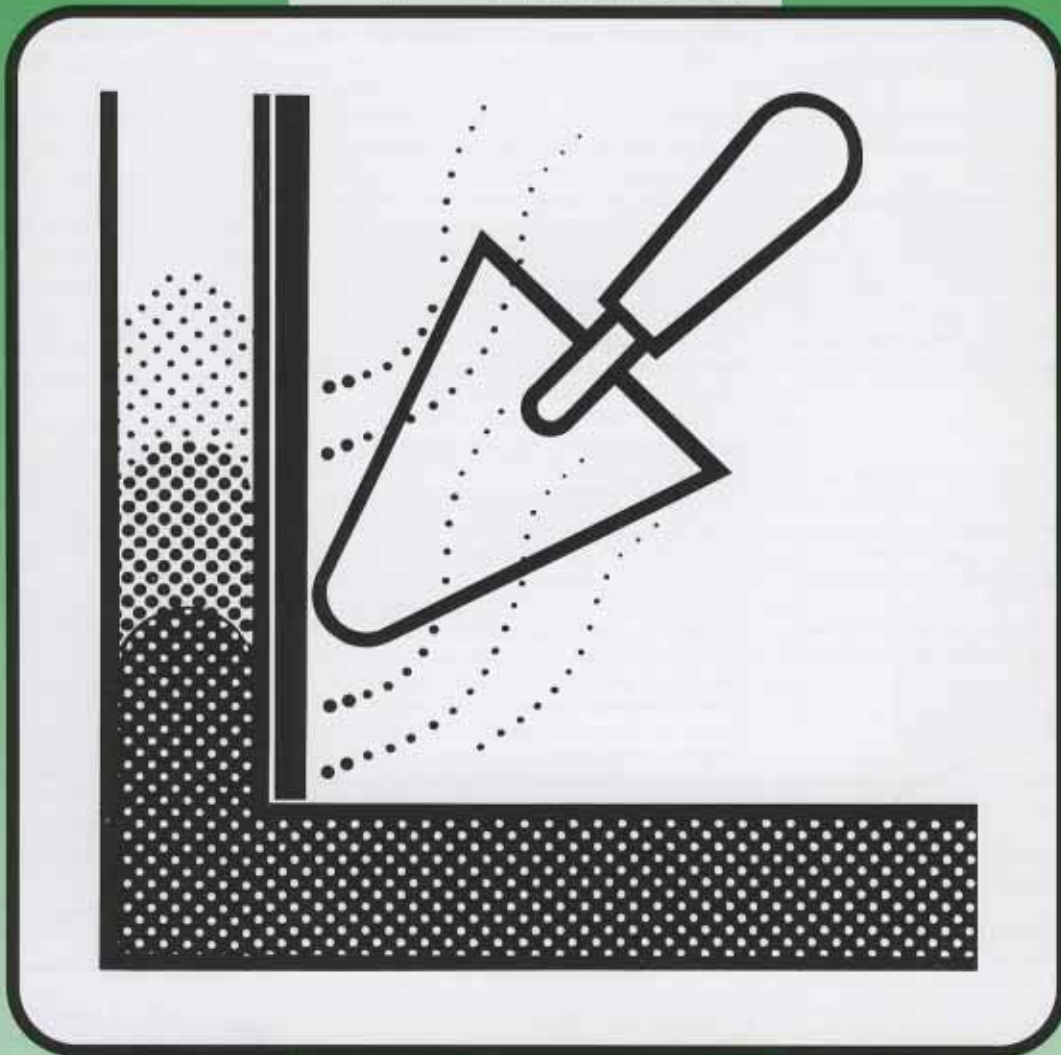




4<sup>th</sup> Division: damp-proofing plasters for refurbishment and restoration. Water-proofing cements. Shrink - resistant mortars, paints, protective, water-proofing and epoxy coating, water repellent treatments, additives for improved bonding, sealants for joints, adhesives for tiles.



# RESTORATION

## OF DAMP MASONRY BRICKWORK USING DAMP-PROOFING RENDERS

TECHNICAL SPECIFICATION

**index**»»»



# Types of humidity in masonry

The restoration of existing buildings offers an improvement to modern living requirements as well as the possibility to safeguard buildings of historical importance.

Buildings are in different states of degradation depending on the type of aggression to which they have been subjected.

The most important source of degradation requiring attention in its various forms is damp.

