

# SOLUTIONS ATLAS

**NanoPhos**

*Pioneering  
Nanotechnology*



# 50

**PROBLEMS SOLVED  
WITH NANOPHOS  
MATERIALS**



**BUILDING AND  
CONSTRUCTION  
APPLICATIONS**

LAVRIO, JANUARY 2019

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# COMPANY



Vast **scientific** knowledge  
Rich product portfolio  
Large-scale **international** projects

## The Company

Since its establishment in 2005 in Lavrio, Greece, NanoPhos has been researching, developing, producing and trading **“smart” materials** to solve everyday problems with the power of **nanotechnology**. A broad range of patented, high-quality and environmentally friendly coating products adds functionality and unique properties in construction projects, industrial units, marine structures or vessels.

## Awards

Numerous international **awards** underline the company's *efficiency, ecological* awareness (i.e. 2010 World Expo, the 100% Detail exhibition, the GAIA awards), or *innovative* character (the President's of Microsoft- Bill Gates- distinction in 2008). NanoPhos has also been selected as a National Champion for the 2016/2017 European Business Awards Innovation. NanoPhos received **“Technical Achievement Award”** during the 2017 Lloyd's List Greek Shipping Awards - 2017.

## Global Presence

The UK, Denmark, Portugal, Spain, France, Italy, Romania, Cyprus, Saudi Arabia, UAE, Qatar, India, New Zealand, China, Japan, Mexico, Guatemala, Malaysia, Singapore, Pakistan, Norway, Vietnam, Moldova, Slovenia, Tanzania, Kenya, Colombia, Albania, Bulgaria, Australia, N. Korea and Portugal.

## Management Systems

NanoPhos has been approved by **Lloyd's Register Quality Assurance** in accordance with the standards of the Quality Management System EN ISO 9001:2015, the Environmental Management System EN ISO 14001:2015 and the Occupational Health and Safety Management System OHSAS 18001:2007 for the development, production and sales of building, marine, industrial nanotechnology products, paints and chemical products for cleaning and protection of surfaces.





# NANOTECHNOLOGY



## Tune the **Nano**World to serve the **Macro**World

### What is Nanotechnology?

Nanotechnology refers to the scientific field that deals in the research and creation of “smart” or functional material particles, which are very small in size – usually 100 nanometers or smaller. For example, one nanometer (nm) is one billionth of a meter ( $10^{-9}$  m). It is so small that if earth was one meter in diameter, then one nanometer would have been the size of an apple. When a common material shrinks at nanoscale level, **it exhibits unconventional and unique properties compared to smaller molecules or larger conventional bulk materials.**

### Why should I prefer NanoPhos nanotechnology products?

In contrast to other common, film-forming products or silicone-based formulations, which create a “plastic film of protection”, **NanoPhos products waterproof and protect the surfaces, penetrating into their pores.** The infinitesimal size of nanoparticles enables them to achieve a deep surface penetration and dress the pores of the materials, thus repelling water or corrosive agents. Consequently, the surfaces are not affected by abrasion, deterioration or mechanical wear. Moreover, NanoPhos products demonstrate long-lasting durability. The protection offered by the products is not affected by factors such as the “hard” part of solar light (UV radiation) while they do not induce the “yellowing” effect, without altering the appearance of treated surfaces. An additional important advantage is the breathing ability of modified surfaces. In particular, in cases where moisture is trapped behind a SurfaPore waterproofing modified surface, the water will evaporate into the environment without accumulating inside the building’s structure. In other words, water vapors can still travel inside the pores of the material and exit into the open environment, thus preventing swelling, cracking or warping.

### Safety

All SurfaPore, SurfaMix, SurfaGuard, ThermoDry and SurfaShield formulations are manufactured in accordance with the Directives 67/548/EC and 1999/45/EC. The Volatile Organic Compounds (VOC) content is always lower than the limits set by the European Union (Directive 2004/42/EC). SurfaPore, SurfaMix, SurfaGuard and SurfaShield are registered trademarks of NanoPhos SA.



LOW VOLATILE ORGANIC COMPOUNDS





50

PROBLEMS SOLVED  
WITH NANOPHOS  
MATERIALS



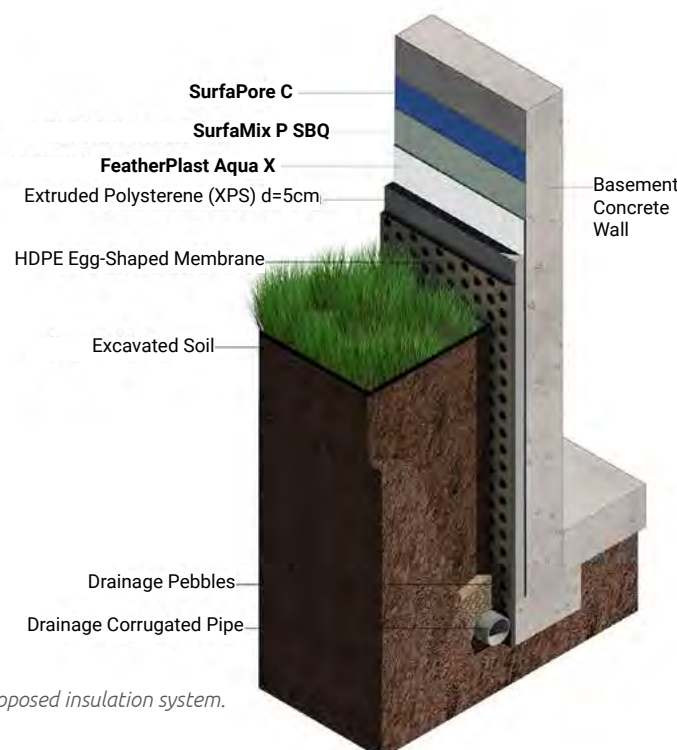
# 01.

## BASEMENT WATER INSULATION ON A CORRUGATED DRAINAGE PIPING



### The Challenge

Water insulation of basements is a most challenging task, as water ingress is supported by the hydrostatic pressure water can develop. Improper exterior insulation of the basement would result in permanent damage at the interior side of the basement. Penetrating water will bubble up, flake, or peel off of the walls, making for a very ugly and very messy basement with chips of paint all over the floor. Apparently, humidity may develop. Mould growth is a sign of a sick building and all problems arise from not taking care basement insulation.



3D illustration of the proposed insulation system.

## BILL OF MATERIALS

- Repairing cement, mixed with **SurfaPore C** 10%v/w
- **SurfaPore C** 4 m<sup>2</sup>/L
- **SurfaMix P SBQ** 8 m<sup>2</sup>/L
- **FeatherPlast AquaX** 4 Kg/m<sup>2</sup> for d=3mm
- XPS Extruded Polystyrene d=5cm
- HDPE drainage egg-shaped membrane (min 500g/m<sup>2</sup>)

## WHY NANOPHOS SYSTEM?

- **FeatherPlast AquaX** is the only product presenting elasticity and complete water insulation properties, even at heavy hydrostatic pressure.
- **SurfaPore C** deeply penetrates the cementitious mass.
- **SurfaMix P SBQ** is not just a primer but actively prevents water ingress. Quartz formulation enhances adhesion and robustness of the whole insulation system.

### The Solution

SurfaPore C will deeply penetrate and protect the basement walls creating an impermeable barrier to water. Apart from the fact that SurfaMix P SBQ primer enhances water impermeability, it adds up as a primer for subsequent cementitious plaster application. FeatherPlast AquaX is also waterproof that can stand heavy hydrostatic pressure. The addition of XPS (Extruded Polystyrene) enhances the energy profile of the building. Finally, installation of the HDPE egg-shaped membrane prevents the chemical interaction of soil with the insulation system and allows water vapours to evaporate, before they accumulate into negative water pressure. The installation of a corrugated pipe at the base of the foundation gap and the layer of pebbles allow proper drainage of water and humidity, before they become a threat of the basement walls.

The whole system is designed in a way that water is directed to collection (drainage), rather than accumulating against the basement walls. Drainage water can be collected for non-drinking purposes, such as watering or laundering.

### Application

Make sure that the basement concrete walls have cured for at least seven days before application. Remove steel bars that are projected outside the basement walls. Fill surface voids, gaps or cracks with repairing cement and SurfaMix C. Add water and SurfaMix C in small quantities (10% per weight) so as to prepare a workable repairing cement plaster. Apply SurfaPore C one day after the application of cementitious repair mix: By using a hand-held sprayer or a roller apply two uniform layers of SurfaPore C; each one at a consumption ratio of 8m<sup>2</sup>/L. The application

of each SurfaPore C layer should take place within a minimum time interval of 4h. 8h after the application of SurfaPore C final layer, apply SurfaMix P SBQ, by using a roller and at a consumption rate of 8m<sup>2</sup>/L. Ensure that the primer formulation is well stirred before application and that the roller is suitable for solvent based formulations. Allow 8h of curing before the application of FeatherPlast AquaX. FeatherPlast AquaX can be mixed using a drum or plasterer's paddle mixer

in a tub (gentle mixing) or by hand using a trowel. Initiate mixing by pouring a quarter of the amount of clean water into a flat-bed mixing container. Empty the full 25Kg bag content slowly (do not use part bag mixes) into the same mixing container. Add a half of the amount of water to the mixture and proceed with thorough mixing. Continue adding the remaining water while mixing until the desired consistency and workability is achieved.

The cementitious mix is applied by hand trowel or by using a plastering pump machine for lightweight pre-mixed products. Prevent applying thickness greater than 1,5mm for each application round to avoid cracking. Points and reference bands can be used in order to obtain the required thickness. Conclude basement insulation by the installation of flat Extruded Polystyrene (XPS) sheets, using appropriate polystyrene glue. Avoid the use of nails or perforating anchors to prevent cracking the basement insulation system or creating water ingress points. The HDPE egg-shaped membrane is applied on the polystyrene surface by using appropriate handheld staplers.

### Expected Useful Life

**At least 30 yrs**, upon proper application/installation.



Basement Insulating system before landfilling.



## 02.

## BASEMENT WATER INSULATION ON A BELOW WATER-BED OR SEAWATER IMMERSED STRUCTURES, PORT INSTALLATIONS OR DEEP UNDERGROUND PARKINGS



### The Challenge

Water insulation of monster buildings and especially skyscrapers is a most challenging process as (in most cases) the excavation depth is lower than the water bed. The same applies for port installations or deeply excavated underground parking installations. Especially in cases where construction is taking place close to sea, water may be brackish or high in salt concentration. Membrane insulation is practically impossible, as mechanical stress may cause membrane perforations that will act as detrimental defects in the insulation pattern of the building.

*Foundation preparation works of a skyscraper in Dubai. Soil cement base (SCB) has been applied and concrete casting frame has been laid.*

## BILL OF MATERIALS

- AES Asphalt Epoxy Sealer 1,50 L/m<sup>2</sup>

## WHY NANOPHOS SYSTEM?

- **AES Asphalt Epoxy Sealer** is the only to combine epoxy and asphaltic technology.
- **AES Asphalt Epoxy Sealer** is easy and fast to apply.
- **AES Asphalt Epoxy Sealer** is the only to withstand high values of water hydrostatic pressure.
- **AES Asphalt Epoxy Sealer** is versatile in application areas and can be applied in absolute combination with the cementitious load bearing structure.

### The Solution

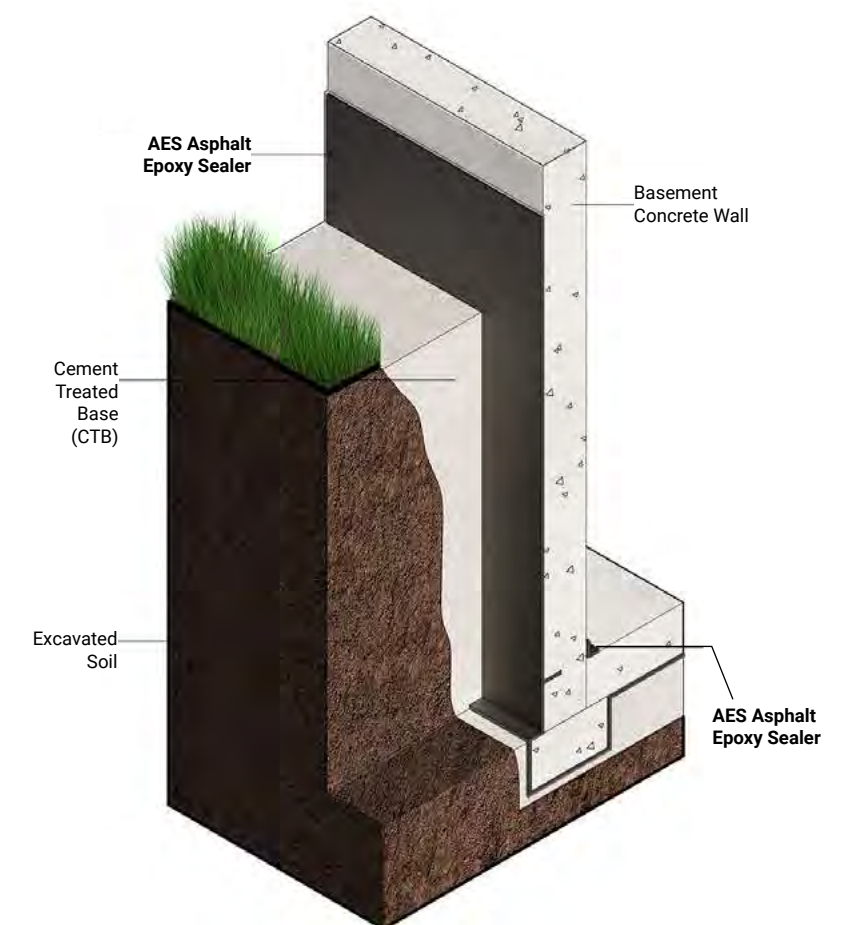
AES Asphalt Epoxy Sealer combines two powerful elements of the water insulation industry: Epoxy resin and asphaltic component. Epoxy is durable, permanent, chemically inert and cannot decompose. Asphalt creates the perfect water barrier – both in vapour and liquid form. The fact that AES Asphalt Epoxy Sealer is a brushable formulation results in a seamless coating, which follows the substrate texture and prevents rupture that may result in waterproofing defects. AES Asphalt Epoxy Sealer is applied on the Cement Treated Base (CTB or Soil Improvement Cement). CTB usually acts as a soil stabilizer and stands between the soil and the concrete load-bearing elements. Applying AES Asphalt Epoxy Sealer inbetween assures that the load bearing structures will be free of external water ingress, even if they are in direct contact with seawater.

### Application

AES Asphalt Epoxy Sealer is a two-component formulation, where the Part A Base is mixed with Part B Hardener at equal volumes. After mixing Base and Hardener, application of the mixture takes place by a thick brush or sprayer. While brush application results in thick coatings, airless sprayer application can reach hidden spots and assure a more uniform application pattern. As AES Asphalt Epoxy Sealer is a 100% volume solids formulation, a consumption rate of 1,5L per m<sup>2</sup> will result in film thickness of 1,5mm. In case water pressure is increase due to water bed proximity, increase consumption rate at 2L per m<sup>2</sup> or 2mm dry film thickness. Any subsequent structural element can be casted 12h after the application of AES Asphalt Epoxy Sealer. In case of interlocking elements (e.g. floor and wall element) apply AES Asphalt Epoxy Sealer at least in half the interlocking surface.

### Expected Useful Life

**Lifetime expected** useful time, upon proper application/installation.



*3D illustration of the proposed insulation system.*

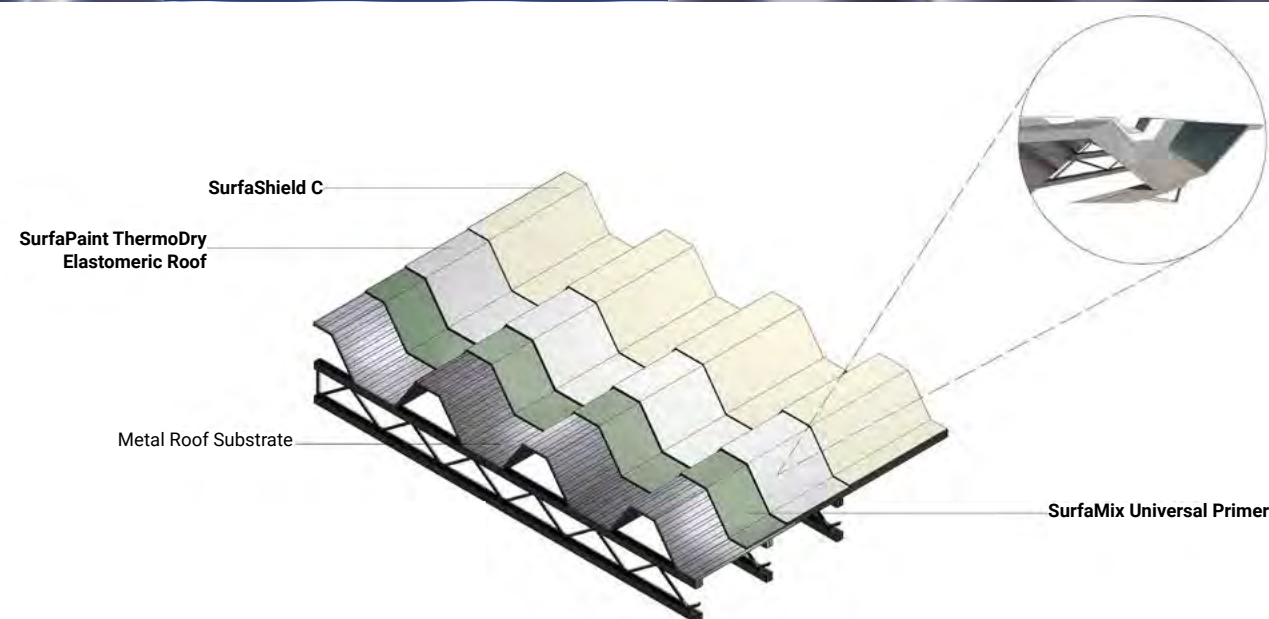


## 03.

# ROOFTOP WATER AND THERMAL INSULATION ON A METAL INDUSTRIAL BUILDING

## The Challenge

Regardless if the building's climate zone is in the Mediterranean or Middle East or Australia, industrial buildings suffer from heavy heat loads ingress, due to large surface area of rooftop. Corrugates steel roof tops are prominent to heating up and transfer heat to the interior of buildings, increasing cooling costs and jeopardizing the working temperature comfort zone. Furthermore, cool coatings may lose their properties due to dirt pick-up. While performance is extraordinary a few months after application, the accumulation of dirt or dust eliminates cooling properties and the relevant benefit is lost.



3D rooftop insulation scheme for a corrugated steel roof industrial building.

## BILL OF MATERIALS

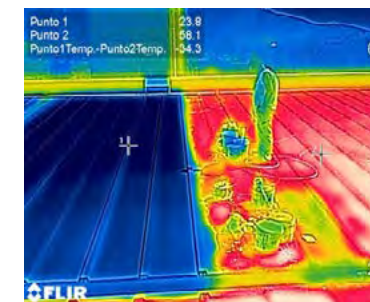
- SurfaMix Universal Primer 10m<sup>2</sup>/L
- SurfaPaint ThermoDry Elastomeric Roof 2m<sup>2</sup>/L
- SurfaShield C 12m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- It is the only system that truly enhances thermal insulating profile by reducing thermal conductivity and enhancing thermal reflectance.
- NanoPhos' system presents high emissivity; thus, it doesn't heat up.
- Application is easy by airless spraying or brushing.
- Full Heat and Water insulation even under ponding water.
- **SurfaShield C** photocatalytic technology assures that thermal reflectance properties will not reduce in time, as self-cleaning properties will maintain the original appearance and coating condition.
- NanoPhos' system remains operational in both cold (winter) and hot (summer) conditions.
- The application of **SurfaMix Universal Primer** assures strong bonding to substrate, regardless if it's porous or not.

## The Solution

NanoPhos has developed a three-layer insulation system that is easily applicable on corrugated steel roof tops. Priming is essential as the substrate of metal rooftops may be heavily damaged from weathering or covered with polymers (polyester or PVDF). SurfaMix Universal Primer assures perfect coating adhesion, even in low porosity substrates. Following priming, the use of SurfaPaint ThermoDry Elastomeric Roof combines high thermal reflectance and low thermal conductivity; thus, providing full thermal protection properties. Finally, the application of SurfaShield C induces self-cleaning properties to assure long-term thermal reflectance and cool properties.



