CRAKGON®

The following article addresses:

- ## Understanding Humidity and its causes

  What causes humidity on walls, and what are its consequences? A deeper understanding of humidity related problems is key in identifying the root causes and proposing complete and effective solutions.

- ## Common Solutions to Humidity related problems and why they fail

  It's commonly assumed that that a simple paint job and a few localized repairs will resolve all wall waterproofing and insulation problems. Why do a majority of these solutions tend to be ineffective and, often, costly?

- ## Fibreglass paint reinforcement solutions and why CRAKGON is a permanent solution

  CRAKGON®, the permanent and dedicated solution to wall-cracks and related humidity problems.

CRAKGON® is a reinforcement for interior and exterior paint films and other coating compounds, and a preventative to the re-appearance of fine plaster cracks, or a consolidation medium for friable plaster surfaces. The inclusion of CRAKGON®reinforced surfaces will outlast non-reinforced surfaces by many years, according to independent tests conducted by the National Building Research Institute of the Council for Scientific and Industrial Research (Pretoria, RSA), and by the Quality Control Labs at Lacose Sotinco / CIN (Porto, Portugal).

Technical Data

Product code	CRAKGON® PR	CRAKGON® 50	CRAKGON® 100
Fibre diameter (microns)	12 - 16±1 µ	12 - 16±1 µ	12 - 16±1 µ
Fibre length	Continuous	Continuous	Continuous
Binder content	6-8% by mass	6-8% by mass	6-8% by mass
Mass	25±3 g/m²	25±3 g/m²	25±3 g/m²
Nominal thickness	0.18 mm	0.18 mm	0.18 mm
Roll width - standard	500±2 mm	500±2 mm	1000±2 mm
- minimum	100 mm	100 mm	100 mm
- maximum	2000 mm	2000 mm	2000 mm
Standard roll length	20±0.5 m	100±1 m	100±1 m

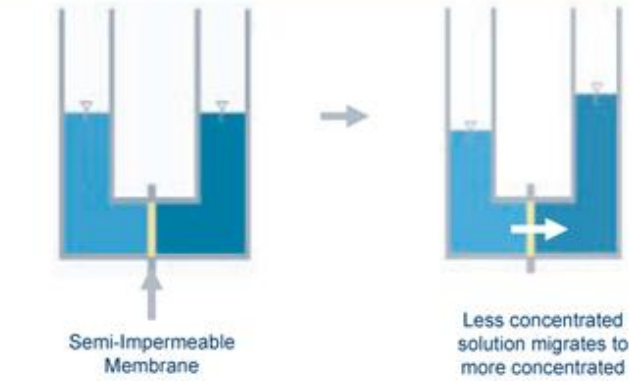
Understanding Humidity

Sources and Penetration of Water into Walls

Rain and snow, construction materials with a high degree of humidity content, and air vapor condensation are key factors in explaining the presence of high levels of humidity on the walls.

Water, ordinarily, penetrates the wall through openings such as cracks, delaminations, minute separations between the brick units and the mortar joints, and faulty joints. Another critical factor for water penetration is the presence of forces that either push or draw the water through – i.e., osmosis (see diagrams A and B below), and capillary absorption of porous and permeable materials.

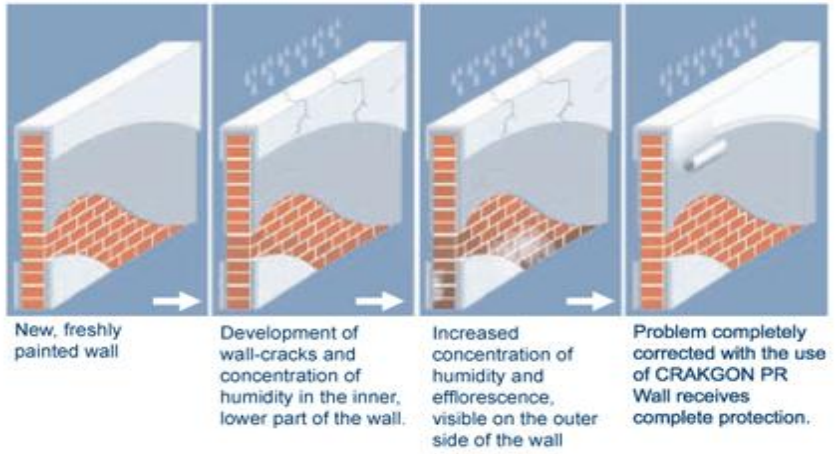
Diagram A: Fundamentals of Osmosis



As represented in Diagram A, Solutions with lower salt-concentration levels tend to migrate towards solutions with a higher degree of salt-concentrations if the barriers between them are not fully impermeable. Such phenomenon is common in the hulls of boats and within the walls of buildings (as Diagram B illustrates).