The elimination of the serious damage which may arise from damp constitutes one of the major cost factors for the restoration of buildings of civil, historical and artistic importance. Before beginning any type of structural restora-

tion, it will be vital to the success of the project to ascertain the nature of the phenomena which has caused damp, how much is contained within the walls **because intervention methods may be quite different depending on each case and the type of damp present.** We classify a wall **dry** if it contains a humidity rate of 3% - 5%, **damp** with humidity between 5% - 10% and **wet** with humidity **above 10%.**

To guarantee a good result it is always necessary to analyse the condition of wall area which is damp and to assess the **quantity and quality of the salts which exist in the wall.**

Next, the damp-proofing system chosen will be

based on what the analysis has revealed. This is a very important stage because a wrong choice can drastically affect the final result.

For damp-proofing and restoration it is usual to use a system which employs materials which are more or less complementary, which together form a «made to measure» restoration cycle for the structure under consideration.

During the course of this brief thesis we will try to explain the causes which generate damp inside building structures and to analyse the various methods of intervention taking into consideration the efficacy of damp-proofing products.

## RESIDUAL DAMP

Residual damp is the result of moisture remaining after the conclusion of construction work and manifests itself during the drying process when the concrete and plasters transmit to the surrounding atmosphere the water used to prepare them.

It is not advisable to use waterproofing paint before eliminating at least in part this type of damp.

## DAMP CAUSED BY LEAKS OR FRACTURES

Usually this is the result of the breaking of pipes and other water plant. It can be eliminated by repairing the leak.

On possible residual rings the mould-proof paint DRYWALL should be used.

## DAMP FROM DRIVEN RAIN

Heavy and consistent rain can be absorbed through brickwork or rendering on the outside of a building. When dealing with degradation to the outside of a building the treatment must take place at this point, intervening with a specific high penetration water repellent product IDROCOAT and/or protective paint which allows moisture to evaporate.

## DAMP FROM SUPERFICIAL CONDENSATION

Condensation is sometimes confused with infiltration damp, it is prevalent in the **coldest parts of the construction.** It is noticeable especially during hot weather when the air mass contains a high percentage of humidity which, when coming into contact with colder areas, creates condensation; and during winter months when colder air meets atmospheres which produce heat and steam (bathrooms, kitchens, etc.).

This condition can cause mould with progressive degradation of the finish. To improve this situation the area must be ventilated.

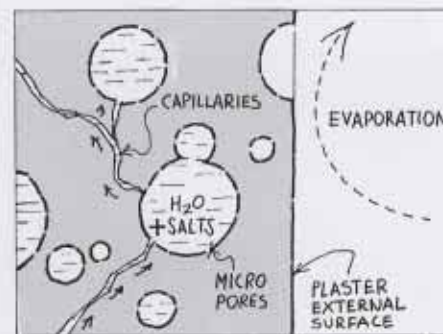
## INFILTRATION DAMP

This is caused by ingress of water passing through a basement wall which is not adequately protected and becomes evident on the internal side of the wall. This will in a short space of time create conditions which will make the area uninhabitable.

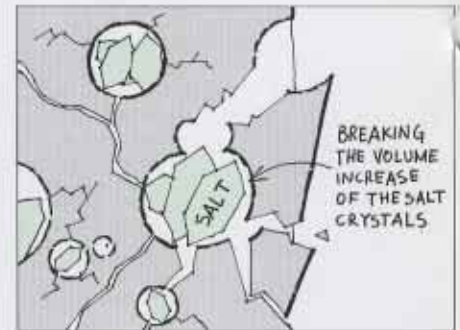
Technical specification «D».

## DAMPNESS DUE TO CAPILLARY ABSORPTION

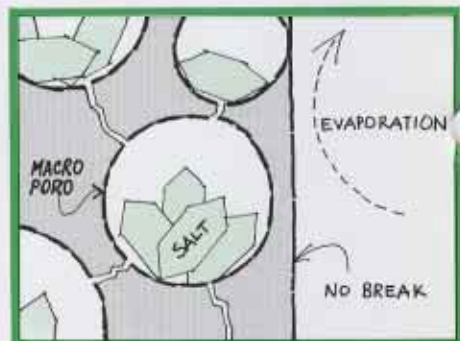
This problem frequently affects the walls of old buildings causing irreversible degradation of the plaster. It is caused when porous building materials which are in contact with the subsoil absorb water. This occurs because damp courses and the waterproofing of foundations were not installed or carried out in the past. The effects are devastating; damp walls and crumbling plaster caused by salts which, transported by the water through the capillaries of the wall, crystallise on the external surface, giving rise to efflorescence. The plaster becomes crumbly and detaches due to the increasing volume of the crystals inside the micro-pores of the plaster. This intervention also will be dealt with in our specifications described hereunder.