34.3°C difference between treated and untreated industrial rooftop observed through thermal imaging equipment.

ing an airless sprayer or a roller, at a consumption rate of 10m<sup>2</sup> per L. SurfaMix Universal Primer is a solvent based formulation and, therefore, application equipment should be accordingly suitable. 8h after primer application apply SurfaPaint ThermoDry Elastomeric Roofs at a consumption rate of 2 m<sup>2</sup> per L, by an airless sprayer or a roller. 24h after application of SurfaPaint ThermoDry Elastomeric Roofs, the application of SurfaShield C takes place, using, again, the same application method: airless sprayer. SurfaPaint ThermoDry Elastomeric Roofs and SurfaShield C are both considered as water based formulations.

considered as water based formulations.

## Expected Useful Life

**20 yrs expected** useful time, upon proper application/ installation and a maintenance plan of a single SurfaPaint ThermoDry Elastomeric Roof top coat, every five years.



Application of SurfaMix Universal Primer.



Application of SurfaPaint ThermoDry Elastomeric Roof on primed surface.



# 04.

## GROUT WATERPROOFING FOR NON-WATER IMMERSED APPLICATIONS

### The Challenge

Regardless if the grout in-between tiles is new, old or renovated, eventually it gets dirty, damaged and mouldy; especially when placed in wet areas such as in bathrooms, kitchens and balconies. Frequent cleaning of unprotected grout becomes exhausting, unaffordable and eventually damages both the grout and tiles. Moreover, non-waterproof grout is the entry point of humidity. Cracks and hairlines on grout can become water ingress points. Those ingress points are very difficult to spot and repair.



The beading effect on grout is intense, even if the grout gap is huge.



3D illustration of the proposed grout waterproofing system.

## BILL OF MATERIALS

- **SurfaMix C** 10% per weight mixing with dry mortar grout
- **DeSalin DG** 50mL per m<sup>2</sup> for cleaning pre-installed grout
- **SurfaPore C** 250mL per m<sup>2</sup> surface application

## WHY NANOPHOS SYSTEM?

- **SurfaPore C** is the easiest to apply versus all other water proofing methods for grout.
- Does not alter the natural appearance of grout – no filming.
- Deep penetration assures better protection.
- Long term protection against water and corroding factors (e.g. chlorides).

### The Solution

Grout waterproofing helps protecting from water ingress, bacteria and mould from growth and reducing dirt pick-up. NanoPhos offers a simple but solid protection method to improve the longevity of tiling system.

#### Fresh grout installation:

System of SurfaMix C and SurfaPore C.

#### Pre- installed grout: SurfaPore C.

SurfaMix C is a water-based admixture for cementitious grouts that enhances adhesion and bonding on application surfaces. Furthermore, it improves elasticity and reduces cracking, shrinkage and water absorption. Cementitious materials require water for bonding and hardening. Uncontrolled setting can induce cracking of the surface or extended capillaries formation. SurfaMix C controls the water reaction with cementitious materials, decreasing rapid shrinkage and cracking. At the same time, a bonding grid fills the microscopic gaps, enhances the elasticity of the material and promotes bonding on the application surface. This also reduces cement surface ingress of dirt and weathering. Furthermore, SurfaMix C prevents unwanted moisture, that may rise through the structure (i.e. rising damp) or penetrate from the outside (i.e. condensation). Finally, the cured cementitious mix is more durable against surface corrosion, negative water pressure, frost threat and extreme weather conditions. As a result, SurfaMix C modified cement surfaces last longer.

SurfaPore C is a water based, liquid formulation that provides water repellence and protection of a wide range of porous cementitious surfaces without creating a "plastic film". As its viscosity is similar to that of water, it deeply penetrates into capillaries that no elastomer or polymer can reach. It creates a water repelling protection by deeply penetrating into the pores of the substrates, instead of sealing them. Therefore, the substrate is deeply protected

and therefore not affected by abrasion or mechanical wear. The nanotechnology-based composition assures effectiveness, prolonged lifetime and no change of the original natural appearance. Whilst SurfaPore C creates a water barrier on the material itself, one of the most important advantages of SurfaPore C is the "breathability" of the modified surface. SurfaPore C modified surfaces last longer comparing to conventional film coatings and are more resistant to the "hard" part of solar light (UV radiation) which does not induce the "yellowing" effect.

### Application

#### Fresh grout installation:

Replace water with SurfaMix C and add directly by 10% per weight of the dry mortar grout. Mix until homogenized. Apply grout as usual. Let the grout dry and cure for at least 7 days and then proceed with the application of SurfaPore C by using a small brush, roller or spraying. No dilution is required. On very absorptive surfaces reapply within 1 hour. The application of SurfaPore C on tiles' surface should be avoided. Maximum effectiveness is achieved 24 hours after application.

#### Pre-installed grout:

Make sure that the grout surface is dry and free of mould, dirt, dust or oily residues. Use DeSalin DG to remove stains or oily residues from the surface of the grout. Rinse with plenty of water and let the surface dry for 24h. Apply SurfaPore C by using a small brush, roller or spraying. No dilution is required. On very absorptive surfaces re-apply within 1 hour. The application of SurfaPore C on tiles' surface should be avoided. Maximum effectiveness is achieved 24 hours after application.

### Expected Useful Life

**3 yrs** upon limited use of corroding detergents and cleaners.

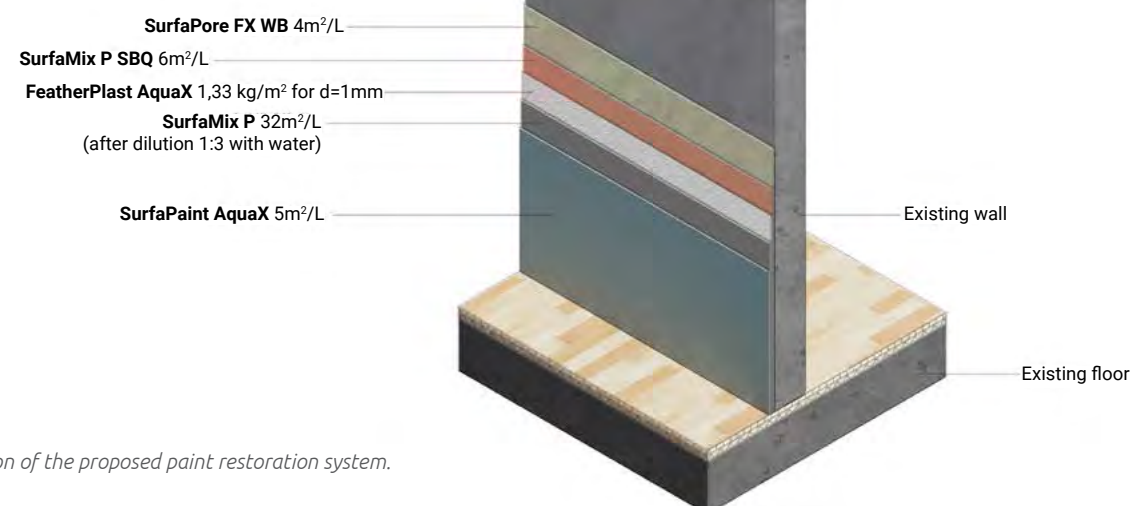
## 05.

## CRACKED PLASTER AND DAMAGED PAINT RESTORATION FROM RISING DAMP

## The Challenge

Rising damp is a form of damp that affects the walls of buildings. It occurs when moisture from the ground travels up through the walls by capillary action. This water contains salts that also travel up through the wall. Rising damp is first noticed by the damage it causes to the internal walls of a building. Plaster or paint can deteriorate and any wallpaper tends to loosen.

Damaged paint on wall due to rising damp.



3D illustration of the proposed paint restoration system.

## BILL OF MATERIALS

- SurfaPore FX WB 4m<sup>2</sup>/L
- SurfaMix P SBQ 6m<sup>2</sup>/L
- FeatherPlast AquaX 1,33 Kg/m<sup>2</sup> for d=1mm
- SurfaMix P 32m<sup>2</sup>/L (after dilution 1:3 with water)
- SurfaPaint AquaX 5m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- In contrast to conventional systems, NanoPhos proposes a breathing system, ideal for negative water pressure.
- **SurfaPore FX WB** enhances the mechanical properties of the substrate, fixing the degraded, loose matter.
- NanoPhos' system acts smart: allows vapour pressure circulation and water pressure mitigation, while preventing efflorescence and swelling. It is the only system that addresses breathability and resistance to negative water pressure, simultaneously.

## The Solution

NanoPhos offers a system set of three products:

- SurfaPore FX WB will penetrate deep, restore the strength of the substrate and induce a waterproofing barrier. SurfaPore FX WB penetrates deeply in the mass of the cementitious substrate, creating a barrier against liquid water movement. Therefore, water cannot carry dissolved salts on the substrate and hydrostatic water pressure is mitigated. SurfaPore FX WB does not affect the breathing capacity of the building surface; therefore, accumulated water may evaporate without dampen the building surface.
- On the other hand, FeatherPlast AquaX is a waterproof, breathable cementitious mix, ideal for repairing the cracks and holes, created during the reparation of the original surface.
- SurfaPaint AquaX is a unique paint top-coat that acts as a water barrier (intense water beading effect and water repellence), combined with superior breathability.

In-between the repairing coatings, SurfaMix P SBQ and SurfaMix P are needed to ensure bonding. SurfaMix P SBQ is applicable on the hydrophobic SurfaPore FX WB substrate and contains quartz sand that will make the subsequent FeatherPlast AquaX formulation bond efficiently. SurfaMix P is waterborne, can be diluted four-times its original volume with tap water and will result paint (SurfaPaint AquaX) adhere on the cementitious substrate, without affecting its breathing capability. All in all, the proposed system can withstand the water pressure by rising damp but will not allow water pressure to deteriorate the repaired area. The proposed solution acts as a molecular valve that permits gaseous water molecules travel throughout the wall. Water pressure is mitigated without the repaired surface being swollen, cracked or damaged.

## Application

Using a spatula, remove all loose material from the damaged, cracked or swollen surface area. Make sure that after removal of loose material, the application

surface area is dry, free of mould, dirt, dust or oily residues. Apply SurfaPore FX WB and allow for one day curing. Allow for one week curing in order for the moisture pressure to be relieved and for the humidity to evaporate and dry. Apply SurfaMix P SBQ as a primer.

Three hours after priming, apply FeatherPlast AquaX. FeatherPlast AquaX can be mixed using a drum or plasterer's paddle mixer in a tub (gentle mixing) or by hand using a trowel. Initiate mixing by pouring a quarter of the amount of clean water into a flat-bed mixing container. Empty the full 25Kg bag content slowly (do not use part bag mixes) into the same mixing container. Add a half of the amount of water to the mixture and proceed with thorough mixing. Continue adding the remaining water while mixing until the desired consistency and workability is achieved. The cementitious mix is applied by hand trowel or by using a plastering pump machine for lightweight premixed products. Prevent applying thickness greater than 1,5mm for each application round to avoid cracking. Allow FeatherPlast AquaX to cure and dry-off for at least five days. Apply SurfaMix P as a primer: shake well SurfaMix P before application. For one volume part of SurfaMix P, dilute by adding 3 volume parts of water. Apply one even coat using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered.

Typically, drying time is 1 hour depending upon coat thickness. Low temperatures and high humidity will lengthen drying times. As a good practice, apply emulsion paints 24h after primer application. Apply the appropriate paint: SurfaPaint AquaX for breathable water ingress protection. The surface dries completely within 48 hours of final application.

## Expected Useful Life

**At least 5 yrs**, upon proper application/installation.

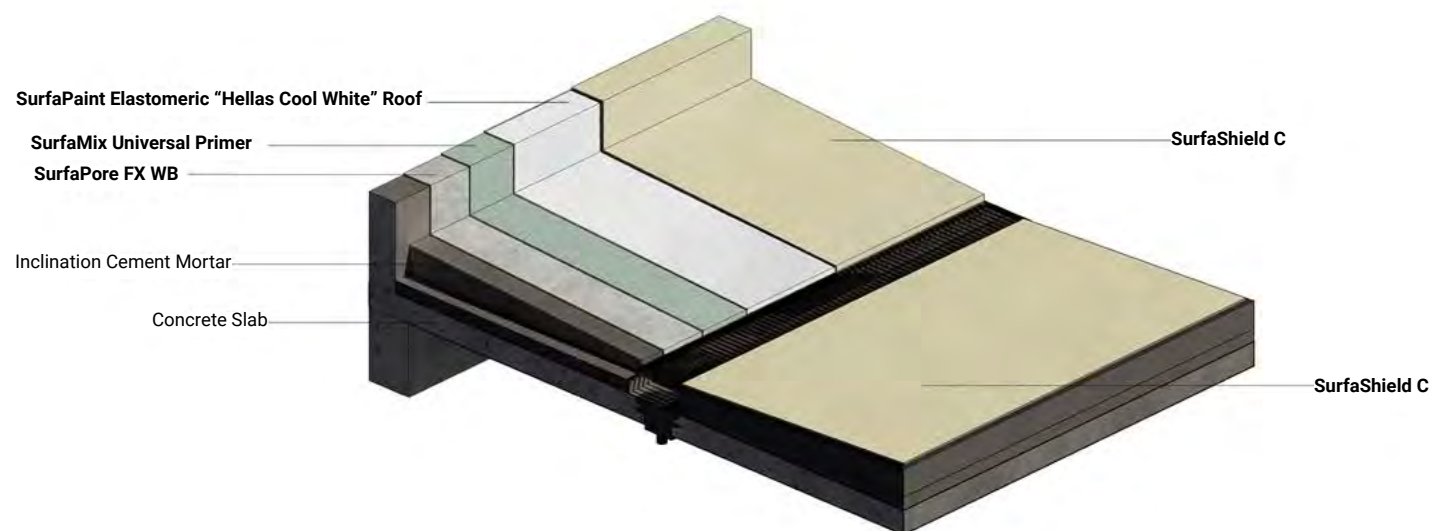


## 06.

# CRACKED POLYURETHANE, CEMENT OR BITUMEN ROOFTOP COOL AND WATER INSULATION, EVEN IN PONDING WATER

## The Challenge

A huge amount of energy is transferred easily through roofs and extended amounts of energy are required for cooling in the summer. In addition, water travels through rooftops and penetrates into the building by creating moisture and mould on the inner walls. The use of bitumen rolls in the past years has created immense problems in rooftop insulation: apart from the fact that bitumen insulation collects incident heat radiation and heats up buildings, bitumen stains are evident, and failure of bitumen roll anchoring points results in complete failure of the water insulation system. The same may apply on old polyurethane systems that yellow over time and crack due to ponding water. A system that can adhere on old polyurethane and repair cracked yellowish surfaces is challenging to develop, NanoPhos has just made it.



3D illustration of the thermal and water insulation system of cementitious roof.

## BILL OF MATERIALS

- SurfaPore FX WB 4m<sup>2</sup>/L (cementitious substrate only)
- SurfaMix Universal Primer 10m<sup>2</sup>/L
- SurfaPaint Elastomeric "Hellas Cool White" Roof 1m<sup>2</sup>/L
- SurfaShield C 10m<sup>2</sup>/L (optional for self-cleaning)

## WHY NANOPHOS SYSTEM?

- Unique Cool properties and SRI values (SRI = 114). As Cool as Hellas White!
- Versatility & Applicability: the application of **SurfaMix Universal Primer** assures strong bonding to substrate, regardless if it's porous (cementitious) or not (old polyurethane coatings or bitumen rolls).
- **SurfaMix Universal Primer** prevents bitumen stains.
- NanoPhos' system presents high emissivity; thus, it doesn't heat up.
- Application is easy by airless spraying or brushing.
- Prevents bitumen staining.
- Full Water insulation even under ponding water.
- **SurfaShield C** photocatalytic technology assures that thermal reflectance properties will not reduce in time, as self-cleaning properties will maintain the original appearance and coating condition.

## The Solution

Further to cement substrate fixing and mechanical enhancement by SurfaPore FX WB, NanoPhos has developed a three-layer insulation system that is easily applicable on cement or bitumen roof tops. Priming is essential as the substrate of cement or bitumen or old polyurethane rooftops may be heavily damaged from weathering and ponding water. SurfaMix Universal Primer assures perfect coating adhesion, even in low porosity substrates. Furthermore, it is a water and vapour sealer, ideal for roof tops. The application of SurfaMix Universal Primer on bitumen roll surfaces acts as a sealer and prevents bitumen stains diffuse to the surface of the insulating coating. Following priming, the use of SurfaPaint Elastomeric "Hellas Cool White" Roof combines high thermal reflectance/emissivity and waterproofing, even in ponding water; thus, providing coolness and water insulation properties. Finally, the application of SurfaShield C induces self-cleaning properties to assure long-term thermal reflectance and cool properties.

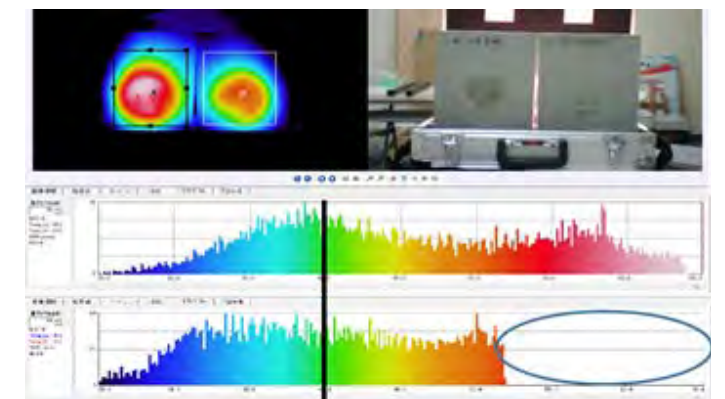
## Application

New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Make sure that the rooftop is dry and free of mould, dirt, dust, oily residues or flaking parts. Apply SurfaPore FX WB by a brush or airless spraying and allow for two days curing. Application of SurfaPore FX WB should take place only on cementitious substrates and never on bitumen rolls insulated substrate. Apply SurfaMix Universal Primer by using an airless sprayer or a roller, at a consumption rate of 10m<sup>2</sup> per L. SurfaMix Universal Primer is a solvent based formulation and, therefore, application equipment should be ac-

cordingly suitable. 8h after primer application apply SurfaPaint Elastomeric "Hellas Cool White" Roof at a consumption rate of 1m<sup>2</sup> per L, by using an airless sprayer or roller. Ensure corners and edges are adequately covered. The application surface should be cross-rolled to ensure even application and to minimise roller mark. Additional coats should be applied 24 hours after the previous application. 24h after application of SurfaPaint Elastomeric "Hellas Cool White" Roof, the application of SurfaShield C takes place by using airless sprayer. Maximum effectiveness is achieved 24 hours after application.

## Expected Useful Life

**20 yrs** expected useful time, upon proper application/installation and a maintenance plan of a single SurfaPaint Elastomeric "Hellas Cool White" Roof top coat, every five years.