Diagram B illustrates the phases of deterioration of the wall resulting from water and humidity infiltration, greatly enhanced and accelerated by this Osmosis phenomenon. As tiny cracks begin to develop throughout the wall surface (this is a normal occurrence and is explained by the settling of the ground and/or retraction of the cement) a more rapid process of water ingression begins.

Diagram B: Effect of Osmosis on Walls



There are other ways by which water finds its way into the wall, such as the inherent porosity of the materials used to build the wall which suck the water in through capillarity, yet wall cracks speed-up that process, greatly. As the water runs its course down the wall, through the cracks, it also absorbs the less stable salts and highly corrosive elements present in the materials that make up the wall (sand, cement and bricks). As it reaches the base of the wall, the water becomes increasingly more concentrated in salts and acids. This is the root cause of yet another problem that soon becomes very visible - the appearance of efflorescence patches.

The humidity in the air and water from the rain (with a lower concentration of salts) on the outer side of the wall will now tend to migrate inwards (through Osmosis) especially where these pockets of highly concentrated water exist within the wall. Soon, we get to the point where the salts become visible (as seen on image 3 in Diagram B), resulting in ugly efflorescence patches.

It is important to note that water/humidity ingression is responsible for several other construction pathologies such as molds (which pose serious health concerns) and deterioration of the wall structure itself to the point of rupture and eventual collapse.

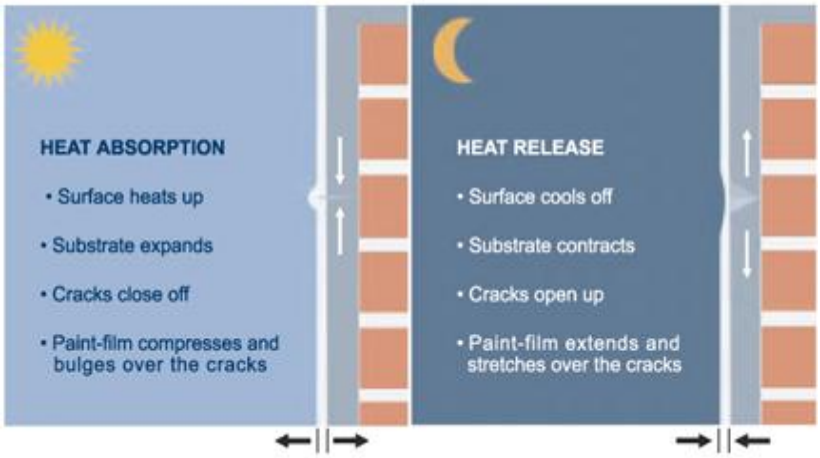
CRAKGON® helps prevent this and other types of humidity related problems as it minimizes the ability for the water to penetrate the walls by permanently covering wall cracks.

Understanding Humidity

Weather and the Paint-Film

Water penetration, along with thermal amplitude and restricted (often opposing) movements of different components in the wall (see diagram C below), are responsible for the majority of problems found on walls, today. Once saturated with water, the wall becomes far more susceptible to cracking due to thermal induced movement cycles, and progressively weakens to the point of rupture, disintegration, and complete structural collapse.

Diagram C: the Effect of Thermal Variance on Walls



Water can also cause considerable dimensional instabilities, which, in due course, can facilitate and lead to corrosion of metal structures such as the steel-reinforcement grids found in concrete walls, and breakdown of waterproofing systems. Water is also responsible for efflorescences in both interior and exterior walls, as well as poor indoor air-quality due to molds and mildew.

Walls of Today and Water

Contrary to walls built in the past, contemporary walls are no more than 75 to 90mm in width, on average. As extended roofs, which protect the walls below, are less used in buildings (especially high-rise structures), the degree of exposure of larger surfaces to the elements is now far greater, and larger amounts of water running down the walls contribute to a higher volume of water penetration.

Other weak areas highly susceptible to water penetration include inadequately waterproofed rooftops, terraces, balconies, and expansion joints.

Part of the solution to Humidity related construction pathologies includes ensuring adequate water drainage, and limiting exposure of the wall to water. But most importantly, prevent the ability of penetration of any water that comes in contact with the wall.