**CAPILLARY ABSORPTION PHASE OF THE WATER RICH IN SALTS AND DEPOSIT CRYSTALS INSIDE THE MICROPORES**



**BREAKING THE VOLUME INCREASE OF THE SALT CRYSTALS**



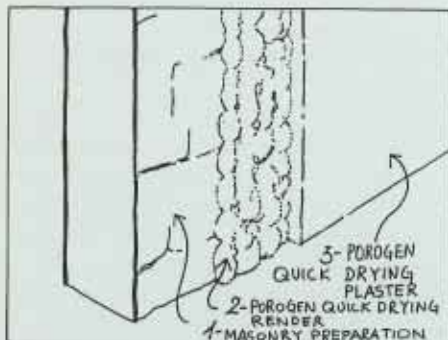
**DAMP-PROOFING PLASTERS ABSORPTION BY THE MACRO PORES OF THE TENSION CAUSED BY SALT CRYSTALLISATION**



# Technical Specifications

RESTORATION OF OUTSIDE WALLS AND UNDERGROUND/BASEMENT WALLS ADVERSELY AFFECTED BY DAMP FROM CAPILLARY ACTION AND STRONG SALINE EFFLORESCENCE, USING DAMP-PROOFING ANTI CONDENSATION «POROGEN» RENDER.

## A TECHNICAL SPECIFICATION



### MASONRY PREPARATION

- Remove the old plaster or render to approximately 1 metre above the stain showing the maximum level reached by the water throughout the seasons.
- Thoroughly brush the surface and clean with pressurised water, removing all inconsistent materials, oils, dust and dirt in general.
- For walls strongly impregnated by salts and oily substances it is advisable to wash with a 10% alcohol solution in water, applied by brush.
- Regularise cavities and surfaces irregularities by filling them up with brick fragments and cement to which mortar with low cement content has been added to Collaseal (1:3 with water).

### POROGEN SYSTEM PRONTO APPLICATION

- Apply to the prepared and previously dampened surface a coat of Porogen Quick Drying Primer anti-saline bonding render to a maximum thickness of approximately 0.5 cm, in order to create the ideal surface for the following damp-proofing plaster application. The render must cover all the surface to be plastered.
- Porogen Quick Drying Primer coverage will be approx. 7Kg/m<sup>2</sup>. After about 24 hours the application of Porogen Quick Drying damp-proofing may be carried out. It contains natural hydraulic lime characterised by elevated homogenous macroporosity which guarantees constant evaporation of the moisture from the treated areas. The homogenous macroporosity of the Porogen Quick Drying product is able to contain saline efflorescence and tensional pressures caused by the increase in volume due to the salt crystallisation. Minimum recommended thickness is 2 cm for a consumption of 26Kg/m<sup>2</sup> of Porogen Quick Drying Plaster.

For manual applications use maximum 24% clean water - avoid prolonging mixing beyond 3 - 4 minutes.

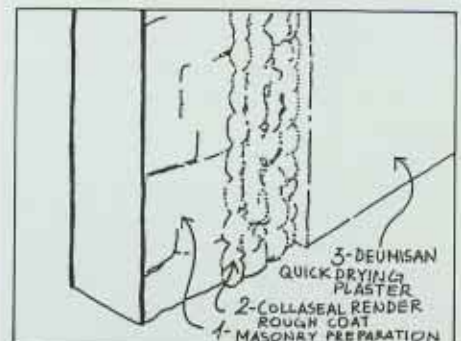
(Extraneous materials must not be added to POROGEN QUICK DRYING PRIMER or POROGEN QUICK DRYING PLASTER).