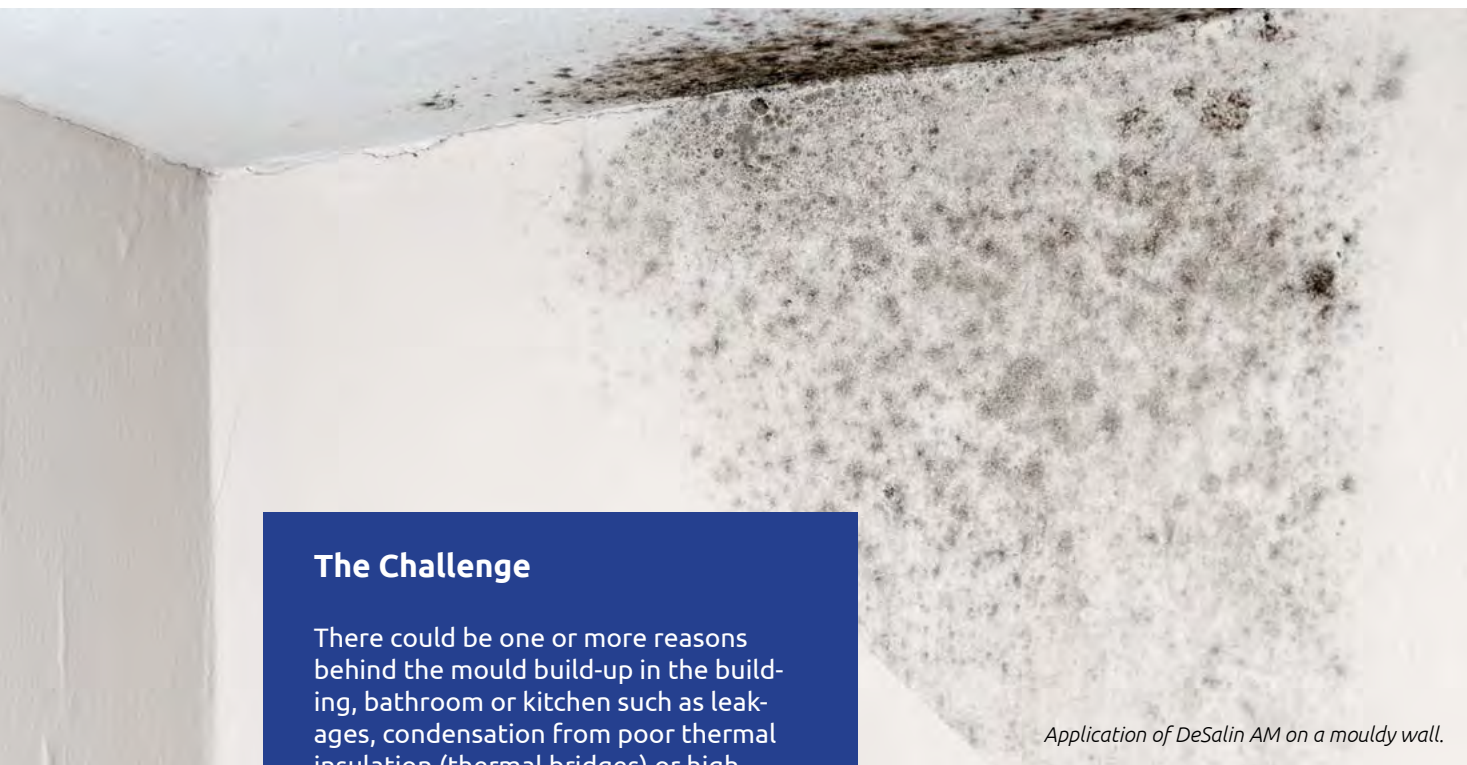


Regular vs SurfaPaint Elastomeric "Hellas Cool White" Roof coating temperature cut-off. Note the absence of surface temperature above 40°C on NanoPhos' coating panel.



## 07.

# MOULD REMOVAL AND PREVENTION ON INTERIOR WALLS



## The Challenge

There could be one or more reasons behind the mould build-up in the building, bathroom or kitchen such as leakages, condensation from poor thermal insulation (thermal bridges) or high humidity levels. Having mould growing on the walls and ceilings is not only unsightly, but also unhealthy. NHS from UK stands solid\*: "If you have damp and mould in your home you're more likely to have respiratory problems, respiratory infections, allergies or asthma. Damp and mould can also affect the immune system." Cleaning the infected surface with bleach products usually worsens the problems as the spores are resistant to sodium hypochlorite (bleach) and, eventually the cleaning effort results contaminating a greater than originally surface area of the wall. Subsequently, instead of disinfecting the wall, traditional cleaning solutions help the spread of the living invaders.

\* <https://www.nhs.uk/common-health-questions/lifestyle/can-damp-and-mould-affect-my-health/>

Application of DeSalin AM on a mouldy wall.



Mould removal and painting sequence by DeSalin AM and SurfaPaint AquaX.

## BILL OF MATERIALS

- DeSalin AM 5m<sup>2</sup>/L
- SurfaMix P 32m<sup>2</sup>/L after dilution
- SurfaPaint AquaX 5m<sup>2</sup>/L  
or SurfaPaint ThermoDry Interior 5m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- DeSalin AM is the only formulation that kills mould spores. Bleach just spreads the mould spores all over.
- DeSalin AM active ingredients bind on the application surface offering a long-term sterilization.
- SurfaPaint ThermoDry Interior fights condensation by its thermal insulating properties; thus, eliminates one of the root causes of mould development.



The application of DeSalin AM on a mouldy surface, immediately, after 24h and after 10 days from application.

## The Solution

NanoPhos 3-step mould removal and prevention system is quick and easy to apply.

**Step 1:** DeSalin AM is a powerful water-based disinfectant, fungicide - preservative against mould, algae and microorganisms for internal and external masonry surfaces. It is not only used to clean infected walls but also to maintain the clean applied surface from the black and green spots caused by microorganisms. It can be used as a preventive treatment for the maintenance of internal surfaces with high humidity such as kitchens, bathrooms and basements, by preventing the growth of microorganisms.

**Step 2:** SurfaMix P is a versatile water-based primer for surface preparation, before the application of emulsion paints. The fine resinous nanoparticles that exhibit a size distribution around 60 nm can penetrate deep in the substrate yielding a coherent and solid result for the application of emulsion paints. Well engineered to be applied on humid surfaces, where mould problems exist. SurfaMix P reduces the water absorption coefficient of porous substrates while in the same time it does not affect their breathability.

**Step 3:** SurfaPaint ThermoDry Interior is a high-quality paint with thermal protective properties, ideal for interior use. Powered by SurfaPore ThermoDry, it contains special thermal protective materials contributing to energy savings during winter and summer. The thermal protective particles block heat transfer, reflect thermal radiation, and create a moisture barrier that can result in significant energy savings. As it prevents thermal bridging, it minimizes moisture condensation and mould growth.

**Or, step 3:** SurfaPaint Aqua X is a water based acrylic paint that provides effective water repellency. It prevents the external humidity and rainwater from penetrating into the building substrate, reducing cracking and swelling.

## Application

**Step 1:** To disinfect and preserve the surface, apply DeSalin AM by using a brush, without any prior dilution. Scrub with a sponge or a stiff brush after 24h. Rinse the application surface with water or a wet sponge. Let the surface dry well before proceeding to step 2.

**Step 2:** Ensure that the disinfected surface is clean and dry prior application. Shake well SurfaMix P before application. For one volume part of SurfaMix P, dilute by adding 3 volume parts of water (porous masonry substrates) or 4 volume parts of water (paint covered surfaces). Application temperature should be between 8 - 35°C. Apply one even coat using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered. Typically, drying time is 1 hour depending upon coat thickness. Low temperatures and high humidity will lengthen drying times. As a good practice, apply emulsion paints 24h after primer application.

**Step 3:** The application method is the same for both SurfaPaint ThermoDry Interior and SurfaPaint AquaX. Stir well before application. Do not dilute for bridging gaps and hairline cracks of up to 0,5 mm. For cracks bigger than 1mm, fill the gap with a suitable putty. If thinning is required add up to 10% water by volume. Application temperature should be between 8 - 35°C. Apply 2-3 even coats using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered. Additional coats should be applied 4-6 hours after the previous application.

## Expected Useful Life

**At least 5 yrs**, upon proper application/installation. All the way that the paint is applied on substrate's surface.



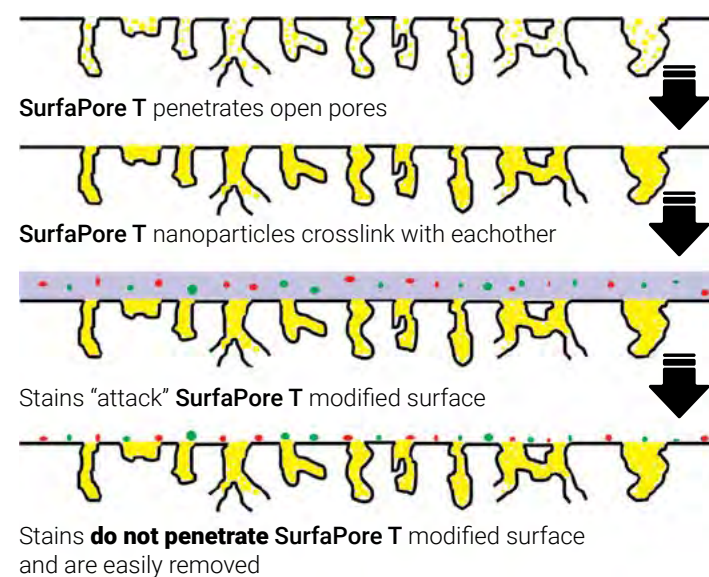
## 08.

# POLISHED MARBLE OR GRÈS PORCELLANATO TILES FLOORING PROTECTION

## The Challenge

Staining of polished marble or Grès Porcellanato tiles flooring can be disastrous for these valuable surface. Microscopic analysis of these surfaces reveals multiple interconnected pores that readily collect stains resulting in loss of shine and natural appearance. Cleaning them frequently requires significant effort with the chance of compromising the appearance and some stains may be impossible to remove.

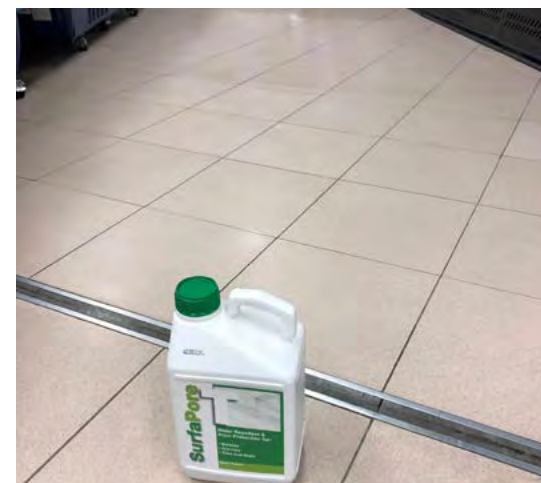
### Action of SurfaPore T



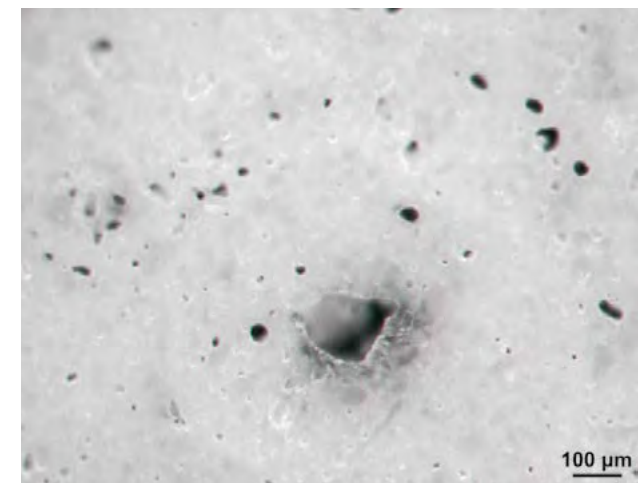
## BILL OF MATERIALS

- DeSalin T 1 m<sup>2</sup>/Kg (cleaning and restoration from stains)
- SurfaPore T 16 m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?



Application of SurfaPore T on Grès Porcellanato tiles.



Microscopic image of a marble surface, subjected to polishing. Surface ripening and dirt accumulating holes are visible.

## The Solution

NanoPhos has developed an effective two-product system in order to clean and protect the marble surfaces from water and stains. DeSalin T is an active, acid-free cleaner, specially formulated for polished, sensitive surfaces like marble, granite or stones. Based on an effective formulation, your sensitive surfaces will not lose their shine, colour or texture. Ideal for removing persistent, deeply absorbed stains like coffee, wine, oil, tomato or other organic materials. After cleaning, SurfaPore T is ideal for protecting the non-porous, polished marble flooring. SurfaPore T is a water-based product for the water and stain protection of polished marble flooring. After cleaning, SurfaPore T application protects the surface by creating an impermeable and invisible shield that blocks even the finest pores of the surface. The particles of SurfaPore T that fit the pores of a polished surface, penetrate and "flood" the pores that can accumulate dirt thus the dirt particles fail to penetrate into the microporosity of the surface and therefore, an important, value-adding objective has been achieved: permanent pore impregnation providing stain proofing and easy cleaning.

## Application

**Cleaning:** Directly apply DeSalin T on the stained surface. Keep the application surface moist by placing a piece of cotton or white cloth that you have wetted with DeSalin T. Do not step on the application area and allow it to act for at least 24h. If the liquid evaporates or for extremely persistent stains, you may reapply.

**Protection:** The surface should be dry and clean. Apply SurfaPore T by brush, roller or sprayer. No dilution is required. After 15 minutes and before SurfaPore T dries completely, remove any excess material, polish by using a wet cloth and then wipe out with a dry cloth. Hand-held or rotating low-speed polishers will eliminate any streaks that may have been created by the excess of SurfaPore T application. On sensitive surfaces, reapply within 3 hours. Test results on a small area before full scale application. Maximum effectiveness is achieved 24 hours after application.

## Expected Useful Life

**At least 3 yrs**, upon proper application/installation.



# 09.

## ANTI-GRAFFITI PROTECTION



### The Challenge

While for certain people Graffiti is considered art, majority considers it as defacement and vandalism, when applied in private property or public buildings. Especially on porous surfaces, graffiti staining can be disastrous. The removing process requires significant effort and most of the times without the desired results. The problem of porous surfaces is that the use of solvent based cleaning products will result in deeper stain penetration: the solvent dilutes graffiti ink and the dilute spreads to neighbouring, clean surfaces. Evaporation of the fast drying solvent will result in staining surfaces that graffiti ink had never originally touched and this is the difficulty of graffiti removal on non-protected areas.



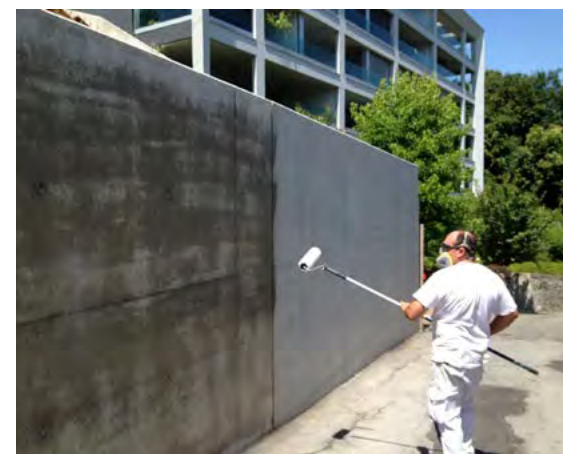
Anti-graffiti effect on a porous surface. Right half-side is SurfaPore AG and subjected to cleaning under hot-water, without scrubbing.

### BILL OF MATERIALS

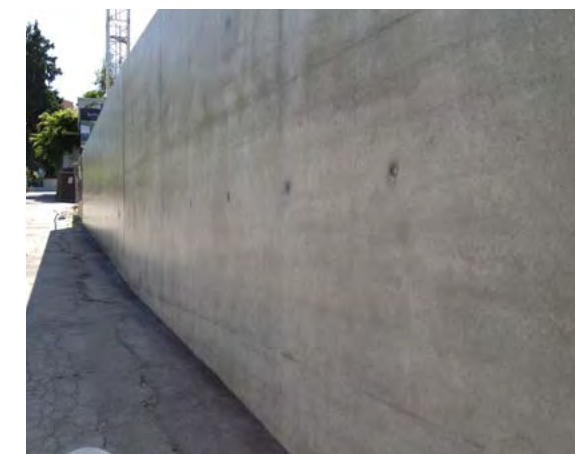
- SurfaPore AG 6m<sup>2</sup>/L (absorptive plaster surfaces)

### WHY NANOPHOS SYSTEM?

- SurfaPore AG is not just wax.
- SurfaPore AG can endure five times of repeating staining – cleaning cycles before reapplication.



Application of SurfaPore AG by brush.



Appearance after SurfaPore AG application.

### The Solution

SurfaPore AG (Anti-Graffiti) is a water-based graffiti protecting coating. It contains nanosized particles that fit into the pores of a surface, penetrate, “flood” and seal the pores that can accumulate graffiti. These nanoparticles have the ability to self-polymerize and create an impermeable 3D network which binds permanently onto the pores and the surface. Paint simply sits on the top of the 3D network and does not adhere to the surface. The SurfaPore AG treated surface effectively repels graffiti stains up to 5 times without the need of reapplying. SurfaPore AG is not just another wax formulation for Graffiti removal. This is why it needs re-application after five times of staining-cleaning cycles; when surface has gotten damaged. SurfaPore AG formulation is the only formulation that binds on surface and actively repels stains and graffiti.

### Application

The application surface should be dry and clean. No dilution is required. Two coat applications of Sur-

faPore AG can be applied by brush, roller or spray gun on the existing vertical surfaces. For non-absorbing surfaces (shiny marbles, granite surfaces), remove any excess by using a damp absorptive towel or paper. Continue polishing the surface, until no apparent wet residue is visible on the surface. Absorbing surfaces (plaster, flamed stone) will absorb most of the applied SurfaPore AG. Ensure that there is no wet residue left after 5 minutes from application, by using a moist cloth. It is recommended to remove graffiti as soon as possible from the damaged surfaces. To achieve that you have to use a stiff brush and warm water, or alternatively a steam cleaner is ideally recommended. You have to re-apply SurfaPore AG after 5-7 graffiti removals for polished surfaces and 3-4 for other surfaces. Maximum effectiveness is achieved a week after application.

### Expected Useful Life

**5 times of repeating staining – cleaning cycles** before reapplication.



# 10.

## POWER OUTPUT INCREASE FOR SOLAR PANELS

### The Challenge

How about significantly increasing your income from solar panels installations? This is exactly what SurfaShield G has been designed for: Increase the power output of existing solar panel installations by a factor of  $\pm 6\%$ . It is a fact that the power output of Photovoltaic (PV) systems is reduced due to the dust and dirt accumulation. PV Panels require regular cleaning, which is not only costly in terms of manpower required but consumes large amounts of water. Water supplies next to a photovoltaic parks are usually scarce and not readily available.



SurfaShield G treated panels, 24 months after SurfaShield G application.



Anti-dust performance of SurfaShield G coated panels: two left panels have been treated with SurfaShield G, while the right one remains untreated for six months in Cyprus. Note the accumulation of dust in the aluminium base of the panels.



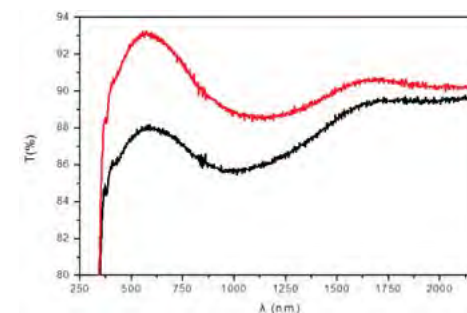
Application of SurfaShield G on pre-installed panels.

## BILL OF MATERIALS

- DeSalin GC  $5\text{m}^2/\text{Kg}$
- SurfaShield G  $35\text{m}^2/\text{L}$

## WHY NANOPHOS SYSTEM?

- SurfaShield G is enhancing power production by  $\pm 6\%$ .
- SurfaShield G increases solar panel transparency.
- SurfaShield G is applied on existing solar panel installations.
- SurfaShield G reduces cleaning effort on solar panels.



SurfaShield G coated glass transparency (red line) vs. uncoated glass surface (black line).

### The Solution

SurfaShield G is an invisible coating based on photocatalytic technology that increases the power energy efficiency of PV systems. SurfaShield G utilizes the - useless for PV installations - surrounding UV radiation to activate itself and eliminates contaminants, organic stains, germs, bacteria and pollutants. The transparency of the glass is not negatively affected. On the contrary, solar light transparency is increased as nanoparticles reduce glass microroughness. SurfaShield G is based on titanium dioxide (titania) semi-conducting nanoparticles. Therefore, upon solar light illumination, titania turns into a conductive thin film that presents anti-static properties and prevents dust accumulation. Due to its superhydrophilic and anti-fogging properties, water cannot form droplets that scatter light.

All-in-all, SurfaShield G presents a triple modus vivendi: (a) As an antireflective coating that increases light transparency of the solar module, (b) as a photon booster, especially when incident light is of high angles (morning or evening) and (c) as a self-cleaning coating that reduces dust accumulation and maintains surface free of pollutants and smog deposits.

