated as very efficient.

Report Number: 622X646-11

Further Reading **Part 6**



Part 6

Further Reading

Further Reading:

Dampness in Buildings (Second Edition)

Oliver, Alan (revised by James Douglas and J. Stewart Sterling) (1996)

Guide to Identification of Dampness in Buildings

Coleman, Graham (1991)

RICS (Royal Institution of Chartered Surveyors):

Surveying Buildings (Fifth Edition)

Hollis, Malcolm (2005)

Remedying Damp

Burkinshaw, Ralph (2009)

ICCROM:

Damp Buildings, Old and New

Giovanni & Ippolito Massari (1985)

PCA (Property Care Association):

- **DP1 – The use of Moisture Meters to establish the presence of Rising Damp** (1990)
- **DP2 – Plastering in Association with the Installation of a Remedial Damp proof course** (1990)
- **DP8 – Damp-Proofing Barriers - Tanking in association with Chemical Damp-proofing courses** (1993)
- **DP10 – Hygroscopic Salts and Rising Dampness** (1990)

BRE (Building Research Establishment):

BRE Digest 245: Rising damp in walls – diagnosis and treatment

Trotman, Peter; Sanders, Chris; Harrison, Harry (1981)

BR466: Understanding Dampness

Trotman, Peter; Sanders, Chris; Harrison, Harry (2004)

Part 6

Further Reading

BSI (British Standards Institution):

BS 6576:2005 – Code of practice for diagnosis of rising damp in walls of buildings and installation of chemical damp-proof courses

BS 5250:2011 – Code of practice for control of condensation in buildings

WHO (World Health Organisation):

WHO guidelines for indoor air quality: dampness and mould
WHO Regional Office for Europe

Academic Papers:

Rising Damp in Masonry Walls and the Importance of Mortar Properties

Dr Rirsch, Eric; Dr Zhang, Zhongyi (2010)
Construction and Building Materials 24: 1815–1820

Evaluation of mortar samples obtained from UK houses treated for rising damp

Dr Rirsch, Eric; MacMullen, James; Dr Zhang, Zhongyi (2011)
Construction and Building Materials 25: 2845–2850

Rising damp: capillary rise dynamics in walls

Hall, Christopher; Hoff, William D (2007)
Proceedings of the Royal Society A 463: 1871–1884

Moisture dynamics in walls: Response to microenvironment and climate change

Hall, Christopher; Hamilton, Andrea; Hoff, William D; Viles, Heather A; Eklund, Julie A (2011)
Proceedings of the Royal Society A 467: 194–211

The rising damp tests of Camberwell Pier: Potential height of moisture rise in brickwork and the effectiveness of a modern chemical injection cream damp coursing application

Burkinshaw, Ralph (2010)
Journal of Building Appraisal 6: 5–19

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