(Adapted from Material hosted by A. Sebastian Engineering and Investigation Services and part of the Masonry resources and bibliography page)

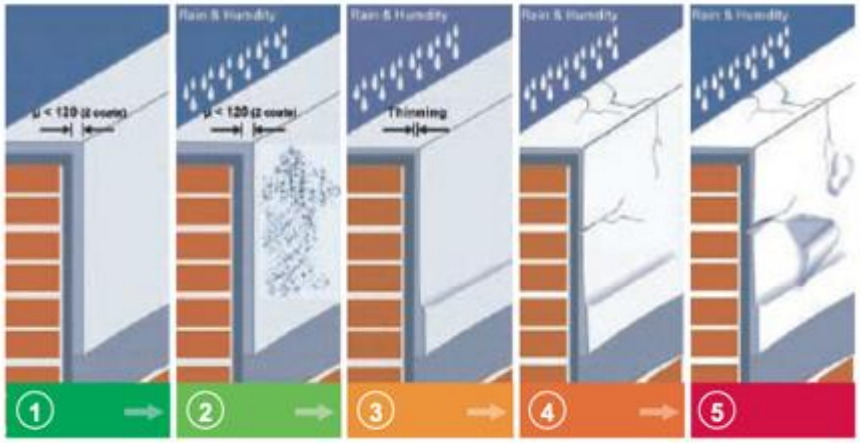
CRAKGON solves humidity and damp problems others solutions can't

Option 1. The Simple Paint Job won't last.

Of all commonly employed solutions, painting is the most popular one, it provides a visible and quick (albeit only apparent) solution as most symptoms are "masked" with a relatively smaller cash-outlay. The problem reappears shortly after, as the paint-film loses its initial flexibility, and begins to crack. This ageing process is considerably faster when the paint-film is exposed to UV Rays (exterior paints), and less able to follow the wall's thermal induced expansion and contraction movements.

CRAKGON extends the life of paint film and prevents surface cracking.

Diagram D: The Weathering Effect on Walls



1. New Non-Reinforced paint job
2. Chalking U.V. rays decompose the paint-film
3. Erosion (a.k.a. "Thinning") the paint-film gets eroded over time by the continuous action of the wind, rain, and dust particles
4. Ageing . Over time, small cracks develop throughout the surface of the paint-film
5. Peeling . The paint-film loses its elasticity, and begins to peal-off as it breaks away from the substrate

Option 2. Ceramic, Marble, Granite Tile/Panel Veneering can't seal the surface

Other solutions, which may require a substantially larger initial cash outlay, such as ceramic, marble, and granite tile/panel veneering used in facades of buildings, avoid the frequent repainting of exterior walls. Despite the esthetical advantages and higher face value, these materials are highly porous and permeable in nature. This is a critical flaw, since materials that absorb considerable amounts of water become highly thermal conductive.

CRAKGON provides a waterproof seal eliminating this problem.

Option 3. Waterproofing membranes can't breathe

In other more extreme cases, the use of waterproofing membranes (commonly, bituminous) is used as a preventative to water penetration, and entire walls are sealed, with serious negative consequences as a result. The problem, in most cases, becomes the inability for the wall to "breathe", an essential and desirable characteristic of a soundly constructed wall, as it allows for the release from within of humidity resulting from condensation, rain, drainage, etc. The eventual decay of both the wall and the membrane is inevitable. Please note that a similar phenomenon takes place with the use of some rubberized paints, which limit the ability for the wall to "breathe").

CRAKGON allows the wall to breathe.

Fibreglass Paint Reinforcement Solutions

CRAKGON-PR® was specifically designed and developed as a paint reinforcer to permanently repair and prevent humidity related problems,
in a simple, yet, highly effective way.

Properties of CRAKGON®

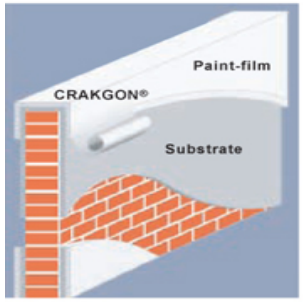
CRAKGON® is a non-woven paint reinforcing tissue of randomly dispersed continuous C-glass fibers . The glass fibers are bonded to one another by means of a specific binder. The binder is 100% compatible with emulsion, and solvent based coating systems.

The inherent properties of the "C-Class" glass used to produce CRAKGON® bestow it its high resistance to acids, alkalis, hydrolysis, and abrasion (see Table A below). These are critical factors in the efficacy of this solution as a permanent protection against the elements and aggressive environments.

The fibers in CRAKGON® are chemically inert, fireproof, and do not rot nor lose resistance. Also, they do not allow for the growth of microorganisms.

The binders within CRAKGON® are 100% stable, permanently flexible, and are non-yellowing under extended UV ray exposure.