### Application

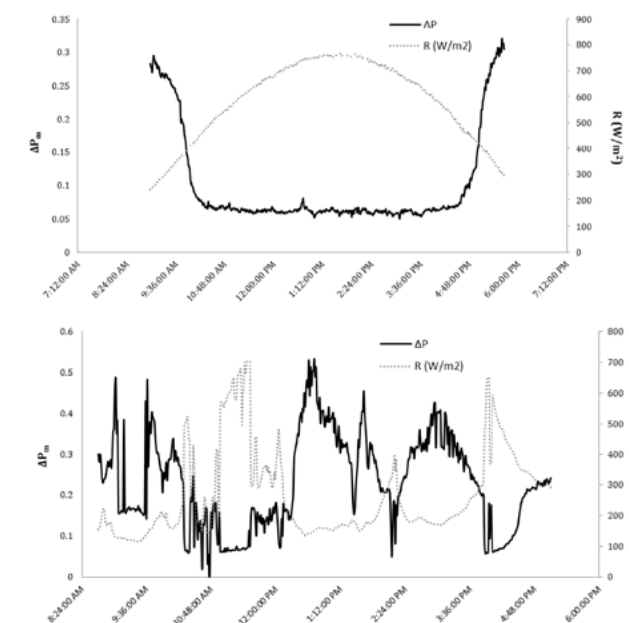
NanoPhos SA is in position to provide the expert team for the application in any solar farm or installation; yet, the application is easy enough for individual application. Ensure that the PV panels surface is dry and clean from oil, grease and biological residues (bird droppings). For the cleaning of the panels, apply a thin film of DeSalin GC paste on the surface of the panels, by using a soft, microfiber, non-absorptive

cloth. Spread the paste formulation evenly on the surface by a rotating polisher at low speed and let conditioning take place for at least 20min. Use low-pressure water to eliminate cleaner residues after conditioning has been completed.

SurfaShield G is applied on dry surface of clean photovoltaic panels. Use air-spraying guns, suitable for water-based formulations. Spraying droplets should form fine mist (spraying tip less than 1,4mm). Apply by horizontal moves covering completely the surface of the panel. Repeat the same application vertically. Treatment of a single  $1,6\text{m}^2$  solar panel should not exceed 150s. Avoid excess application.

### Expected Useful Life

**10 yrs of continuous operation.** The action of the coating is continuous under sunlight irradiation: the photocatalytic activity of nanostructured titania ensures that active ingredients are not consumed during function.

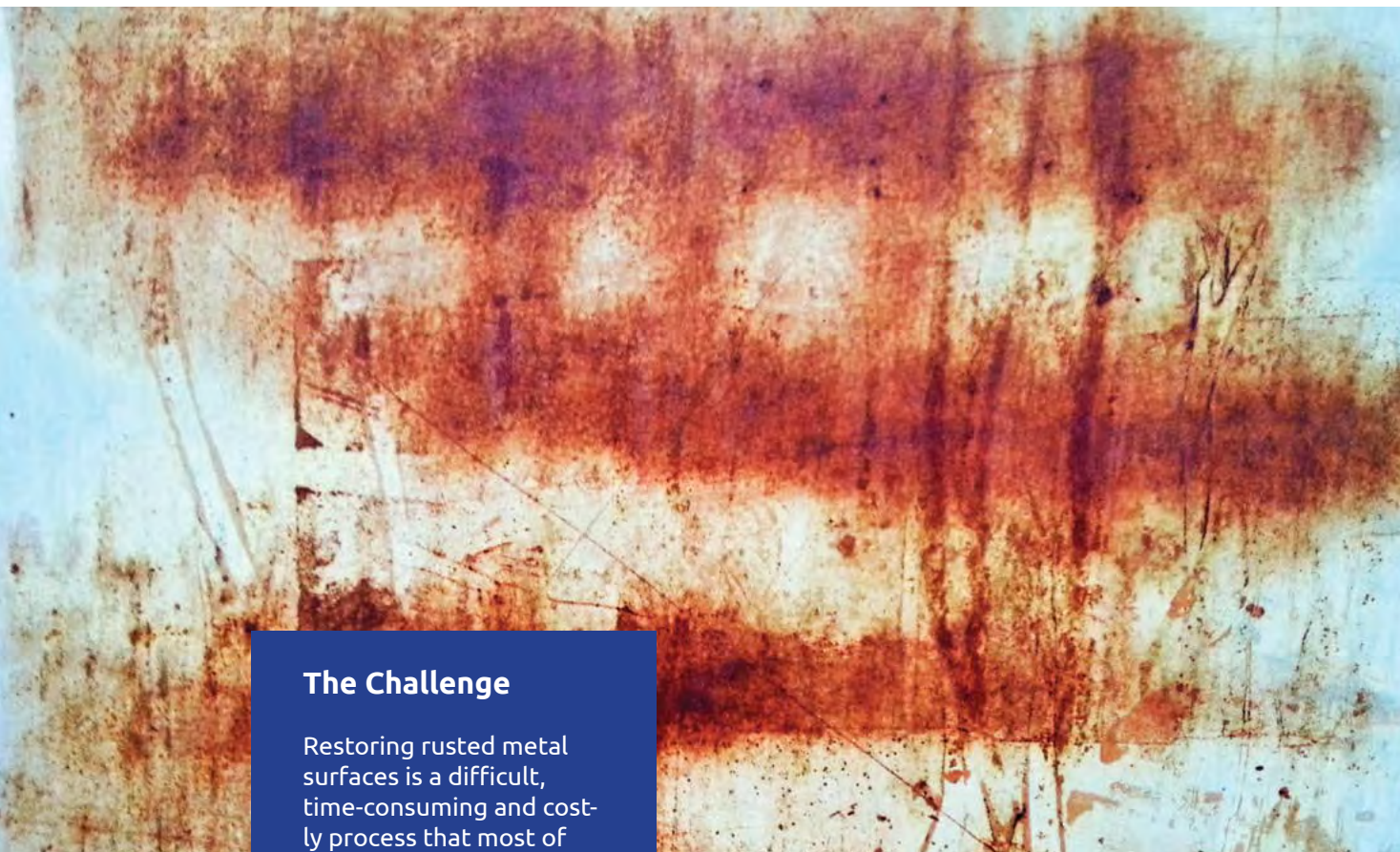


Increase of power output ( $\Delta P$ ) as a function of solar intensity ( $R$ ) in a shiny day. Extra power output is boosted in the morning and evening when incident radiation is in high angles.

Increase of power output ( $\Delta P$ ) as a function of solar intensity ( $R$ ) in a cloudy day. Extra power output is boosted when clouds are present and power production is driven mainly by diffuse light.



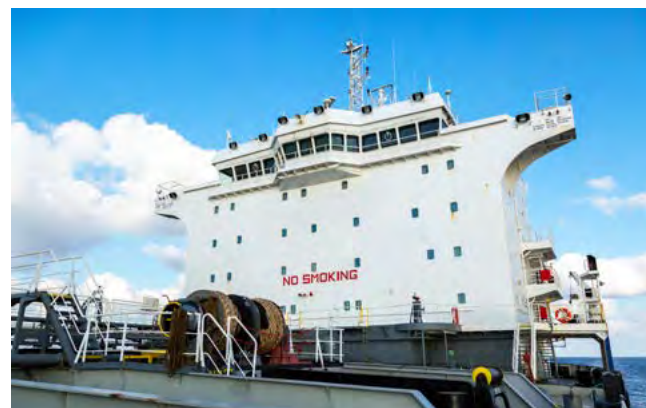
## 11.

RESTORE AND PAINT  
ON RUSTED METAL SURFACES

## The Challenge

Restoring rusted metal surfaces is a difficult, time-consuming and costly process that most of the times requires sand-blasting or power-tooling. Some metal surfaces are even difficult to reach with restoring equipment or are parts of historical monuments that are very sensitive to handle. The challenge remains for restoring rusted surfaces without the need of mechanical treatment before repainting.

*A typical rusted metal surface requiring restoration and repainting.*



*A typical rusted surface (white superstructure) that blasting and restoration is practically impossible. The application of SurfaGuard RCS can restore and stabilize rust before the application of fresh top coating.*

BILL OF  
MATERIALS

- SurfaGuard RCS – Rust Converter & Stabilizer 4m<sup>2</sup>/L
- SurfaPaint ACR 5m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- Restoration takes place without mechanical treatment.
- Chemical stabilization induced by **SurfaGuard RCS** ensures successful re-painting on rusted surfaces.



## The Solution

SurfaGuard RCS - Rust Converter & Stabilizer - is a single component, water-based primer applicable on rusted surfaces to convert ferric oxides into passivated and stabilized compounds. SurfaGuard RCS is a vinyl/acrylic primer coating formulation that can be applied easily and directly to an iron or iron alloy surface to convert iron oxides (rust) into a protective chemical barrier. SurfaGuard RCS interacts with iron oxides, especially iron (III) oxide, converting them into an adherent black layer that is more resistant to moisture and protects the surface from further corrosion. After SurfaGuard RCS application and curing, protect the restored surface with SurfaPaint ACR - Single Component Acrylic Enamel Paint. SurfaPaint ACR is a single component, solvent based, fast-drying, enamel paint formulation for exterior or interior application in moderately to severely corrosive ambient environment. It is a finishing top coat with semi-glossy appearance. Resistant to salt water, splashes of aliphatic hydrocarbons or oils.

## Application

Ensure that application surface is clean, dry and free from oil, grease or loose matter. SurfaGuard RCS can be applied with airless sprayer, brush or roller. Substrate temperature should be minimum 5°C and at least 3°C above air dew point. Good ventilation is required to ensure proper drying. Allow SurfaGuard RCS coating cure for minimum 6 hours before the application of the protective SurfaPaint ACR top coating. Apply SurfaPaint ACR with conventional sprayer, airless sprayer and roller or brush. Good ventilation is required to ensure proper drying.

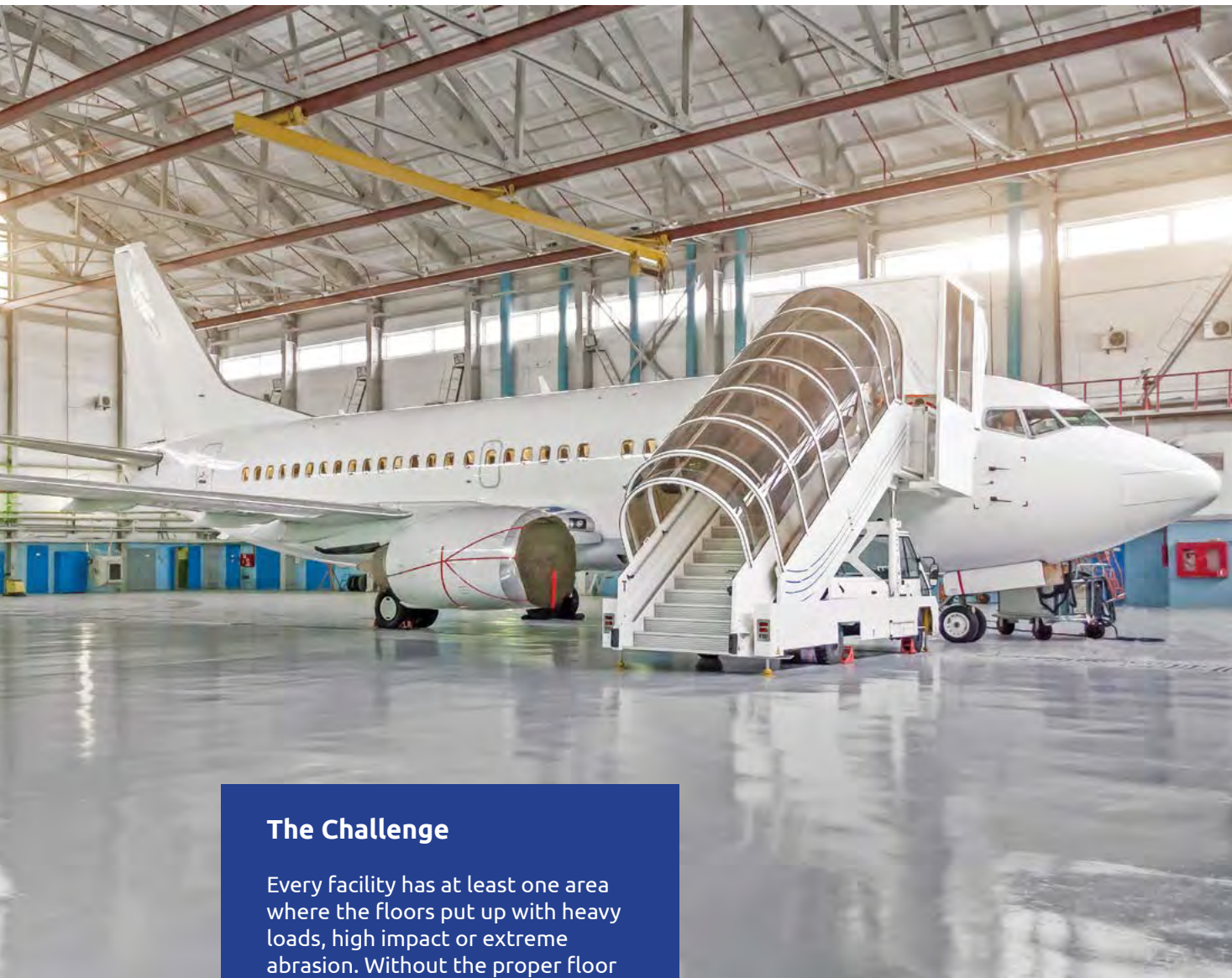
## Expected Useful Life

**At least 5 yrs**, upon proper application/installation in C3 (EN ISO 12944) corrosion threat industrial or urban areas of high condensation, contamination and low salinity.



## 12.

# ABRASION RESISTANT EPOXY FLOOR COATINGS



## The Challenge

Every facility has at least one area where the floors put up with heavy loads, high impact or extreme abrasion. Without the proper floor system, the floor surface is liable to crack, buckle or deteriorate under these conditions, developing divots and fractures that necessitate costly repairs and that put the entire facility into risk.

*Application result of Nova technology for abrasion resistant epoxy floor coating in an aircraft hangar.*

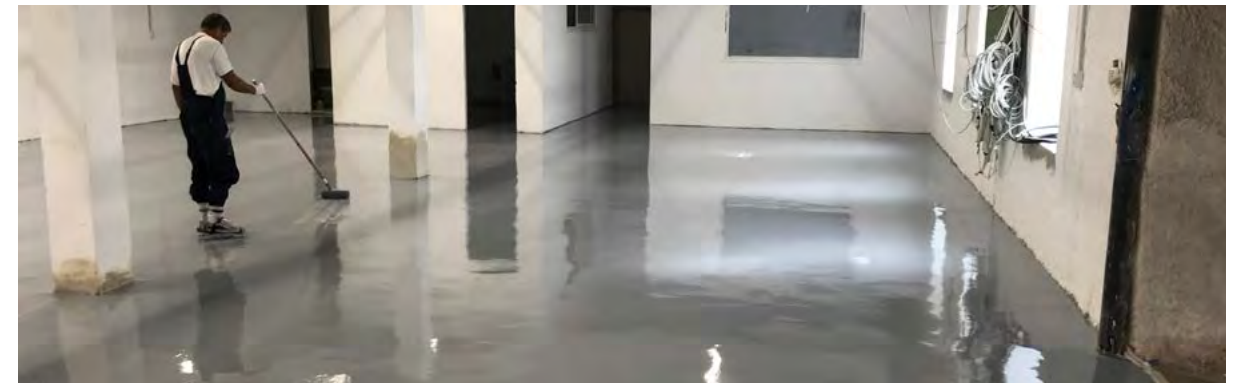
## BILL OF MATERIALS

For a complete 700µm thick system, including 10% Loss Factor

- SurfaPore FX WB 9m<sup>2</sup>/L
- SurfaPaint EPF<sub>r</sub> Solvent-Free, Epoxy Floor Primer 3,6m<sup>2</sup>/L
- SurfaPaint EPF<sub>Nova</sub> Solvent-Free, Epoxy Floor Top Coat 3,6m<sup>2</sup>/L
- Quartz Dry Sand ±400µm 3,3Kg/m<sup>2</sup>
- NPTA NanoPhos Thinner A 51m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

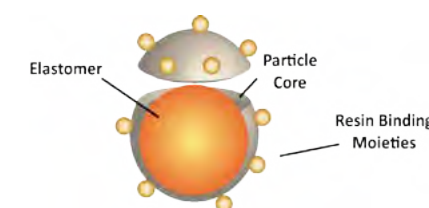
- It incorporates the unique "Nova" abrasion resistant technology of elastomeric nanoparticles.
- The incorporation of "Nova" technology allows reducing epoxy flooring thickness, up to 5 times.



*Application of EPF<sub>Nova</sub> Solvent-Free, Epoxy Floor top coat.*

## The Solution

NanoPhos has developed a protective floor system that covers demanding floor needs. Nova Abrasion Resistance technology is unique among its kind for incorporating silicon elastomer nanoparticles. Their structure is described by a soft, elastomer core that can adhere on the resin binder. The core competency of the resulting coating is that even though no abrasion resistance, strength or toughness is lost, the particles can reversibly act as energy storage units, absorbing the acute pressure of abrasive loads. The particles are permanently bound to the resin binder polymers, due to their binding moieties. They act like nano-springs in the coating. Their existence does not modify the ability of the epoxy coating to adhere on the substrate. The polymer planes and "threads" remain resistant to impact or abrasion; however, much of the damaging energy is absorbed before the coating cracks, flakes or fails. The application substrate of epoxy flooring is most of-

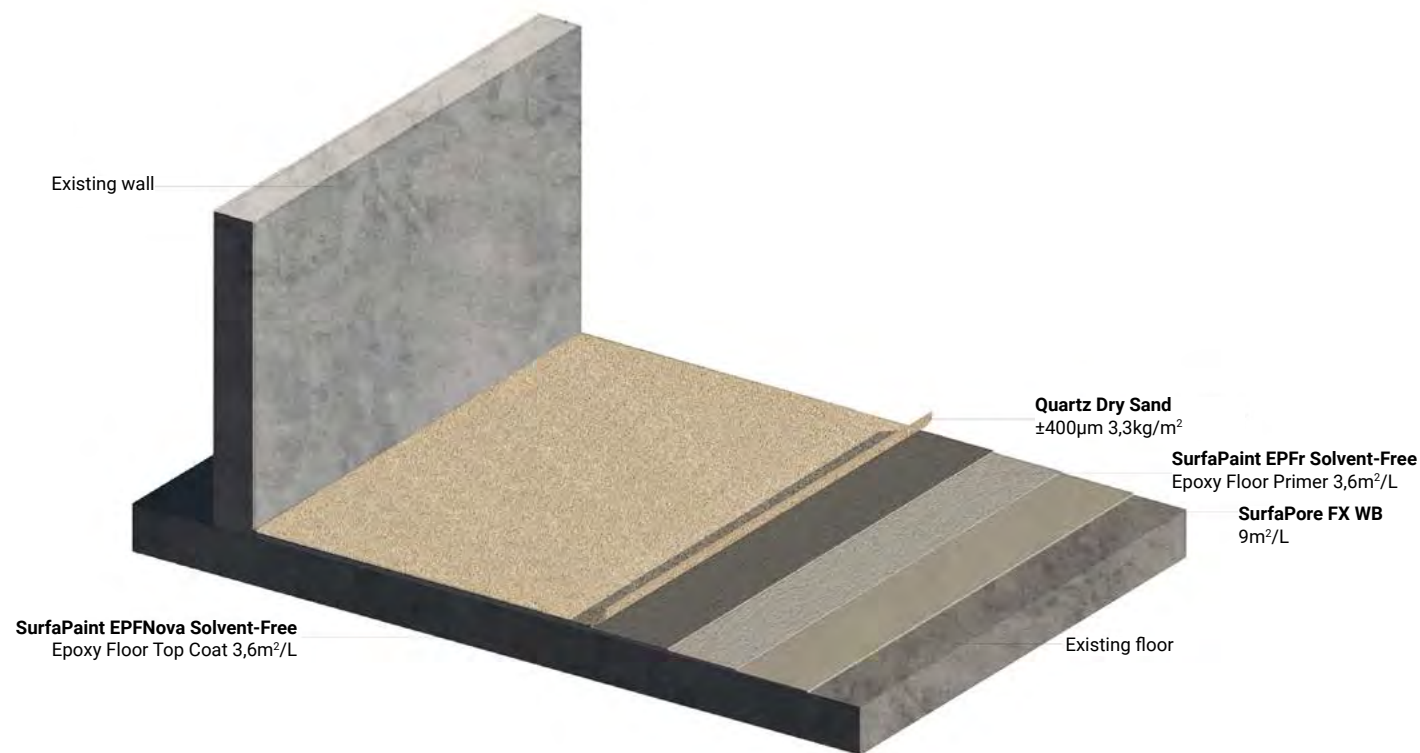


*Illustration of "Nova" abrasion and impact absorbing elastomeric nanoparticles, incorporated in EPF<sub>Nova</sub> formulation.*

ten planar concrete. Concrete is hard, but not always hard enough. Some concrete floors wear out before their time. SurfaPore FX WB is an innovative hybrid nanomaterial for enhancing the mechanical properties and stabilizing loose and worn concrete floor surfaces. Essentially SurfaPore FX WB is an effective concrete densifier/hardener. Inspired by the ingredients of the best-preserved ancient monuments, SurfaPore FX WB contains nanoparticles that fix and bind together with building materials, resulting in the enhancement of their mechanical properties.