For a thickness of 2cm POROGEN damp-proofing plaster must have the following performance characteristics:

- Vapour transmission speed	148g/m <sup>2</sup> 24 h
- Permeability	2.85 10 <sup>-10</sup> - Kg/m <sup>2</sup> xhmmHg
- Superficial specified area	4.6 m <sup>2</sup> /g
- Apparent mortar density	1.65 Kg/litre
- Apparent dry density	1.25 Kg/litre
- Total porosity %	40.56%
- Water vapour diffusion resistance factor μ	6

RESTORATION OF OUTSIDE WALLS AND UNDERGROUND/BASEMENT WALLS ADVERSELY AFFECTED BY DAMP FROM CAPILLARY ACTION, USING DAMP-PROOFING «DEUMISAN» PLASTER.

## B TECHNICAL SPECIFICATION



### MASONRY PREPARATION

- Remove the old plaster or render to approximately 1 metre above the stain showing the maximum level reached by the water throughout the seasons.
- Thoroughly brush the surface and clean with pressurised water, removing all inconsistent materials, oils, dust and dirt in general.
- Regularise cavities and surface irregularities by filling them up with brick fragments and cement to which mortar with low cement content has been added to Collaseal (1:3 with water).
- Treat the surface to be plastered with a spray coat of semi-liquid consistency prepared on site in the following proportions: sand 70% - cement 30% mixed with COLLASEAL and water in ratio 1:3.
- Rendering must be «open» and must create an excellent bonding surface for the plaster which follows.
- After about 24 hours apply DEUMISAN QUICK DRYING damp proofing plaster which contains natural hydraulic lime, is water-repellent and allows the surface to breathe. Hygrometric equilibrium will also be re-established in the masonry.

Recommended thickness is 2cm for a consumption of 28Kg/m<sup>2</sup>.

For manual application use maximum 22% clean water - avoid prolonging mixing beyond 3-4 minutes.

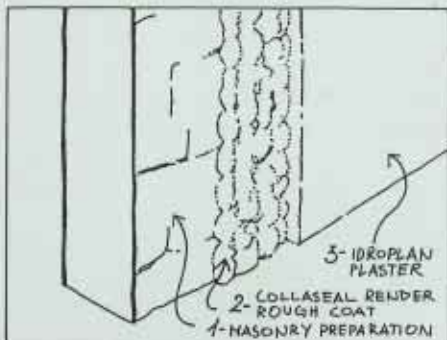
(Extraneous materials must not be added.)

For a thickness of 2cm DEUMISAN damp-proofing plaster must have the following performance characteristics:

- Vapour transmission speed	138g/m <sup>2</sup> 24 h
- Permeability	1.32 10 <sup>-10</sup> - Kg/m <sup>2</sup> xhmmHg
- Superficial specified area	2.15m <sup>2</sup> /g
- Apparent mortar density	1.75Kg/litre
- Apparent dry density	1.35Kg/litre
- Total porosity %	39.52%
- Water vapour diffusion resistance factor μ	10

RESTORATION OF WALLS ADVERSELY AFFECTED BY DAMP FROM CAPILLARY ACTION, SALINE EFFLORESCENCE, SUBJECTED TO DRIVEN RAIN AND INCLEMENT WEATHER, USING IDROPLAN WATER-REPELLENT DAMP-PROOFING PLASTER.

### C TECHNICAL SPECIFICATION



#### MASONRY PREPARATION

- Old plaster must be removed from damp masonry to approximately one metre above the damp stain.
- Remove all inconsistent materials, oils, release agents, dust and dirt in general by brushing and high pressure water cleansing.
- Fill up any cavities with brick fragments and mortar with low cement content.
- Where saline efflorescence is present, a treatment using DEUMISAL anti-saline impregnator should be carried out after cleaning has been completed.
- 24 hours after the anti-saline treatment, apply an open render with a cement based mortar of semi-liquid consistency in the recommended proportions:  
sand 70% - cement 30% mixed with water and COLLA SEAL (which improves bonding) in the proportion 3 : 1.
- 24 hours after the open render bonding layer, plastering with IDROPLAN is carried out to achieve an average recommended thickness of 2 cm.

IDROPLAN is ready to use and needs only to be mixed with 20% of clean water (5 litres of water to each 25 Kg bag).

Mixing time in the cement mixer must not exceed 3-4 minutes.

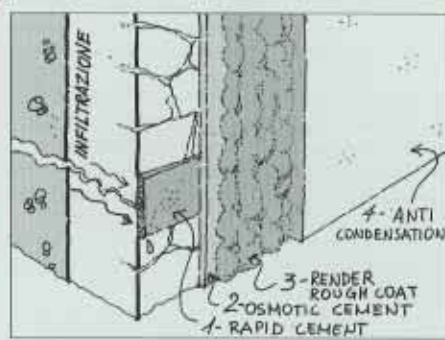
(Extraneous materials must not be added).