Diagram A: Walls And CRAKGON® Compatibility Bridge



1. The Substrate and Paint-film have different movements (incompatible pattern)
2. The Substrate and CRAKGON PR® move in unison (compatible movement pattern)
3. The Paint-film and CRAKGON PR® also have compatible movement patterns
4. CRAKGON PR® restricts the movement of the Paint-film

Table A: Glass Comparison & Definition

Chemical Composition	C-GLASS %	E-GLASS %	ECR-GLASS %	A-GLASS %
Sio2	69	55	55	72
A1203	4	15	14	3
B2O3	1	7	-	0,5
MgO	3	3	3	1
CaO	5	19	22	9
Na2O	13	0,3	1,5	12,5
K2O	3	0,2	0.5	1,5
BAO	2	-	-	-
Trace Elements	1	0,5	4	0,5
Properties				
Hydrolytic Class	Good	Poor / Fair	Fair / Good	Very Good
Acid Durability	Excellent	Poor	Good	Excellent
Alkali Durability	Very Good	Good	Good	Poor
CTE	9.1	5	6	9
Density	2,46 – 2,52	2,53 - 2,59	2,70 - 2,72	2,45 - 2,47
Refractive Index	1,505 – 1,525	1,550 - 1,556	1,560 - 1,576	1,542 - 1,550
Dielectric Const	7,2	6,4	7,1	No Info

Fibreglass Paint Reinforcement Solutions

How CRAKGON® 'Cures' Humidity-Related Pathologies

CRAKGON®'s perfect compatibility with both the paint-film and the cement/plaster rendering is due to two important facts: (1) Sand (i.e., Silica) makes up 2/3 of the composition of the cement/plaster rendering. Equally, Silica (i.e., sand) makes up 2/3 of the composition of glass (CRAKGON®); (2) The specific binders within CRAKGON® are 100% compatible with the resins that make up the paint (see diagram A).

A Composite is formed through the absolute adhesion of CRAKGON® to both elements (the paint-film and the wall surface). Thus, the opposing coefficients of thermal expansion and contraction movements between the wall and the paint itself are equalized by the presence of CRAKGON® in the paint system.

CRAKGON®, simultaneously, moves in sync with the wall surface and enhances dimensional stability to the paint-film. Lab results show irrefutable evidence that CRAKGON® reinforced paint-film's tensile strength is 10 times greater than unreinforced paint-film itself and 3 times greater than CRAKGON® tissue itself.

Fibreglass Paint Reinforcement Solutions

CRAKGON® – the Permanent Solution

CRAKGON® ensures the correct and recommended industry standard paint-film thickness (circa 300u, dry paint-film). This is an important feature as there is a direct and proportional relationship between the (long-term) performance of the paint-job and the thickness of the paint-film. On average, only up to 3 coatings of un-reinforced paint-film are usually applied (mainly for economical reasons), which underlines the familiar short-comings of traditional paint systems, as only circa 180u (dry paint-film) are achieved (60u per coating, dry paint-film). Too thin a paint-film results in inferior surface protection, uneven and mediocre appearance, and more frequent and costly repainting jobs.

A CRAKGON® reinforced paint system won't require more than 3 coatings (only 2 if a textured paint is used) to achieve the recommended paint-film thickness (300u, dry paint-film).

The CRAKGON® glass fibers function as the "steel-rod grid in concrete structures", enhancing the durability and, thus, preventing cracking of the reinforced paint system (see diagram B). A single layer of CRAKGON® and paint offers an impermeable, highly abrasion-resistant, hygienic, and long lasting protection barrier, which, most importantly, allows for the wall to "breathe". CRAKGON® is ideal for both interior and exterior walls, and as a preventative against the effects of UV rays exposure, osmosis, and other related humidity problems.

	CRAKGON® REINFORCED PAINT JOB	COMMON PROBLEMS IN NON-REINFORCED PAINT JOB
1 Chalking	The CRAKGON® system is permanent. Chalking is limited only where it reaches the CRAKGON® Membrane.	U.V. rays decompose the paint-film.
2 Erosion (thinning)	CRAKGON® repels dust. Erosion is limited to the outer layers since each fiber is encapsulated in paint. Once the fibre surface is exposed, the color is still reflected by the fibers.	The paint-film gets eroded over time by the continuous action of the wind, rain, and dust particles.
3 Ageing	Avoided by the specific resin-rich reinforcement fibres found in CRAKGON® .	Over time, small cracks develop throughout the surface of the paint-film.
4 Peeling	The paint-film maintains its plasticity through micro sub-superficial capsules within the fibre, which reinforce the paint-film the same way steel-rods do in reinforced concrete, enhancing durability and preventing cracking.	The paint-film loses its elasticity, and begins to peal-off as it breaks away from the substrate.

Diagram B: Walls and CRAKGON® Reinforced Paint Systems