After stabilizing and enhancing the floor surface with SurfaPore FX WB, priming of the surface is essential by using SurfaPaint EPF<sub>r</sub> Solvent-Free, Epoxy Floor Primer. It is a two-pack solvent-free epoxy resin bonding and priming coat, designed for easy application, with good surface wetting properties and targeted for flooring with various levels of mechanical and chemical exposure. SurfaPaint EPF<sub>Nova</sub> Solvent-Free, Epoxy Floor Top Coat is based on 100% pure epoxy two pack





3D illustration of the proposed system.



Floor Epoxy Coatings Consumption Calculations								
Total surface area (sqm): 1000				Loss Factor LF (%): 10%				
Products	Cover %	D.F.T. (µm)	Volume Solids (%)	Th. Cover m²/Lts	Product Volume			
					(L. no LF)	(L. with LF)	Packaging	Pack. bill
SurfaPore FX WB	100			10.00	100.00	111.11	10L	12
SurfaPaint EPFr Epoxy Floor Primer	100	250	100	4.00	250.00	277.78	20L	14
SurfaPaint EPFNova Epoxy Floor Top Coat	100	250	100	4.00	250.00	277.78	20L	14
NanoPhos Thinner A	Calculation of Solvent on Product:			3.5%	17.50	19.44	20L	1
Sand 400 microns	3 kg/m²				3,000.00	3,333.33	25Kg	134
Sand 700 microns	0 kg/m²				0.00	0.00	25Kg	0
<b>Total Nominal Dry Film Thickness without sand (µm):</b>		<b>500</b>	<b>Total Product Volume (L):</b>		<b>517.50</b>	<b>575.00</b>	<b>175</b>	

Calculation table for 1,000 square meters of EPFNova Abrasion Resistant Epoxy Floor Coating system and for a nominal total thickness of 700 microns.

amine cured high performance solvent free product, designed to resist aggressive chemicals, water, mineral oils, most of diluted acids and alkalis and ideal for use on substrates, where severe impact or abrasion loads are experienced. It is unique among epoxy polyamide coatings for incorporating silicon elastomer nanoparticles, i.e. a soft, elastomer core, directly on the epoxy resin binder. In this way, impact/abrasion energy elements are introduced in the epoxy matrix without affecting durability. The energy absorbing particles promote the abrasion resistance and absorb acute abrasive forces protecting the integrity of both the coating and the floor substrate.

### Application

Surfaces must be clean, dry and free from all traces of loose material, old coatings, curing compounds, release agents, laitance, oil and greases etc. Substrate compressive strength should be at least 25MPa, cohesive bond strength at least 1.5MPa and with moisture content below 4%. Structurally unsound layers and surface contaminants must be mechanically removed by abrasive blasting, blast-tracking or grinding. Substrates heavily impregnated with oil must be cleaned by torching or suitable solvent cleaning methods. NanoPhos materials do not serve as self-levelling floor topping and they will not reprofile irregular substrates. For reprofiling defects on horizontal surfaces a suitable patching mortar is required.

#### Product Preparation:

- SurfaPore FX WB: Shake the container well before use. No dilution is required.
- SurfaPaint EPFr Solvent-Free, Epoxy Floor Primer: Mix the entire contents of the SurfaPaint EPFr part A (base) with the SurfaPaint EPFr part B (hardener). If a separate mixing bucket is being used mix thoroughly ensuring all contents of both components are removed from the buckets supplied. Mix using a slow speed electric mixer for approximately 15 minutes. The mixed unit should be applied immediately. Mix the entire contents of the SurfaPaint EPFNova part A (base) with the SurfaPaint EPFNova part B (hardener). If a separate mixing bucket is being used mix thoroughly ensuring all contents of both components

are removed from the buckets supplied. Mix using a slow speed electric mixer for approximately 15 minutes. The mixed unit should be applied immediately.

**Application:** Apply SurfaPore FX WB by using brush, roller or airless sprayer. On very absorptive or worn surfaces reapply after 15 minutes. Suggested application temperature is 5-35°C. **Drying time/curing time:** Touch dry time is 30 minutes, depending on the relative humidity level and temperature. After 24 hours, proceed with priming. Apply mixed SurfaPaint EPFr by brush or roller. Theoretical consumption rate for 100µm DFT (Dry Film Thickness) is 10m² per Litre. Wet film thickness should be 100±5µm. **Touch Dry time:** 60min @ 20°C. **Min. Recoat Interval:** 2h @ 20°C. Repeat procedure up to the achievement of at least 200µm DFT. Apply mixed SurfaPaint EPFNova onto the SurfaPaint EPFr by brush or roller. Theoretical consumption rate for 100µm DFT is 10m² per Litre. Wet film thickness should be 100±5µm. **Touch Dry time:** 60min @ 20°C. **Min. Recoat Interval:** 2h @ 20°C. Allow a single coat of SurfaPaint EPFNova partially cure and blind surface with dry quartz sand. Allow the SurfaPaint EPFNova to cure (minimum 6h) and remove loose sand by vacuum. Repeat SurfaPaint EPFNova application for at least another 100µm DFT coat.

### Expected Useful Life

**At least 10 yrs**, upon proper application/installation.





# 13.

## WOOD DECKS PROTECTION



### The Challenge

Large decks are part of a growing trend in the construction sector to take advantage of outdoor landscapes for relaxation, dining and entertaining. Although deck living can be casual and easygoing, wood and composite decks still need regular maintenance and care. Even treated wood deteriorates over time, and the impact of water, humidity and sun exposure can have your charming, wooden oasis looking dirty and dingy after one season.



Application of a single SurfaPaint HDO coat on wooden composite deck flooring. Upper right application corner has been treated with an extra SurfaPaint HDO coat. Photo is taken 12 months after application on a sample applied next to coastline area and subjected to desert heat/irradiation.

### BILL OF MATERIALS

- SurfaPaint HDO Deck Oil 6-12 m<sup>2</sup>/L

### WHY NANOPHOS SYSTEM?

- SurfaPaint HDO formulation incorporates a resin to stabilise diffusion of oil content.
- Ideal when black joint sealants are used, as SurfaPaint HDO does not deteriorate them.
- Extreme UV stability, even in desert environment.



### The Solution

Unlike conventional teak oil, SurfaPaint HDO Deck Oil is a binder stabilized, deep penetrating protecting formulation, ideal for hardwood surfaces, like decks, with excellent UV protection. Its deep penetrating formula feeds wood, restoring the natural oils lost through weathering. It penetrates the wood leaving a wet look finish that lasts longer than other conventional oils. It provides a durable long-life finish and it is suitable for wood with large contraction and expansion properties.

### Application

The deck should be clean, dry and free from oil, grease and other foreign matters or contamination. The application of SurfaPaint HDO Deck Oil can be done through conventional sprayers, airless sprayers and roller or brush. Substrate temperature should be minimum 5°C above environmental temperature and at least 3°C above air dew point. Good ventilation is required to ensure proper drying.

### Expected Useful Life

**At least 4 yrs**, upon proper application/installation.

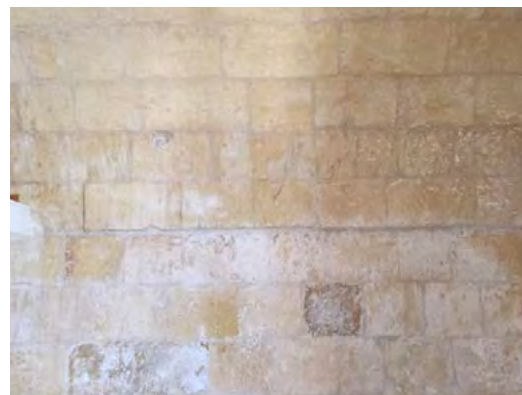


# 14.

## SOFT STONE FIXING AND PROTECTION

### The Challenge

Building surfaces, such as porous stone (sandstone, psammite), suffer from corrosion issues, because they are exposed in environmental conditions overwhelmed with corrosive agents. The most aggressive agents generally considered to be water, sulfates and air-borne particulates. Serious corrosion effects are powdering and crumbling of the surfaces.



Soft stone stabilization substrate after application of SurfaPore FX WB (upper half). Dusting and deterioration have stopped.



Old cementitious plaster stabilization (middle bright section). Salt decay and humidity attacks have been eliminated.

## BILL OF MATERIALS

- SurfaPore FX WB 5m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- SurfaPore FX WB contains no resinous ingredients and creates no film.
- Technology inspired by ancient monuments for long-term protection.
- SurfaPore FX WB prevents stabilizes and strengthens porous surfaces, without cracking.

### The Solution

SurfaPore FX WB is an innovative hybrid nano-material for enhancing the mechanical properties and stabilizing loose and worn building surfaces. Inspired by the ingredients of the best-preserved ancient monuments, SurfaPore FX contains nanoparticles that fix and bind together with building materials, resulting in the enhancement of their mechanical properties. The complete absence of organic ingredients and resinous compounds assures long term effectiveness and weathering resistance. SurfaPore FX can be also applied on sensitive surfaces to enhance abrasion resistance. Porous and brittle sandstone surfaces will stop dusting upon application of SurfaPore FX. SurfaPore FX WB is a water based emulsion of calcium oxalate functionalized nanoparticles. Due to the nanoparticles small size and the organic medium used, penetration depth can reach more than 20mm (porous sandstone). After application nanoparticles penetrate the substrate, chemically attach on the application surface and covalently interconnect with each other. Therefore, they form a dense 3D network, enhancing the mechanical properties of the worn or deteriorated surfaces. As the active ingredient is also inorganic, SurfaPore FX WB exhibits strong chemical affinity with building materials. The nanoparticles do not seal the pores but support the "walls" or cracks of the worn substrate. Therefore, natural appearance, water vapor permeability and porosity of the treated surfaces remain unaffected. SurfaPore FX creates a consistent surface with increased mechanical strength and durability. Ease of application makes SurfaPore FX suitable for both protecting and repairing deteriorated surfaces. The complete absence of resins, its inorganic composition in combination with the nano-particle size provide long term protection and weathering resistance.

### Application

Remove any dust, flaking or loose surface material. The stone surface has to be dry and clean. Shake the SurfaPore FX WB container well before use. No dilu-



Egyptian Calcite sandstone sample before treatment (left) and after treatment (right).

tion is required. Apply by using a brush, a roller or airless spray gun. On very worn surfaces re-apply after 15 minutes. Suggested application temperature is 5-35°C. **Touch dry time:** 30 minutes, depending on the relative humidity level and temperature. Maximum SurfaPore FX WB performance is achieved 3 days post application.

**Estimated consumption rate:** 5-8 m<sup>2</sup>/L, strongly dependant on the properties of the stone applied.

### Expected Useful Life

**At least 30 yrs**, upon proper application/installation.



# 15.

## PROTECTION OF ROOF TILES



*SurfaPore R treated tile.*

### The Challenge

Roof tiles are used when we want to have both weathering protection and an aesthetic result in a residence. Protection of roof tiles is necessary not only for maintaining their original appearance, but also to prevent side effects of lack of performance. Tiles are made from porous materials which are renowned for absorbing water and falling foul of weathering. As the tiles can hold onto water, there is always the potential for this to get to a point where the additional weight begins to put a strain on the framework. Furthermore, moss can be a very big problem with tiled roofs as again this can absorb water which in turn increases weight, whilst also having the potential to push up tiles and expose the felt underneath as it grows.

## BILL OF MATERIALS

- SurfaPore R 10m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

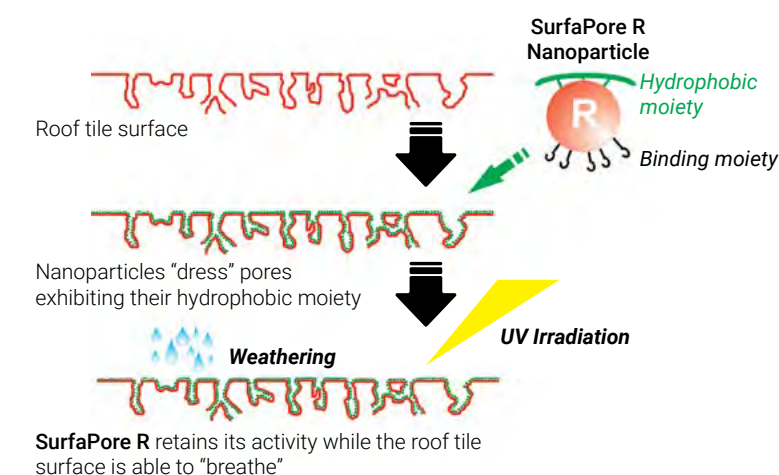
- SurfaPore R last longer than resinous or silane products.
- SurfaPore R allows breathing of tiles.
- SurfaPore R does not create white spots when curing.

### The Solution

SurfaPore R protects your clay surfaces from water penetration. Roof tiles and pottery are effectively protected from deterioration and from the unsightly “greening” of mould growth. SurfaPore R preserves the aesthetics of your clay surfaces while protecting them against water and ageing. SurfaPore R was designed to exactly “fit” the unique nature, structural and surface properties of clay based materials. After applying SurfaPore R, clay surfaces repel water and can remain dry even after rain. By excluding water, you will protect your roof tops and favourite clay based surfaces from “greening” and cracking, due to frost! SurfaPore R is a water stabilized emulsion, composed from nanoparticles, possessing three molecular regions:

- (a) The core nano-sized particles, suitably engineered to fit the pores of a clay-based surface
- (b) The hydrophobic moiety, attached on top of the core nanosized particles, responsible for the creation of a continuous hydrophobic layer that covers all the clay product’s pores, capillaries and free surface and
- (c) the binding moiety, responsible for anchoring the nano-particle directly onto the clay surfaces. Most traditional sealers are based on “plastic” or small silicon based molecules (most often corrosive Potassium Methyl Silicate, PMS) that react with atmospheric carbon dioxide to create an impermeable water barrier. Even though their action might initially seem effective, they detrimentally diminish the useful life time of clay based products by restricting their breathing ability or by creating efflorescence spots (white spots). The use of the aforementioned products affects the three most important advantages of clay products: 1) their compatibility to the modern, functional and 3) aesthetic perfection. NanoPhos introduces a brand-new approach. Instead of covering the clay surface with polymerizing additives, SurfaPore R dresses the pores, the capillaries and the “free” surface of clay based products with hydrophobic materials. Instead of covering your favourite tiles, let them breath protected. Furthermore, the salt grabbers that are contained deactivate the mobility of efflorescence forming cations and stabilize them, preventing

### SurfaPore R protection



*Illustration of SurfaPore R action mode.*

their appearance on the surface of the material. Thus, clay based surfaces remain free of white spots. The combination of the water repelling action and the salt mobility deactivation are key parameters for a most effective protection against efflorescence.

### Application

**Surface application:** The surface should be dry and clean. Apply SurfaPore R by using a brush, a roller or spray gun. No dilution is required. On very absorptive surfaces re-apply within 3 hours.

**Dipping:** dip the clay based surface in SurfaPore R for 30 seconds. In any case (surface application or dipping) test results on a small area before full scale application. Maximum water repellence is achieved 24 hours post application.

**Estimated consumption rate:** 9-11 m<sup>2</sup>/L, strongly dependant on the properties of the surface applied.

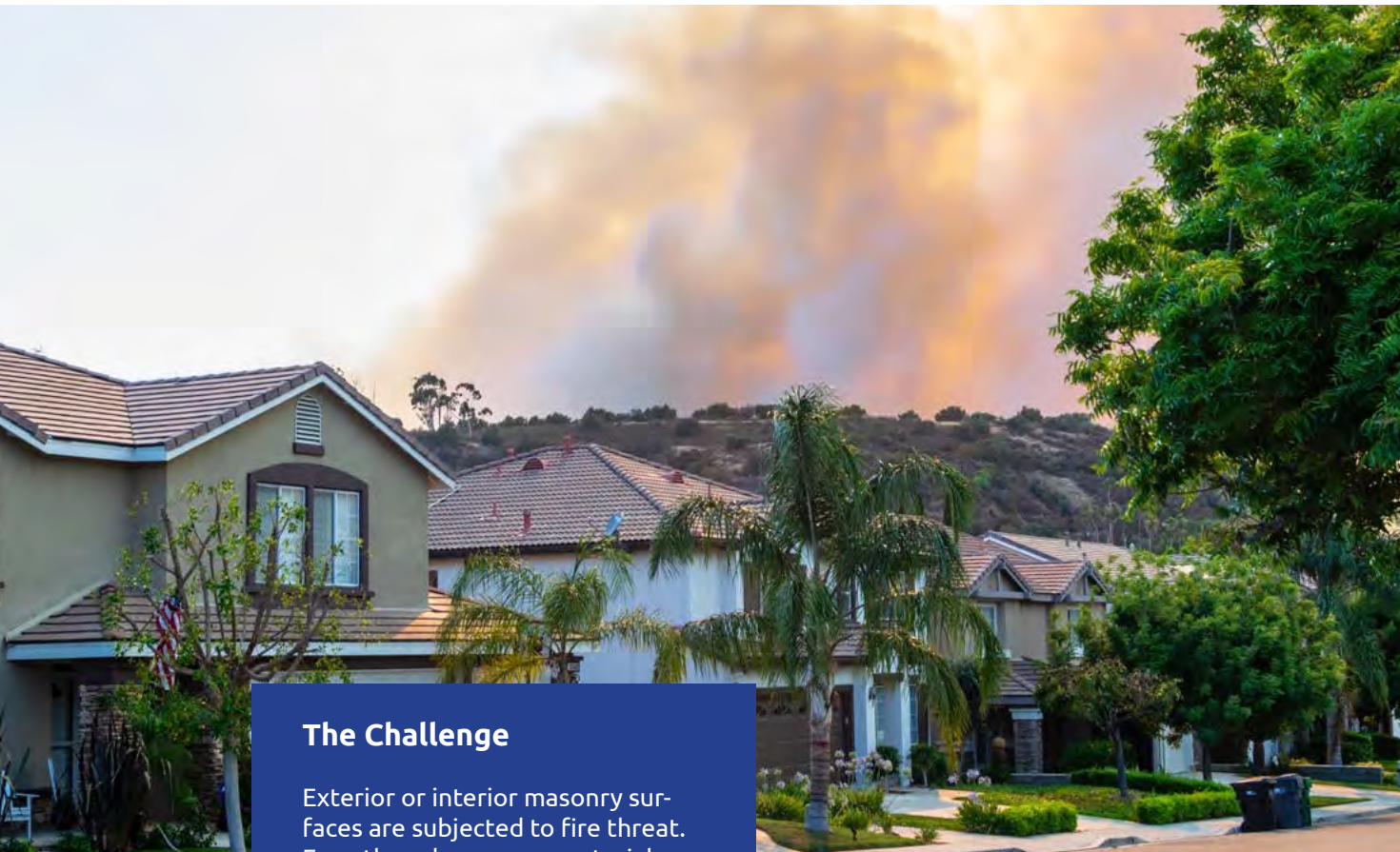
### Expected Useful Life

**At least 5 yrs**, upon proper application/installation.



## 16.

## FIRE PROTECTION OF BUILDING SURFACES



## The Challenge

Exterior or interior masonry surfaces are subjected to fire threat. Even though masonry materials are considered more fire resistant than metal beam structures, propagation of fire is often attributed to masonry surfaces. Additionally, and most often, walls under fire lose their load bearing properties, detrimentally reducing evacuation time. Intumescent paints, also known as fire resistant paints may be used in buildings as a passive fire resistance measure. To the extent of recent technology developments, intumescent paints are addressing effectively metal structures. A water-based formulation that can be applied on regular masonry building surfaces does not exist.