IDROPLAN corresponds with the requirements of DIN 4108

- |  |                      |
|--|----------------------|
| - Apparent mortar density                        | 1.65Kg/litre         |
| - Apparent dry density                           | 1.3 Kg/litre         |
| - Total porosity%                                | 36.50%               |
| - Water absorption coefficient W                 | 0.36                 |
| - Water vapour diffusion resistance factor $\mu$ | 11                   |
| - Compression resistance                         | 51Kg/cm <sup>2</sup> |
| - Resistance to flexing                          | 29Kg/cm <sup>2</sup> |

RESTORATION OF UNDERGROUND/BASEMENT WALLS ADVERSELY AFFECTED BY WATER INFILTRATION FROM THE SOIL AND BY DAMP FROM CAPILLARY ACTION, USING «OSMOSEAL» OSMOTIC CEMENT AND FOLLOWED BY «POROGEN» PLASTER APPLICATION WHICH RESTRICTS THE FORMATION OF CONDENSATION.

### D TECHNICAL SPECIFICATION



#### MASONRY PREPARATION

- Remove plaster which has degraded and clean the surface removing incrustation, oils, release agents, parts which have become detached and dust and dirt in general by brushing and high pressure water cleansing.
  - Any remaining old steelwork must be cut and plastered.
  - Seal gravel nests and re-start castings regularising the surface using shrink-resistant mortar from the RESISTO range (see technical sheets).
  - At the base of walls and in corners RESISTO TIXO shrink-resistant mortar should be used to form curved angle fillets.
- Infiltration and localised leaks must have already been sealed and blocked with BE-TONRAPID fast setting cement.

#### WATERPROOFING

- Thoroughly bathe surfaces to be treated avoiding excess surface water.
- Apply OSMOSEAL cement in a thin mortar consistency using a bristle brush. Care should be taken to ensure that a uniform layer is achieved with the first coat. Apply the second coat, in the same way as the first coat, on top of the first layer while it is hardening, taking care to achieve a homogeneous covering.
- Minimum coverage will be approximately 3 Kg/m<sup>2</sup>.

The mixing ratio is 7 litres of water to each 25 Kg bag of OSMOSEAL. To improve adhesion on smooth or crumbling surfaces, mix OSMOSEAL with water and COLLA SEAL latex adhesive in the proportion: 25 Kg OSMOSEAL/5 litres of water/2 litres of COLLA SEAL, or with RESINFLEX pliable acrylic resin.

Do not apply OSMOSEAL in direct contact with gypsum, lime, crumbling stone. To create waterproofing on loose, crumbling masonry, in addition to normal surface cleaning, a sand and cement render reinforced with steel mesh must be applied. The mesh should be securely attached to the outside of the building.

On cast concrete treated with water-repellents

and on surfaces broken/loosened by mineral oils, it is necessary to roughen surfaces beforehand to achieve good bonding. Finally apply an «open» render on the OSMOSEAL waterproofing, made up as follows: sand 70% - cement 30% mixed with water and COLLA SEAL in the ratio 3:1 so as to create anchorage for following plasters. This type of intervention will be completed by the application of a plaster of the POROGEN type which restricts the formation of condensation.



# System in use for damp proofing masonry

## MECHANICAL CUT

(see design A)

This consists of a horizontal cut through the entire thickness of the wall, using suitable mechanical chain saws and then the introduction of thin metallic plate or sheet of synthetic material along the length of the opening to act as a damp course.

The intervention is completed by sealing with epoxy products or with filtered mortar. It is a conclusive intervention for preventing capillary action but in some cases it may jeopardise the static nature of buildings.

## SYSTEM OF REPLACING BRICKWORK

This ancient technique was introduced by the Venetians who were accustomed to restoring structures invaded by damp, using metal at the base where as a waterproofing layer, they inserted a sheet of lead. Then the demolished wall was reconstructed, taking care to insert the bricks properly.

Subsequently the operation was repeated on the whole perimeter of the building, achieving good results.

This technique is today too costly and slow and is used only in special cases and on structures which are not too thick.

## SIPHONING OR DRAINING

(see design B)

This consists of inserting into the damp wall special siphoning tubes which collect the damp. The frequency of the holes is approximately at 50 cm centres. It is a quick system and quite economical but not sufficient to radically resolve the problem.

## CONTINUOUS CHEMICAL BARRIER

(see design C)

This is a treatment which impedes rising damp creating a waterproofing resin barrier. It is an intervention which as a concept calls to mind the mechanical cut but differs from this by not impairing the integrity of the construction.

The intervention is made by holes into which the waterproofing resins are injected. Various treatments are used depending on the type of wall and substance applied.

It is however vital that the walls are uniform, compact and not too degraded.

## HARDCORE BASE

This system tends to eliminate damp due to seasonal rains causing the water table to rise. Suitable systems to prevent water coming into contact with the walls by way of external soakaways and additional internal walls are required to prevent the water vapour accumulating on the internal surface of walls. This intervention involves the reduction of habitable space by introducing cavity walls. In these cases it is always useful to provide good cavity wall ventilation. This system, however, is very often used to hide the problem.

## ELECTRO-OSMOSIS - ELECTROPHORESIS

Exploits the principle according to which the particles of water inside a capillary conduit under the influence of continuous current flow towards a negative pole (cathode).

These electrodes are localised at a lower point than the wall to be restored and they will draw down the water particles and the salt content.

The execution varies in its details according to the characteristics of the wall to be damp-proofed and the thickness of the wall.

## DAMP-PROOFING PLASTERS

(see design D)

POROGEN SYSTEM, DEUMISAN and IDROPLAN are products recommended by INDEX. They are macro porous plasters which prevent capillary action. The evaporation mechanism acts on the «specific surface» created by the pores inside the plaster. This is achieved by the use of porogenous additives in powder form which are added during the mixing of the mortar. This «specific surface» is twenty times greater than the specific surface of a normal plaster. The condition allows the plaster to evaporate away all the water present through capillary action **faster than it can be replaced, thereby guaranteeing the draining of the walls even in the most difficult cases. A progressive displacement of the dampness takes place until all the moisture has been dispelled.**

POROGEN plaster reduces the effect of the cold wall offering these advantages instead: contained cost, simplicity of application, strong water repellence, little or no reaction to salts, maximum «specific surface» evaporation, resistance to frost/thaw, excellent vapour permeability coefficient, low thermal conductivity, treatment limited to improvement of wall surface only.

## TYPE OF INTERVENTION

POROGEN, DEUMISAN e IDROPLAN are particularly useful for the following applications:

- exterior plaster for skirting of old buildings affected by capillary action and efflorescence
- interior plaster to reduce condensation and mould
- interior plaster to eliminate damp from capillary action and efflorescence
- damp-proof plasters which complete the chemical or mechanical barrier to allow the evaporation of the residual damp of the wall
- water repellent plasters to protect facades from driven rain.

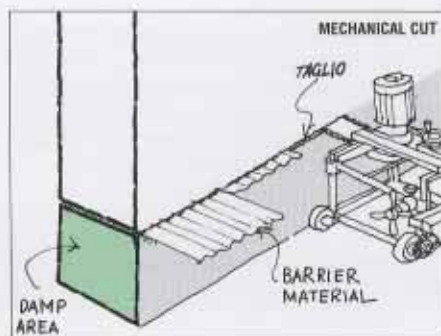
**INDEX plasters have been studied, for restoration work, to obtain maximum chemical-physical compatibility with the original materials.**

## FINISHES

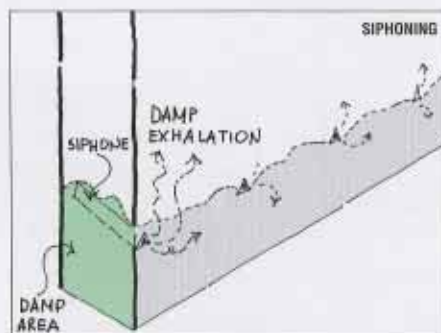
Particular attention must be paid to the choice of paint to be used which must provide **maximum vapour permeability**. It is advisable for internal areas to finish the walls with slaked lime and sand, paint containing lime, or smoothing coat containing lime of the **Rasocal** type (see technical sheet).

For exterior walls the choice will be orientated towards paints containing silica which are resistant to the action of atmospheric agents and which allow the surface to breathe, or natural mineral coatings such as **Decorfine** (see technical sheet).