*SurfaPaint FireX is an intumescent coating to protect masonry surfaces in areas of high fire threat.*



*SurfaPaint FireX Intumescent effect on a building surface.*

## BILL OF MATERIALS

- SurfaMix P 24 m<sup>2</sup>/L
- SurfaPaint FireX for masonry 0,65m<sup>2</sup>/L for 90min fire protection

## WHY NANOPHOS SYSTEM?

- SurfaPaint FireX is the only intumescent coating designed for masonry surfaces.
- Thickness may vary as per desired fire protection time.
- Standalone top coat or compatible with desired top coats.

## The Solution

Intumescent coatings are highly technical products that should respect international standards in independent testing houses, as they are directly related to protection of lives and properties. As their nature is in perfect alignment to NanoPhos' principles, SurfaPaint FireX Intumescent Coating for Masonry is designed to protect concrete or masonry substrates from the detrimental effects of fire. Unique in its conception and technology, SurfaPaint FireX Intumescent Coating for Masonry provides maximum protection with minimum dry film thickness. Easily applicable and compatible with preceding or subsequent coats. Variation of dry film thickness can result different fire resistance time periods, as per desired end-user specifications. SurfaPaint FireX is designed, upon exposure to fire temperatures, to promote a chemical reaction to result 40-60 times original dry film thickness swelling and creation of a fire (thermal) insulating layer. Therefore, the thermal insulating char coating protects metal substrate and prevents loss of metal mechanical properties due to high temperatures. SurfaPaint FireX is not a fire fighting coating but enhances the protection envelope of a building against fire threat. Additional measures (use of inflammable materials, proper attention to windows or fire propagation routes) should be considered as a wholistic protection against fire. Follow the recommended dry film thickness, as a function of desired fire protection time:

Desired Fire Protection Time	Recommended Dry Film Thickness	Recommended Wet Film Thickness	Theoretical Coverage
60 min	600 µm	923 µm	1,08 m <sup>2</sup> /L
90 min	1000 µm	1538 µm	0,65 m <sup>2</sup> /L
120 min	1300 µm	2000 µm	0,50 m <sup>2</sup> /L

## Application

**Substrate Priming:** SurfaMix P can be applied directly on exterior or interior wall surfaces (masonry, concrete, plaster, drywalls), and wherever emulsion paints are to be applied. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Adverse conditions during or immediately after application may affect the coating's properties. **Surface Preparation:** ensure all surfaces are clean and dry prior to application. **Application note:** shake well before application. For its volume part of SurfaMix P, dilute by adding 3 volume parts of water (porous masonry substrates) or 4 volume parts of water (paint covered surfaces). Application temperature should be between 8-35°C. Apply one even coat using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered.

**SurfaPaint FireX:** SurfaPaint FireX can be applied directly on primed wall surfaces (concrete, plaster, drywalls) and wherever water based, acrylic paints are applied. New substrates from cement or masonry should have cured for more than 3-4 weeks before application. **Preparation:** ensure proper priming has been performed. Stir well before application. If thinning is required add up to 10% water by volume. Application temperature should be between 8-35°C. Apply even coats using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered. Additional coats should be applied 4-6 hours after the previous application. **Drying Time:** typically 1 hour depending upon coat thickness. Low temperatures and high humidity will lengthen drying times. **Cleaning of tools:** all tools and equipment should be cleaned immediately after use with water.

## Expected Useful Life

**At least 8 yrs**, upon proper application/installation. All the way that the paint is applied on substrate's surface.



# 17.

## MOSQUITO REPELLENT PAINT

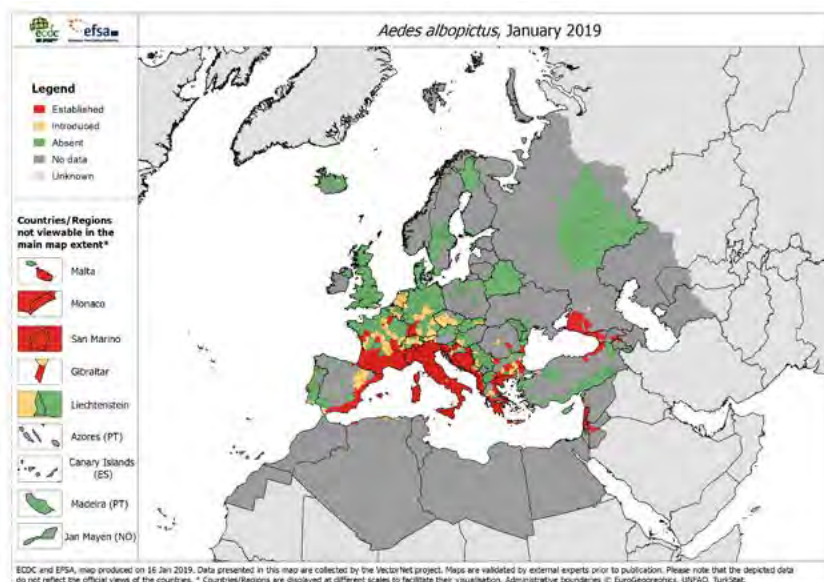
### The Challenge

*"What would you say is the most dangerous animal on Earth? Sharks? Snakes? Humans? Of course the answer depends on how you define dangerous. Personally I've had a thing about sharks since the first time I saw Jaws. But if you're judging by how many people are killed by an animal every year, then the answer isn't any of the above. It's mosquitoes! [...] It threatens half of the world's population and causes billions of dollars in lost productivity annually."* The above statement, attributed to Bill Gates, underlines that mosquito threat is much more serious than most people believe. Even though among the smallest animals of earth, mosquitoes prove deadliest, as almost a million people are killed or incapacitated every year by mosquito transmitted diseases. So how can a paint mitigate mosquito threat?



Asian tiger mosquito on a wall surface. Walls are cool and serve as "nesting and resting" areas for mosquitoes during daytime.

1 <https://www.gatesnotes.com/Health/Most-Lethal-Animal-Mosquito-Week>



Population distribution of *Aedes albopictus* (tiger mosquito), as of January 2019. Major threat regions/countries also include Japan, China, India, mid- and East USA, Brazil and South America, all central Africa and East Australia. Asian tiger mosquitoes can transmit numerous diseases including West Nile virus, encephalitis and dengue fever. Asian tiger mosquitoes are in fact also capable of transmitting Zika virus, a rare mosquito-borne disease that has made its way to the USA.

## BILL OF MATERIALS

- SurfaMix P 24m<sup>2</sup>/L
- SurfaPaint MosquitoX 5m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- SurfaPaint MosquitoX is the only paint formulation that combines "knock-down" and insect repellent ingredients.
- SurfaPaint MosquitoX can turn ordinary masonry surfaces into insect repellent.

### The Solution

NanoPhos has developed SurfaPaint MosquitoX: a unique formulation that combines "knock-down" ingredients and natural mosquito repellents. "Knock-down" ingredients are composed from insect biocides that disrupt mosquito neurons paralyzing and, subsequently, killing them. Painted walls and masonry surfaces are considered cool for insects, serving as "nesting and resting" areas for mosquitoes during daytime. However, "knock-down" effect takes place only after the mosquito repellence defence zone is breached: Natural Citronella Oil is transforming ordinary painted walls into mosquito repelling. Citronella Oil is a natural mosquito repellent, which is completely safe to non-insect organism, even on permanent contact with skin.

All-in-all, NanoPhos' SurfaPaint MosquitoX is a functional paint that eliminates mosquito threat by acting in a dual way: "Knocking-down" and Repelling.

*Note: As per Biocidal Products Regulation (BPR, Regulation (EU) 528/2012) adopted by European Union countries, SurfaPaint MosquitoX is biocide and "Knock down" ingredients free, when to be applied in European Union member states.*

**SurfaPaint MosquitoX:** SurfaPaint MosquitoX can be applied directly on primed wall surfaces (concrete, plaster, drywalls), and wherever water based, acrylic paints have been previously applied. Mosquito repellence or "knock-down" effect is expressed only when SurfaPaint MosquitoX is applied as a top coat. New substrates from cement or masonry should have cured for more than 3-4 weeks before application.

**Preparation:** ensure proper priming has been performed. Stir well before application. If thinning is required add up to 10% water by volume. Application temperature should be between 8-35°C. Apply even coats using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered. Additional coats should be applied 4-6 hours after the previous application. **Drying Time:** typically 1 hour depending upon coat thickness. Low temperatures and high humidity will lengthen drying times.

**Cleaning of tools:** all tools and equipment should be cleaned immediately after use with water.

### Expected Useful Life

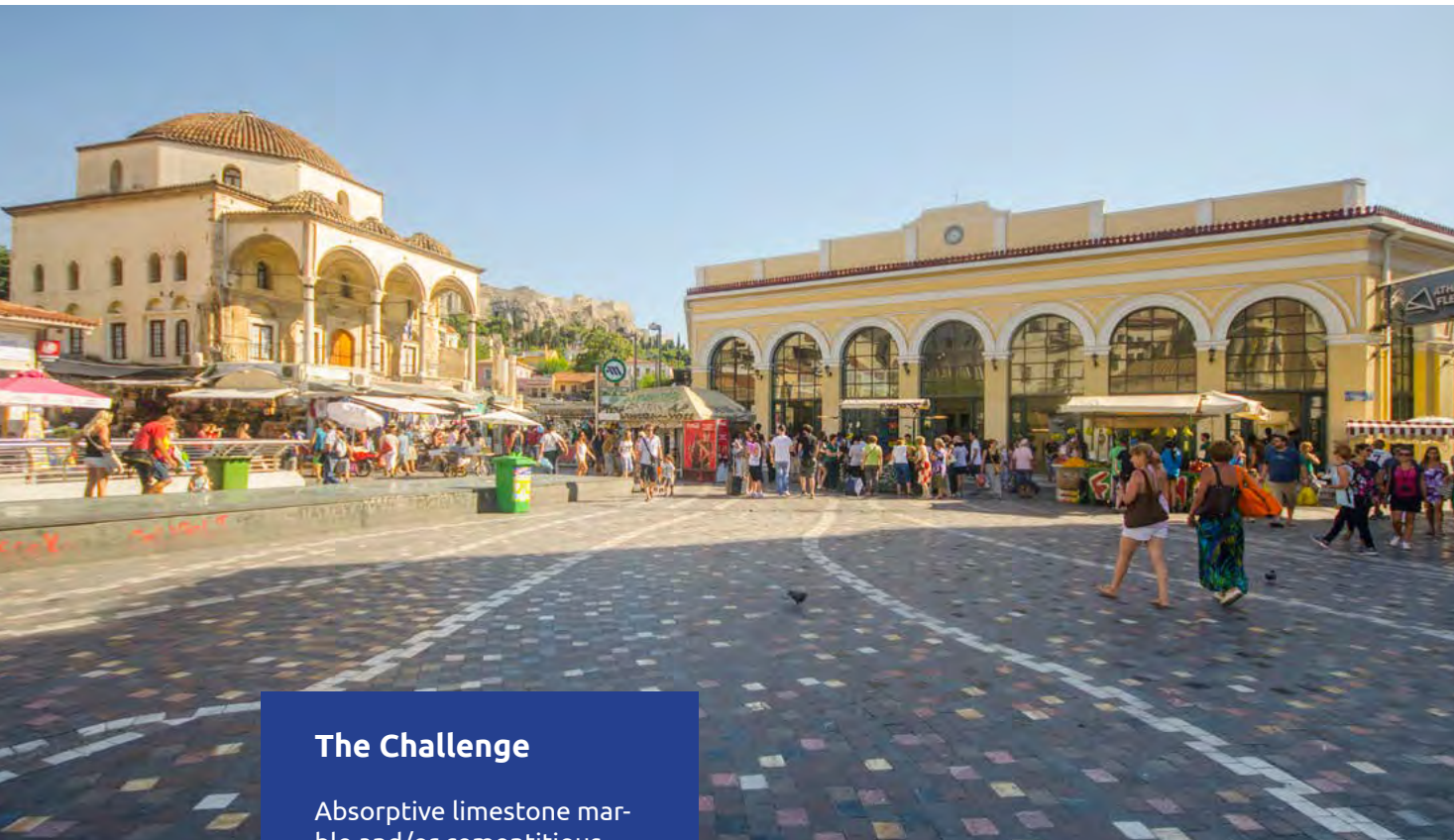
**At least 18 months**, upon proper application/installation.

### Application

**Substrate Priming:** SurfaMix P can be applied directly on exterior or interior wall surfaces (masonry, concrete, plaster, drywalls) and wherever emulsion paints are to be applied. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Adverse conditions during or immediately after application may affect the coating's properties. **Surface Preparation:** ensure all surfaces are clean and dry prior to application. **Application note:** shake well before application. For its volume part of SurfaMix P, dilute by adding 3 volume parts of water (porous masonry substrates) or 4 volume parts of water (paint covered surfaces). Application temperature should be between 8-35°C. Apply one even coat using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered.



## 18.

LIMESTONE OR CEMENT  
OIL AND STAIN PROTECTION

## The Challenge

Absorptive limestone marble and/or cementitious surfaces are considered intricate but delicate flooring surfaces. Their use can be for indoor and outdoor applications. Normal use can result important staining which degrades the aesthetic appearance of those sensitive surfaces. Moreover, oil stains can penetrate in depth that removal is impossible.

*Monastiraki Square, downtown Athens, is laid by different composition and appearance limestone cubes, which are protected by SurfaPore M.*



*Limestone Marble surface, protected by SurfaPore M.*

BILL OF  
MATERIALS

- SurfaPore M 4 m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- SurfaPore M provides simultaneously water and oil stain protection.
- SurfaPore M doesn't change the appearance of the surface it is applied on – invisible protection.
- SurfaPore M is water based and easily applied.
- SurfaPore M lasts long without being affected by weathering.



*Oil droplets on a SurfaPore M treated porous, cementitious surface.*

## The Solution

SurfaPore M not only protects these surfaces from stains, but also makes them oil and water repellent. SurfaPore M coats the pores of valuable surfaces, without changing their appearance and enables them to actively repel oil based stains. Therefore, a dual effect is achieved: passive protection by dressing the surface of pores and active oil repellence. An ideal effective protection shield. SurfaPore M is a water based formulation, specifically designed to harness the power of nanotechnology, in order to achieve both oil and water repellence on the surfaces applied. The core nano-sized particles, suitably engineered to fit the pores of the surface applied, penetrate and "flood" pores that can accumulate water, oil or dirt. SurfaPore M anchors on to the surface applied, resulting in the coating being permanent and effective. After coating, water, oil or dirt fails to penetrate into the porosity of the substrate.

## Application

**Surface Application:** the application surface should be dry and clean. Apply SurfaPore M with brush, roller or spray gun. No dilution is required. For extra protection of very sensitive surfaces reapply, within 3 hours after the first application.

**Dipping Application:** Dipping application is highly recommended on absorptive and flooring surfaces to reduce ion mobility and efflorescence from all sides. Dipping should not exceed 2 min and thorough drying should take place before installation.

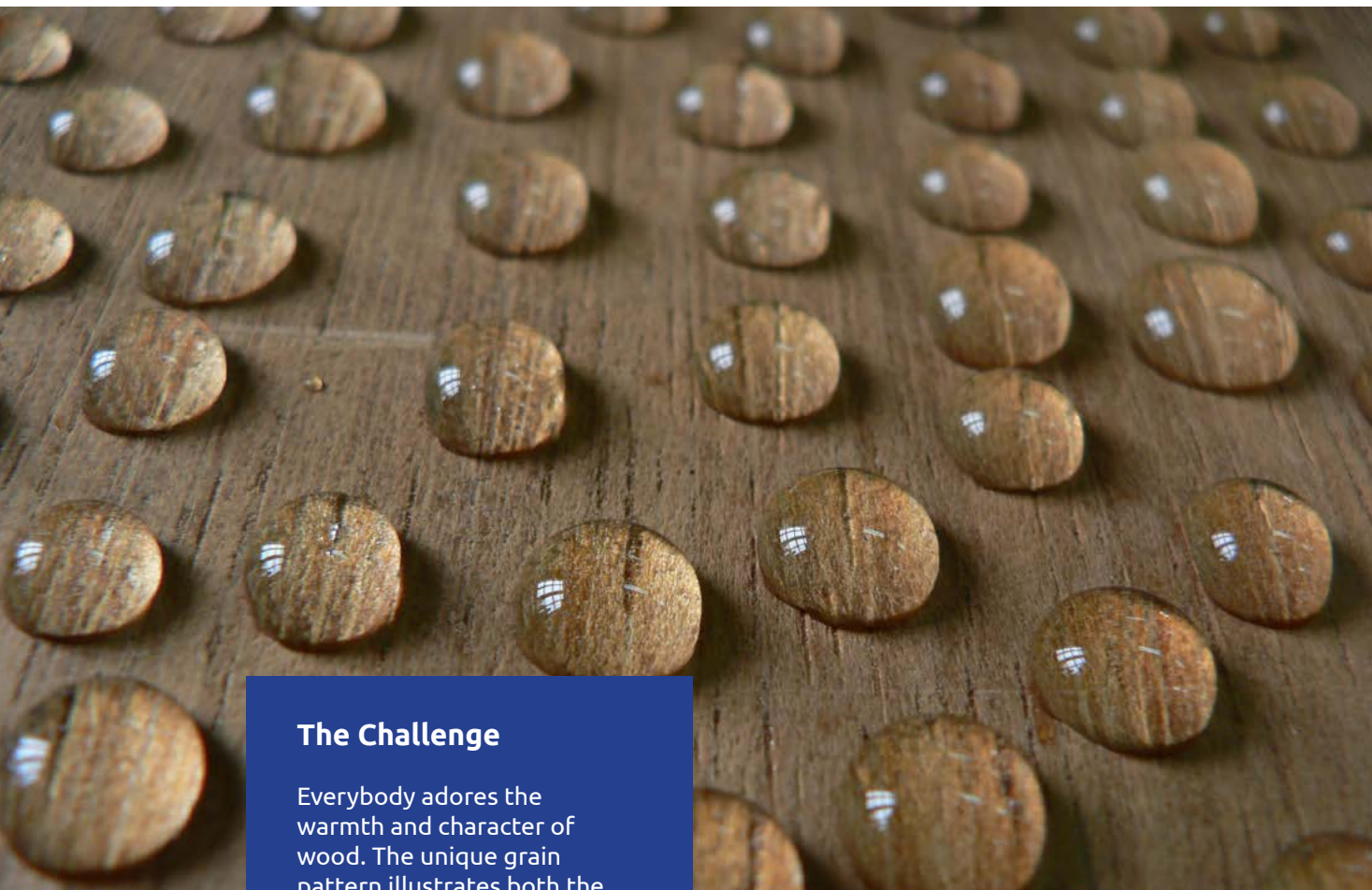
**Estimated consumption rate:** 8-10 m<sup>2</sup>/L, strongly dependant on the absorption properties of the application surface.

## Expected Useful Life

**At least 5 yrs,** upon proper application/installation.



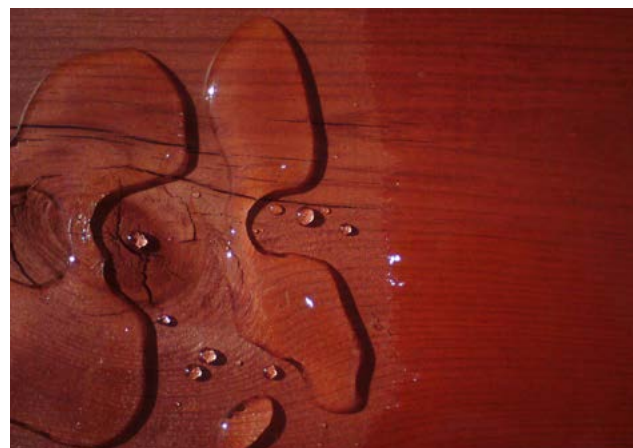
## 19.

WOOD PROTECTION WITHOUT  
NATURAL APPEARANCE CHANGE

## The Challenge

Everybody adores the warmth and character of wood. The unique grain pattern illustrates both the time and place of the tree's growth. Natural, absorptive wood is a building material with unique properties. Unfortunately, wood is a highly sensitive building material, susceptible to the detrimental effects of weathering, UV silvering and woodboring insects (e.g. termites). Protecting wood without affecting its natural appearance is a true challenge.

Application of SurfaPore W on natural wood deck.