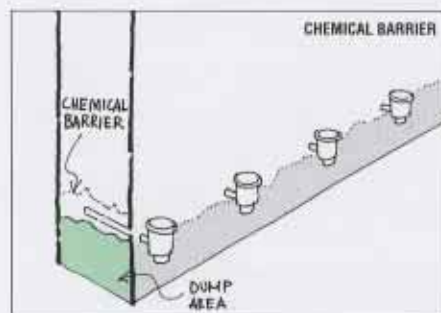
Damp-proofing plaster is a natural and economic system which has no contra indications and can always be used, even in conjunction with other systems. Plastered surfaces to be restored are always in a very bad condition and require destruction of the plaster. At this point, the total application costs involved between using an ordinary plaster and a special damp-proofing plaster are negligible.



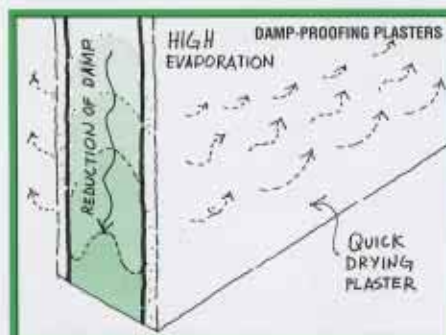
(design A)



(design B)



(design C)



(design D)



# The Products

## POROGEN SYSTEM PRONTO

**POROGEN SYSTEM PRONTO** is made up from two products:

### 1 - POROGEN QUICK DRYING PRIMER

Ready-mixed in powder for containing damp-proofing bonding agents, inert material with selected granulometric curve and various additives.

This priming plaster improves bonding of the macroporous plaster and puts the two layers into contact with the capillary network. It also creates an anti-saline barrier.

### 2 - POROGEN QUICK DRYING PLASTER

Ready mixed in powder form containing natural damp-proofing lime, macroporous light natural inert material which allows rapid evaporation of the humidity, contains water repellents and various porogenous additives.

**POROGEN QUICK DRYING PLASTER**, once applied, allows the damp masonry to enter into thermohygrometric equilibrium with the surrounding atmosphere, both because of its high degree of porosity and its excellent distribution of macropores. This macroporosity allows the plaster to repress any anti-aesthetic efflorescence and tensions caused by the increase in volume of the crystallising salts.

## DEUMISAN PRONTO

**QUICK DRYING DEUMISAN** is ready mixed in powder form and contains natural damp-proofing lime, inert material with selected granulometric curve, and additives which improve handling; it is water-repellent and contains porogenous agents. **QUICK DRYING DEUMISAN**, once mixed with water, provides a plaster which is particularly suitable for restoring masonry degraded by damp because it facilitates water evaporation due to its high level porosity. The process of damp-proofing a wall affected by rising damp is resolved as a result of the exceptional speed of evaporation which in **QUICK DRYING DEUMISAN** is greater than the speed of the advancing damp.

**QUICK DRYING DEUMISAN** is permeable to water vapour and therefore promotes the rapid transit from the wall to the external atmosphere. It also possesses extremely good surface bonding power and good water-repellence.

## IDROPLAN

**IDROPLAN** is a ready-mixed plaster in powder form containing damp-proofing lime, cement, calcareous inert material with selected granulometric curve and additives which allow excellent handling, water-repellence and adhesion to various surface types.

**IDROPLAN** impedes the movement of the atmospheric water in the masonry and allows the elimination of excessive damp in the form of water vapour because of its high uniformly distributed porosity.

The process of drying out a wall affected by rising damp is resolved due to the exceptional evaporation speed which **IDROPLAN** achieves which is greater than the speed of the advancing damp.



All information is given in good faith but normal tolerance of manufacture and testing will apply. Index reserves the right to improve and change their products at any time without prior notice or advice. The use of Index products is determined by local conditions and the individual requirements of each contract. In consideration of the many factors involved, Index cannot be held responsible for the application of their products and for conditions beyond their control.

For other types of intervention we refer you to Index Technical Specifications

# index

advanced waterproofing systems, insulations and refurbishment



RESTORATION OF DAMP MASONRY BRICKWORK USING DAMP-PROOFING RENDERS



WATERPROOFING UNDERGROUND AREAS USING VAPOUR PERMEABLE CEMENTS



CONCRETE REFURBISHMENT