Application of SurfaPore W on cherry heartwood

BILL OF  
MATERIALS

- SurfaPore W 4m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- Simultaneously protects against oil and water absorption.
- Effective against woodboring insects.
- Prevents warping and preserves natural wood appearance.
- Retains natural breathability.
- Non-film forming, invisible.
- Long lasting, easy to apply, water based.

## The Solution

SurfaPore W is a water-based formulation, specifically designed to harness the power of nanotechnology in order to preserve absorptive wooden surfaces. By making wood water resistant, it assures dimensional stability and protection against warping and decay. Additionally, it provides oil repellence in order to prevent oily stains from penetrating wood surfaces. SurfaPore W can provide complete protection for decking, fences/posts, facade and roof shingles, garden furniture and sheds, docks or any absorptive wood that needs combined protection and natural appearance. SurfaPore W has been successfully used as an additive (10% dilution ratio) in pressure-treatment solutions to protect wood. The application of SurfaPore W does not induce any visible change on the surface applied and does not block the pores (no pore sealing like traditional varnishes or wood stains). Thus, the breathing ability of the natural wood surface is preserved. SurfaPore W contains active ingredients against wood-boaring insects. The fact that the active ingredients are encapsulated among water repelling nanoparticles assures minimal leaching. Thus, insect protection lasts longer, as it is not washed away of the wood mass.

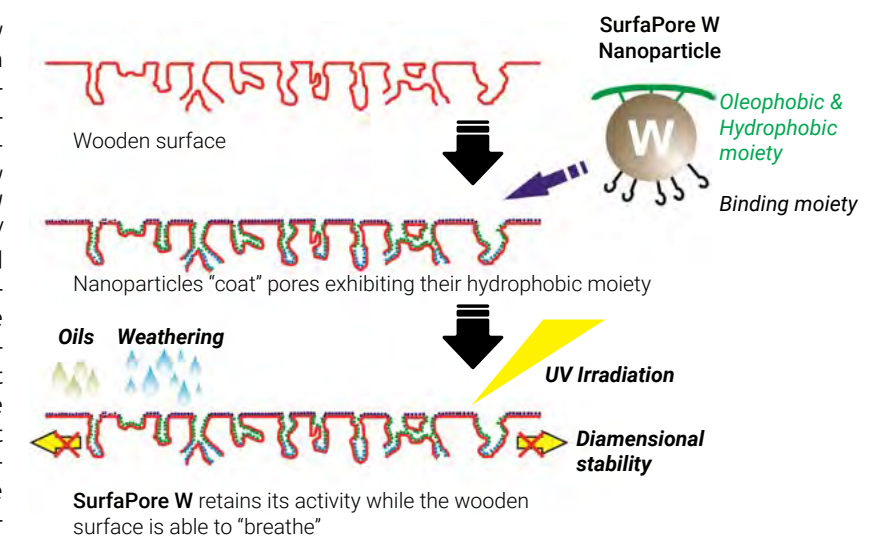
## Application

Applicable on natural, absorptive wooden surfaces. Remove any varnish or wood stain residues before applying SurfaPore W. The application surface should be dry and clean. Shake well before use. SurfaPore W is ready for use; no need to dilute before applying. Apply SurfaPore W by brush, roller or spraying. Maximum performance is reached 24h after application. In case of very absorptive surfaces, reapply within 2 hours. **Application temperature:** 10-35°C (50-95°F). **Coverage:** 6-8 m<sup>2</sup> per Litre, strongly dependant on the properties of the surface applied. **Wood Stain or Varnish Application:** Let SurfaPore W cure for at least 72h before application. Applying wood varnish or stain on a SurfaPore W treated surface might affect their colour or adherence. Test results on a small area before full scale application.

## Expected Useful Life

At least 5 yrs, upon proper application/installation.

## SurfaPore W protection



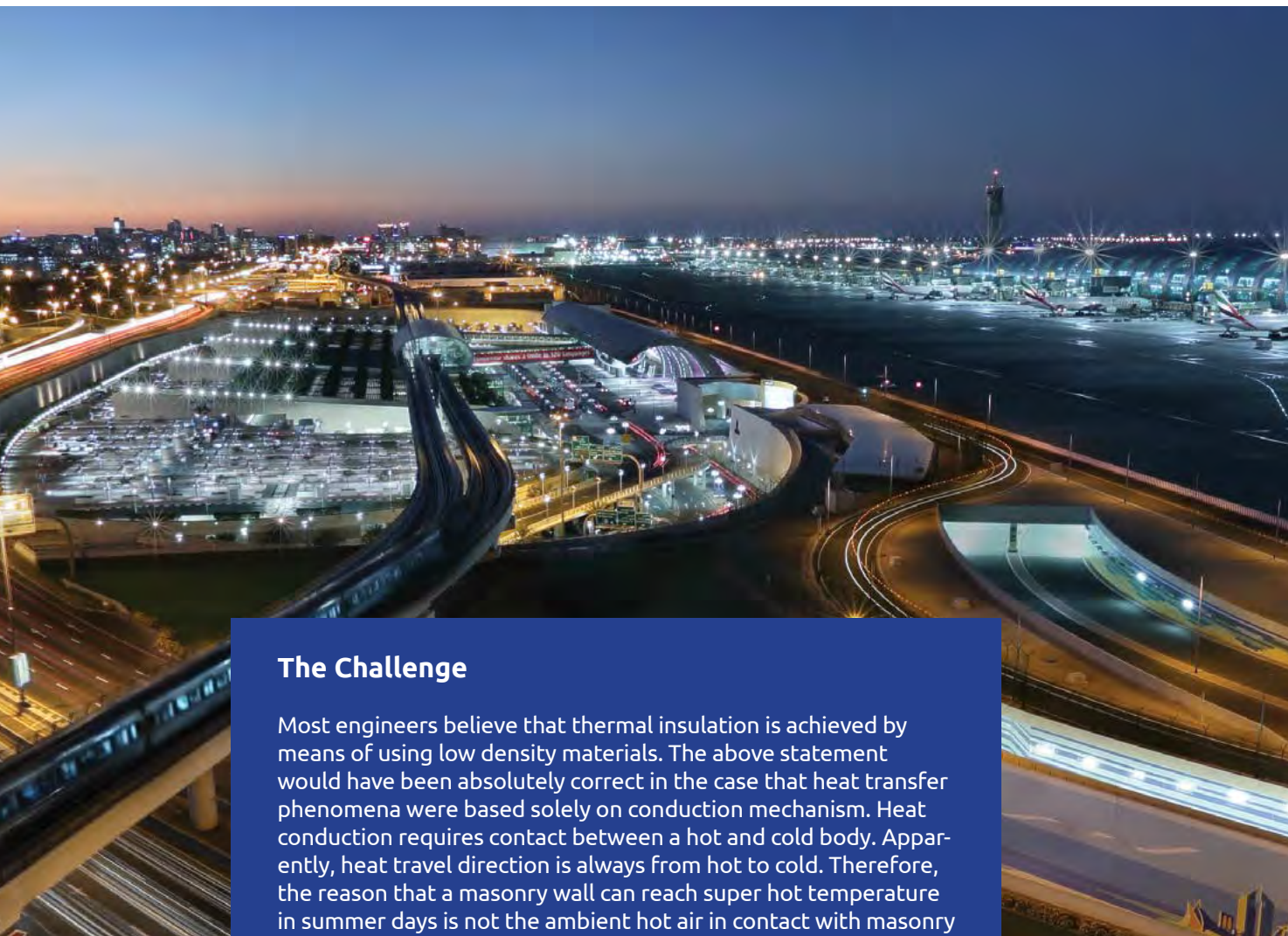
SurfaPore W action mechanism.



Application of SurfaPore W on the most absorptive pine wood cut.



## 20.

THERMAL INSULATION AND  
SELF-CLEANING BY PAINTING

## The Challenge

Most engineers believe that thermal insulation is achieved by means of using low density materials. The above statement would have been absolutely correct in the case that heat transfer phenomena were based solely on conduction mechanism. Heat conduction requires contact between a hot and cold body. Apparently, heat travel direction is always from hot to cold. Therefore, the reason that a masonry wall can reach super hot temperature in summer days is not the ambient hot air in contact with masonry walls but the heat irradiation from the sun. Heat loads are attributed more in irradiation, rather than conduction. In a similar way, building heating in cold winter days is taking place largely by irradiation (fireplaces, radiating heating devices). Based on the above, thermal insulation strategy is not just an issue of conductivity but should take into consideration both conduction and irradiation. Based on the above faulty consideration that low density materials are the only to provide thermal insulation, engineers fail to believe that a thin paint coating can provide significant thermal insulation. The challenge remains that the paint formulation should have both low thermal conductivity, high emissivity and high reflectance. ThermoDry technology is the nanotechnology future of thermal insulation of modern buildings.

BILL OF  
MATERIALS

- SurfaMix P 24 m<sup>2</sup>/L
- SurfaPaint ThermoDry Interior 5m<sup>2</sup>/L  
or SurfaPaint ThermoDry Exterior 5m<sup>2</sup>/L
- SurfaShield C 12 m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- SurfaPaint ThermoDry technology addresses both conduction and irradiation heat transfer mechanisms.
- SurfaPaint ThermoDry technology saves cooling and heating costs, just by painting!
- Heat insulation lasts longer by a self-cleaning top coat.
- Easy application that boosts the energy profile of a building, just by painting its walls.
- Eliminates thermal bridges.

## The Solution


NanoPhos revolutionizes thermal insulation enhancement of a building shell by offering a three part system with advanced thermal insulating and self-cleaning properties. The system composes of:

- A primer; SurfaMix P
- A thermal insulating paint; SurfaPaint ThermoDry Interior or SurfaPaint ThermoDry Exterior
- A self-cleaning coating; SurfaShield C.


SurfaMix P is a versatile water-based primer for surface preparation. Ideal for exterior or interior building surfaces, such as concrete, masonry, plaster, cementitious renders, screeds and mortars. The fine resinous nanoparticles that exhibit a size distribution around 60 nm can penetrate deep in the substrate yielding a coherent and solid result for the application of emulsion paints. SurfaMix P can be also applied on already painted areas, when a paint refreshing is required. When thermal energy "travels" through walls and other surfaces, large amounts of energy are often necessary for cooling in the summer and heating in the winter.

**The triple action of SurfaPaint ThermoDry paints, i.e. thermal radiation reflectance, heat transfer resistance and water repellence protects painted surfaces and improves energy efficiency.**

Both SurfaPaint ThermoDry Exterior and SurfaPaint ThermoDry Interior are high quality acrylic elastomeric emulsion paints with thermal insulating properties, ideal for exterior or interior use respectively. Powered by ThermoDry particles, they contain special nano and micro-sized thermal insulating ingredients contributing to energy savings during winter and summer. The thermal insulating particles block heat transfer, reflect thermal radiation, and create a moisture barrier that can result in significant energy savings. Suitable for application on masonry exposed to adverse weather conditions and for the protection of damaged surfaces with micro cracks. Excellent gap bridging even in very low temperature conditions (-20°C) and/or high temperature differences without

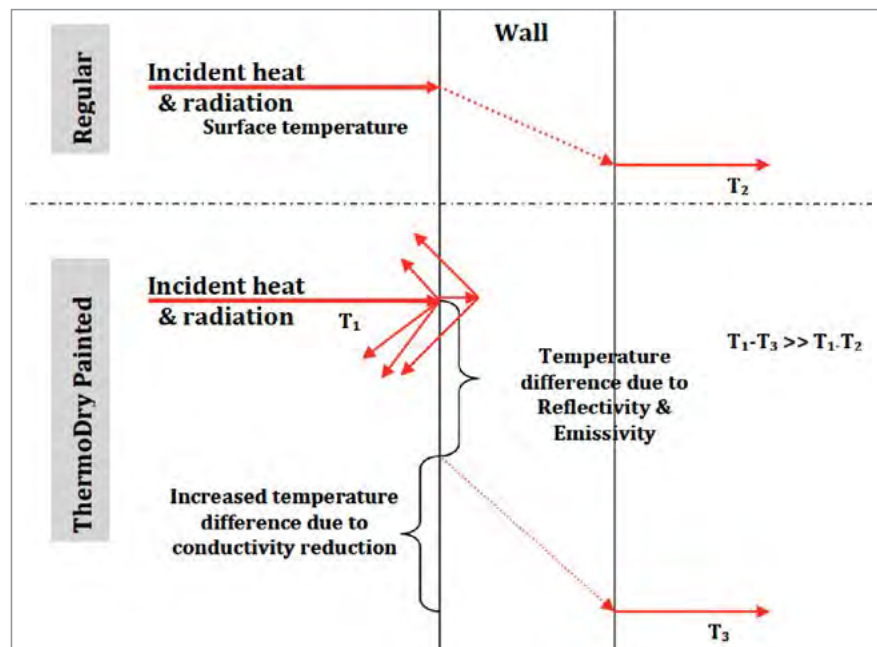
 <b>ECRC</b> EUROPEAN COOL ROOFS COUNCIL		Rated Product ID Number		FA00000004
RATED PRODUCT		Initial	Aged	
Solar Reflectance		0.86	-	
Infrared Emittance		0.90	-	
Solar Reflectance Index		108	-	
Climate type		Date of measurement	Manufacturers name	
-	-	-	11/12/2015	NanoPhos SA
European Cool Roofs Council Ratings are determined for a fixed set of conditions which may not be appropriate for determining differing seasonal performance. The actual effect of solar reflectance and thermal emittance on building performance may vary with differing conditions. The manufacturer of this product stipulates that these ratings were determined in accordance with the applicable European Cool Roofs Council procedures.				

ECRC Certificate of SurfaPaint ThermoDry Exterior.

 EUROPEAN COOL ROOFS COUNCIL		Rated Product ID Number		FA00000005
RATED PRODUCT			Initial	Aged
Solar Reflectance			0.85	-
Infrared Emittance			0.89	-
Solar Reflectance Index			107	-
Climate type		Date of measurement	Manufacturers name	
-	-	-	11/12/2015	NanoPhos SA
European Cool Roofs Council Ratings are determined for a fixed set of conditions which may not be appropriate for determining differing seasonal performance. The actual effect of solar reflectance and thermal emittance on building performance may vary with differing conditions. The manufacturer of this product stipulates that these ratings were determined in accordance with the applicable European Cool Roofs Council procedures.				

ECRC Certificate of SurfaPaint ThermoDry Interior.

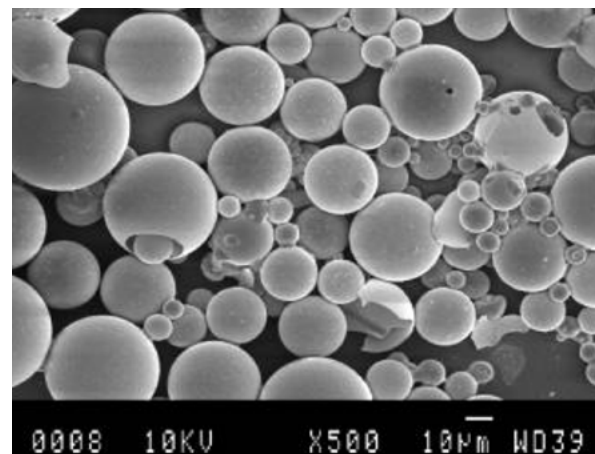




ThermoDry heat phenomena analysis.

	Reflectance			Emittance	SRI	Thermal Conductivity (W/m.K)
	VIS (380-780nm)	IR (700-2200nm)	Solar (250-2200nm)			
SurfaPaint ThermoDry Interior	94,04%	94,19%	90,98%	91%	116	0,10789
SurfaPaint ThermoDry Exterior	92,69%	94,64%	90,53%	91%	115	0,09599

risk of flaking. Excellent resistance to UV radiation and alkali. They are breathable paint formulations, preventing at the same time water penetration. Due to their UV cross linking mechanism and the nanoparticles they contain, the tendency to pick-up dirt particles and atmospheric pollution is significantly reduced. Available in white colour for optimum thermal insulation properties. Both SurfaPaint ThermoDry Interior and SurfaPaint ThermoDry Exterior can be used as tinting bases for light shades. The application of SurfaPaint ThermoDry Interior on interior walls can prevent thermal bridges on walls; a frequent phenomenon for poorly insulated surfaces. It is an ideal solution for preventing mould growth by eliminating humidity condensation on cold wall surfaces, along with its anti-fungal properties. SurfaPaint ThermoDry Exterior is used for reducing the cooling costs; especially on hot summer days. In order to prevent dirt pick-up that would eventually reduce heat reflecting properties, an active, self-cleaning, transparent coating is proposed. SurfaShield C decomposes organic stains and pollutants, prevents microbial growth, purifies the air, removes odours. It is an active nanotechnology formulation that can be easily applied on paint surfaces. By harnessing the surrounding light, treated surfaces be-



SurfaPaint ThermoDry micro- and nanoparticles as observed through Scanning Electron Microscopy (SEM).



Dubai Airport Free Zone (DAFZA) warehouses save 28-36% annually on energy for cooling or heating, due to SurfaPaint ThermoDry Interior or Exterior Coatings.

come Self-Cleaning and Self-Sterilizing. SurfaShield C coated surfaces efficiently decompose organic stains, bacteria, mould, gaseous pollutants, even odours. The modified surfaces are safer, without the need to use hazardous disinfectants or chemicals, and are preserved as new. Furthermore, SurfaShield C preserves the reflectivity of paints.

## Application

**Substrate Priming:** SurfaMix P can be applied directly on exterior or interior wall surfaces (masonry, concrete, plaster, drywalls), and wherever emulsion paints are to be applied. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Adverse conditions during or immediately after application may affect the coating's properties. **Surface Preparation:** Ensure all surfaces are clean and dry prior to application. **Application note:** Shake well before application. For its volume part of SurfaMix P, dilute by adding 3 volume parts of water (porous masonry substrates) or 4 volume parts of water (paint covered surfaces). Application temperature should be between 8-35°C. Apply one even coat using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered.

**SurfaPaint ThermoDry:** SurfaPaint ThermoDry Interior and SurfaPaint ThermoDry Exterior can be applied directly on primed interior and exterior wall surfaces (masonry, concrete, plaster, drywalls), and wherever

water based, acrylic paints are applied. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Ensure all surfaces are clean and dry prior to application. Remove any dust and dirt. Stir well before application. Do not dilute for bridging gaps and hairline cracks of up to 0,5 mm. For cracks bigger than 1mm, fill the gap with a suitable putty. If thinning is required add up to 10% water by volume. Application temperature should be between 8-35°C. Apply 2-3 even coats using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered. Additional coats should be applied 4-6 hours after the previous application. **Spreading Rate:** 10-12 m<sup>2</sup>/L. **Drying Time:** Typically 1 hour depending upon coat thickness. Low temperatures and high humidity will lengthen drying times.

**SurfaShield C:** Shake or stir the container vigorously before use. The application surface should be dry and clean. Apply **SurfaShield C** with a brush, roller or spray gun. No dilution is required. If any excess remains on the application surface, remove by using a wet cloth. On very absorptive surfaces re-apply a second coating. **Estimated consumption rate:** 8-10 m<sup>2</sup>/L.

## Expected Useful Life

**At least 8 yrs**, upon proper application/installation. All the way that the paint is applied on substrate's surface.



## 21.

INDOOR AIR QUALITY  
ENHANCEMENT

## The Challenge

A healthy building is based on the successful fulfilment of many requirements. For each building, sound design and construction are necessary for its technical functioning and mechanical stability and for the basic safety of its occupants. However, this is not sufficient to ensure indoor environmental quality for its occupants. There are a number of other factors that affect the occupants' well-being either directly or indirectly. Among such factors are heating, ventilation and air conditioning, and activities of the occupants, including the use of office equipment or household activities such as cooking, cleaning, or applying pesticides. The risk assessment of indoor contaminants and the effectiveness of interventions are challenges faced globally because of vast differences in the types of residences and their climates as well as the many types of household products, furniture, appliances, and so on, that are available to consumers today. Indoor air quality affects the health and comfort of the building occupants. Most common pollutants are: second-hand smoke, allergens, bacteria, carbon dioxide, particulates, volatile organic compounds etc. How can we improve indoor air quality? How can a coating keep cleaning indoor air and provide a healthier indoor environment?

BILL OF  
MATERIALS

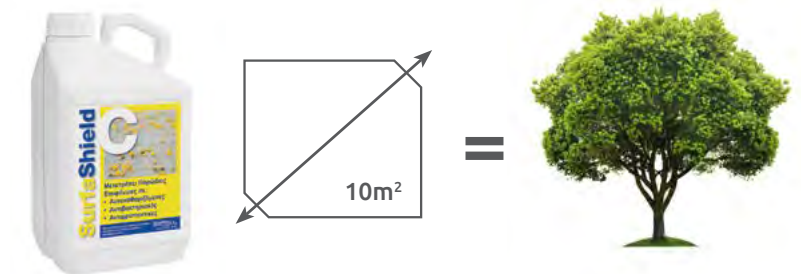
- SurfaShield C 8m<sup>2</sup>/L  
(painted or porous substrates)
- SurfaShield T 12m<sup>2</sup>/L  
(marble, tiles or non-porous substrates)

WHY  
NANOPHOS  
SYSTEM?

- SurfaShield formulation are activated by light; therefore they are not consumed – keep depolluting as long as light is there.
- SurfaShield formulations are not selective – any organic pollutant gets decomposed.
- SurfaShield is cost effective cause it needs no re-application in ten years.

Plant a **tree**  
in your room!

In terms of NO<sub>x</sub> pollutants  
10m<sup>2</sup> have the same exterior  
cleaning power as one tree.



*SurfaShield C has been tested under the EN ISO 22197-1 Test method for air-purification performance of photocatalytic materials — Removal of nitric oxide. In terms of NO<sub>x</sub> pollutants, 10m<sup>2</sup> eliminate the same NO<sub>x</sub> amount as an adult tree.*

## The Solution

SurfaShield C and SurfaShield T are two coating formulations developed to enhance indoor air quality. They decompose organic stains and pollutants, prevent microbial growth, purify air, remove odours. SurfaShield C has been developed for application on porous surfaces and paints, whilst SurfaShield T presents narrower size distribution of TiO<sub>2</sub> nanoparticles; therefore, it's most suitable for non-porous surfaces like marbles or granites or tiles. By harnessing the surrounding light, treated surfaces become self-cleaning and self-sterilizing. SurfaShield coating is transparent but activates by light, burning organic pollutant that threaten indoor air quality. Volatile Organic Compounds (VOCs), solvents, formaldehyde, odours are all organic compounds that turn into harmless carbon dioxide when exposed to the cleaning effect of SurfaShield coating. SurfaShield coated surfaces can also efficiently decompose organic stains, bacteria, mould, fungi or even viruses. SurfaShield formulations provide a healthier indoor air environment, without the need of using powerful disinfectants, antibiotics or oxidizers.

As a proof of concept, a luxurious hotel, based in mainland SW China, reported for the need of elevating the quality characteristics of their indoor quality.

Among their hospitality premises individual apartments, rooms and a basement amusement hall (KTV) can be found. Total projected floor area was calculated to be 11.168,21m<sup>2</sup>. Even though application took only place on painted or marble walls and painted ceilings, the project was calculated on a floor basis. The total application area is calculated to extend the floor area by a factor of ±2,0. For 11.168,21m<sup>2</sup> of floor area, 10 workers/applicators were employed for 8 days (preparation and application included). This accounts for 140m<sup>2</sup> per man-day. 200L of SurfaShield C and 200L of SurfaShield T were used. This accounts for a consumption area of 50m<sup>2</sup> of real surface area per L of SurfaShield. According to the Chinese Indoor Air Quality Assessment Protocol, 3 concern substances have to be monitored: Formaldehyde, Benzene and total Volatile Organic Content (TVOC).

## Critical Values:

- Formaldehyde Air Concentration ≤ 0,12 mg/m<sup>3</sup>
- Benzene Air Concentration ≤ 0,06 mg/m<sup>3</sup>
- TVOC Air Concentration ≤ 0,60 mg/m<sup>3</sup>

Subsequently, a multiplier factor to the critical substances concentrations is created. For example, if Formaldehyde air concentration is found 0,24mg/m<sup>3</sup> then the Formaldehyde factor is 2 (0,24/0,12 = 2).





Application of SurfaShield C on painted ceiling.

**Hazard Levels are defined as follows:**

- 0 < Factor ≤ 1 **Green** – Acceptable Indoor Air Quality
- 1 < Factor ≤ 5 **Orange** – Polluted Indoor Air Environment
- 5 < Factor ≤ 10 **Red** – Heavily Polluted Indoor Air Environment
- 10 < Factor **Black** – Severely Polluted Indoor Air Environment – Go Away!

Analysis of samples took place using accredited analytical chemistry principles with pumps collecting samples of air and stabilizing pollutants in a liquid environment. Subsequent quantification is taking place by using a calibrated spectrophotometer.

Area	Application Date	Pollutant	Concentration (mg/m³)	Critical Value (mg/m³)	Factor	Application Date	Measurement Date	Concentration (mg/m³)	Factor	% Reduction	Measurement Date	Concentration (mg/m³)	Factor	% Reduction	Measurement Date	Concentration (mg/m³)	Factor	% Reduction
Appartment A	31/12/15	Formaldehyde	0.14	0.12	1.17	31/1/16	3/1/16	0.08	0.5	57%	3/1/16	0.05	0.42	64%	4/1/16			
	31/12/15	Benzene	0.15	0.09	1.78	31/1/16	3/1/16	0.08	0.5	50%	3/1/16				4/1/16			
	31/12/15	TVOC	0.23	0.6	0.38	31/1/16	3/1/16				3/1/16				4/1/16			
Appartment B	31/1/16	Formaldehyde	0.06	0.12	0.50	1/2/16	3/1/16	0.04	0.3	33%	3/1/16	0.03	0.25	50%	4/1/16			
	31/1/16	Benzene	0.34	0.09	3.78	1/2/16	3/1/16	0.18	2.8	47%	3/1/16	0.12	1.8	55%	4/1/16	0.07	0.78	78%
	31/1/16	TVOC	0.83	0.6	1.38	1/2/16	3/1/16	0.62	1.3	25%	3/1/16	0.32	0.5	61%	4/1/16	0.20	0.33	76%
Appartment C	31/1/16	Formaldehyde	0.06	0.12	0.50	2/2/16	3/1/16				4/1/16				5/1/16			
	31/1/16	Benzene	0.21	0.09	2.33	2/2/16	3/1/16				4/1/16				5/1/16	0.06	0.7	71%
	31/1/16	TVOC	0.96	0.6	1.60	2/2/16	3/1/16	0.67	0.8	30%	4/1/16				5/1/16	0.52	0.8	46%
Appartment D	31/1/16	Formaldehyde	0.09	0.12	0.75	2/2/16	3/1/16				4/1/16	0.05	0.4	44%	5/1/16			
	31/1/16	Benzene	0.18	0.09	2.00	2/2/16	3/1/16				4/1/16				5/1/16	0.04	0.4	78%
	31/1/16	TVOC	0.84	0.6	1.40	2/2/16	3/1/16				4/1/16				5/1/16	0.48	0.6	42%
Dining Hall	2/1/16	Formaldehyde	0.02	0.12	0.17	2/1/16	3/1/16		0.6	100%	4/1/16				5/1/16			
	2/1/16	Benzene	0.12	0.09	1.33	2/1/16	3/1/16	0.08	0.6	58%	4/1/16				5/1/16			
	2/1/16	TVOC	0.57	0.6	0.95	2/1/16	3/1/16				4/1/16				5/1/16			
Wine Bar Area	2/1/16	Formaldehyde	0.04	0.12	0.33	2/1/16	3/1/16				4/1/16				5/1/16			
	2/1/16	Benzene	0.19	0.09	2.11	2/1/16	3/1/16	0.10	1.3	47%	4/1/16	0.05	0.6	74%	5/1/16			
	2/1/16	TVOC	0.95	0.6	1.58	2/1/16	3/1/16	0.37	0.4	61%	4/1/16				5/1/16			
KTV	2/1/16	Formaldehyde	0.15	0.12	1.25	2/2/16	3/1/16	0.11	0.5	31%	4/1/16				5/1/16			
	2/1/16	Benzene	1.21	0.09	13.44	2/2/16	3/1/16	0.64	10.4	22%	5/1/16	0.66	7.8	15%	6/1/16	0.12	1.3	90%
	2/1/16	TVOC	2.30	0.6	3.83	2/2/16	3/1/16	2.22	3.7	40%	5/1/16	1.49	2.4	38%	6/1/16	0.48	0.6	79%
Fitness - Gym	2/1/16	Formaldehyde	0.00	0.12	0.57	3/1/16	4/1/16				5/1/16				6/1/16			
	2/1/16	Benzene	0.25	0.09	2.78	3/1/16	4/1/16	0.07	0.8	72%	5/1/16				6/1/16			
	2/1/16	TVOC	0.84	0.6	1.40	3/1/16	4/1/16	0.52	0.9	38%	5/1/16				6/1/16			
Appartment E	3/1/16	Formaldehyde	0.1	0.12	0.83	4/1/16	5/1/16	0.07	0.8	30%	6/1/16				7/1/16			
	3/1/16	Benzene	0.13	0.09	1.44	3/2/16	4/1/16	0.08	0.5	38%	5/1/16				6/1/16			
	3/2/16	TVOC	0.8	0.6	1.33	3/2/16	4/1/16	0.10	0.2	88%	5/1/16				6/1/16			
	3/3/16	Formaldehyde	0.07	0.12	0.58	4/1/16	5/1/16	0.05	0.5	29%	6/1/16				7/1/16			
	3/3/16	Benzene	0.19	0.09	2.11	4/1/16	5/1/16	0.08	0.9	58%	5/1/16				6/1/16			
	3/3/16	TVOC	0.61	0.6	1.02	4/1/16	5/1/16	0.37	0.6	39%	5/1/16				6/1/16			
Appartment F	4/1/16	Formaldehyde	0.11	0.12	1.08	4/2/16	5/1/16	0.00	0.0	100%	7/1/16				8/1/16			
	4/1/16	Benzene	0.32	0.09	3.55	4/1/16	5/1/16	0.02	0.8	76%	7/1/16				8/1/16			
	4/1/16	TVOC	0.94	0.6	1.56	4/1/16	5/1/16	0.23	0.4	76%	7/1/16				8/1/16			
Appartment G	5/1/16	Formaldehyde	0.17	0.12	1.58	5/1/16	6/1/16	0.02	0.2	89%	7/1/16				8/1/16			
	5/1/16	Benzene	0.13	0.09	1.44	5/1/16	6/1/16	0.06	0.7	56%	7/1/16				8/1/16			
	5/1/16	TVOC	1.8	0.6	3.0	5/1/16	6/1/16	0.25	0.4	86%	7/1/16				8/1/16			
SPA	5/1/16	Formaldehyde	0.05	0.12	2.40	5/1/16	6/1/16	0.07	0.6	40%	7/1/16				8/1/16			
	5/1/16	Benzene	0.62	0.09	6.89	5/1/16	6/1/16	0.18	1.8	71%	7/1/16	0.04	0.4	94%	8/1/16			
	5/1/16	TVOC	2.11	0.6	3.52	5/1/16	6/1/16	0.52	0.6	75%	7/1/16				8/1/16			
Room A	5/1/16	Formaldehyde	0.12	0.12	1.00	5/1/16	6/1/16	0.05	0.5	92%	7/1/16				8/1/16			
	5/1/16	Benzene	0.74	0.09	8.22	5/1/16	6/1/16	0.05	0.8	67%	7/1/16				8/1/16			
	5/1/16	TVOC	0.73	0.6	1.22	5/1/16	6/1/16	0.29	0.5	60%	7/1/16				8/1/16			
										One Day Average:	54%				Two Days Average:	59%		
																Three Days Average:		

Results table of TVOC, formaldehyde and Benzene concentration assessment after one, two and three days from application.



Application of SurfaShield T on vertical marble surface.

After pollutants concentration assessment, major finding are summarized as following:

- All Critical Factors were reduced to **Green** Level in three days.
- KTV, the most polluted area, proved **nearly Green** in three days.
- Taking into account the reduction of all pollutants in all areas, an astonishing **90% reduction of the Air Indoor pollution was achieved**.
- SurfaShield C is **not a selective**, but a **universal** solution for **all airborne pollutants**.
- **90 days after applications**, all hotel areas remain in **Green** Level.

**Application**

**SurfaShield T:** The application surface should be dry and clean. A wet, spraying deposition method has been chosen to combine simplicity and minimum disturbance to the existing industrial processes. Shiny or glossy finish marble or ceramic tiles should be given the appropriate care (HVLP spraying is recommended) to eliminate visible defects. **Estimated consumption rate:** 12-15 m²/L, strongly dependent on the properties of the surface applied.

**SurfaShield C:** Shake or stir the container vigorously before use. The application surface should be dry and clean. Apply SurfaShield C with a brush, roller or spray gun. No dilution is required. If any excess remains on the application surface, remove by using a wet cloth. **Estimated consumption rate:** 8-10 m²/L, strongly dependent on the properties of the surface applied.

**Expected Useful Life**

**At least 10 yrs**, upon proper application/installation.



## 22.

TOTAL PROTECTION OF **TEXTILES**,  
**CARPETS** AND **FURNITURE****The Challenge**

Stains from food, oil, sunscreens and biological fluids do not only affect the appearance but can permanently damage our clothes, sofas, carpets and furniture. In many cases, use of chemicals or strong cleaners is forbidden by product manufacturer. How can a textile be protected before it stains?

BILL OF  
MATERIALS

- SurfaPore H 8m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- SurfaPore H is water based and easy to apply.
- Protects from both oily and water-based stains.
- Ideal for hotels, rooms and the hospitality industry.
- Permanent solution - Invisible protection.
- Certified skin contact safe - hypoallergic.

**The Solution**

SurfaPore H is a water-based formulation that can protect and waterproof furniture, carpets, curtains and surfaces covered with textiles, assuring that water and dirt are effectively repelled by chemical forces. Oily threats, such as food or grease, cannot penetrate and cannot stain the treated surfaces. SurfaPore H modified surfaces pick up dirt harder, their clean appearance lasts longer and can be easily cleaned. SurfaPore H is laundry washable, three times after original application.

**Application**

Before applying SurfaPore H, make sure the surface is clean and dry. After shaking or stirring the product container so as to homogenize, apply it by brush, roller or by spraying. In the case of cotton textiles, dipping method can be applied for 0,5 to 10 minutes accordingly. Full SurfaPore H effect reveals 24h after application.

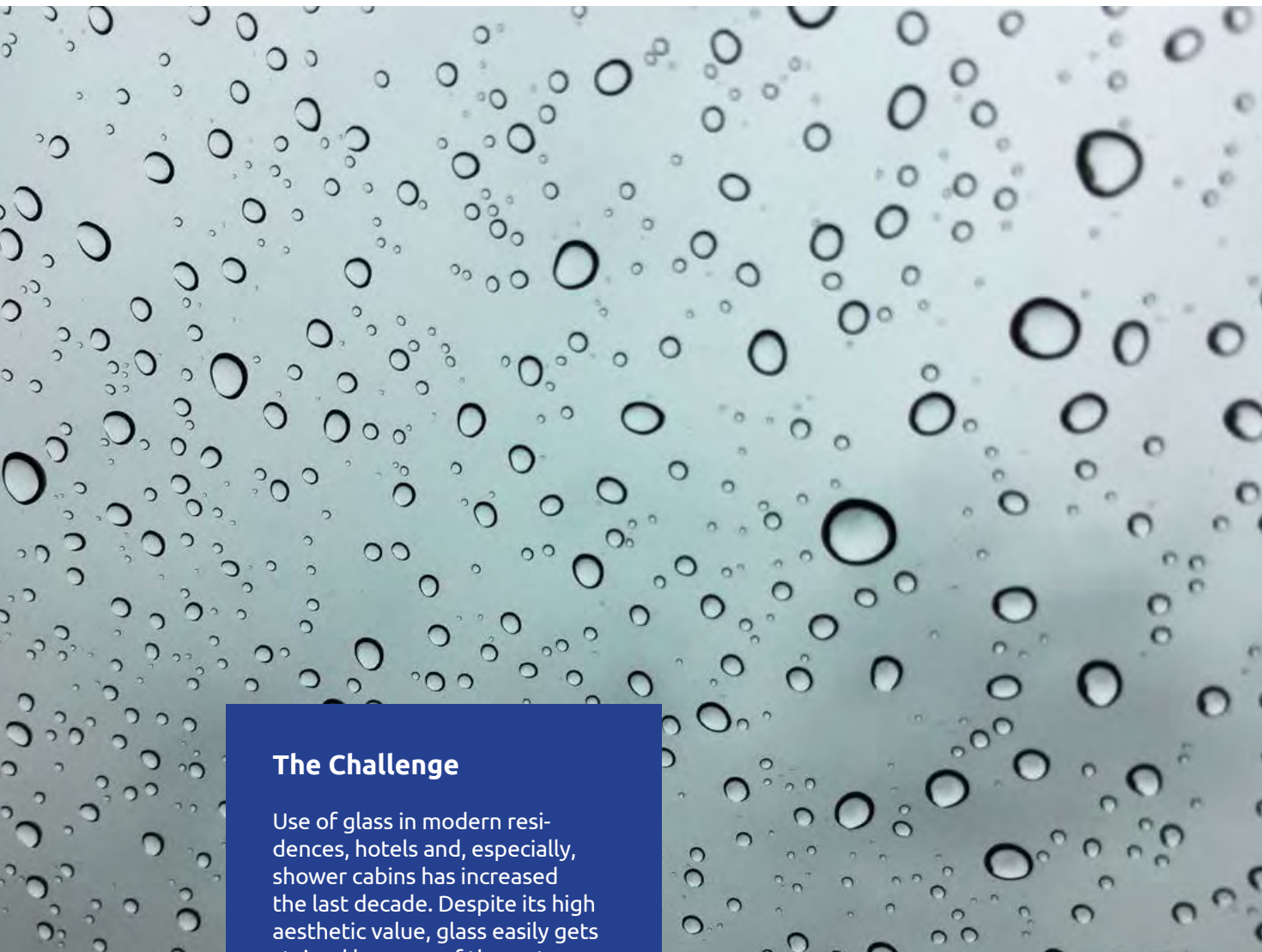
**Expected Useful Life**

**At least 5 yrs**, upon proper application or three complete laundry washing cycles.





## 23.

CLEANER GLASS FACADES AND  
SHOWER CABINS**The Challenge**

Use of glass in modern residences, hotels and, especially, shower cabins has increased the last decade. Despite its high aesthetic value, glass easily gets stained because of the water droplets deposits. Tap water droplets contain soluble salts that, upon evaporation of water, solidify on the deposition surface. Accumulated salt deposits are hard to clean and underline a filthy, dirty, unwell maintained appearance. But what if water droplets cannot stand on glass surfaces?

*Application of SurfaPore G on a façade glass surface.*

BILL OF  
MATERIALS

- SurfaPore G 18m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- SurfaPore G is water based and easy to apply.
- Prevents salt deposits by not-allowing water droplets to stand on the glass surface.
- Ideal for hotels, rooms and the hospitality industry.
- Permanent solution - Invisible protection.



*Shower cabin glass, where stripes of SurfaPore G have been applied. Note the water droplets accumulation prevention on the treated stripes.*

**The Solution**

SurfaPore G solves this problem by transforming glass surfaces from hydrophilic to hydrophobic and water-repellent without affecting the transparency of the glass. Therefore, water droplets cannot "stick" on glass surfaces and salt stains are prevented.

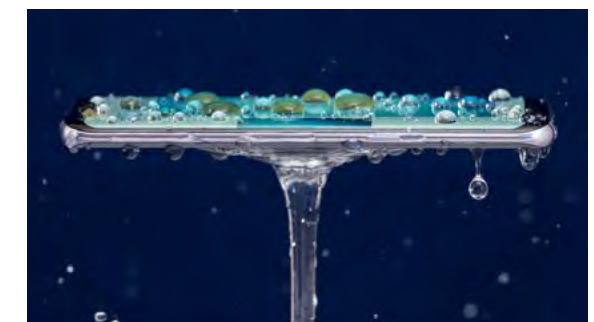
**Application**

The application surface must be clean, degreased and dry. Shake before application. Apply by using a clean and dry microfiber cloth. Maximum effectiveness is achieved 24 hours post application. Slight cleaning of the surface with a cloth after application is recommended for further homogenization of the film.

**Estimated consumption rate:** 10-14m<sup>2</sup>/L.

**Expected Useful Life**

**At least 5 yrs**, upon proper application.

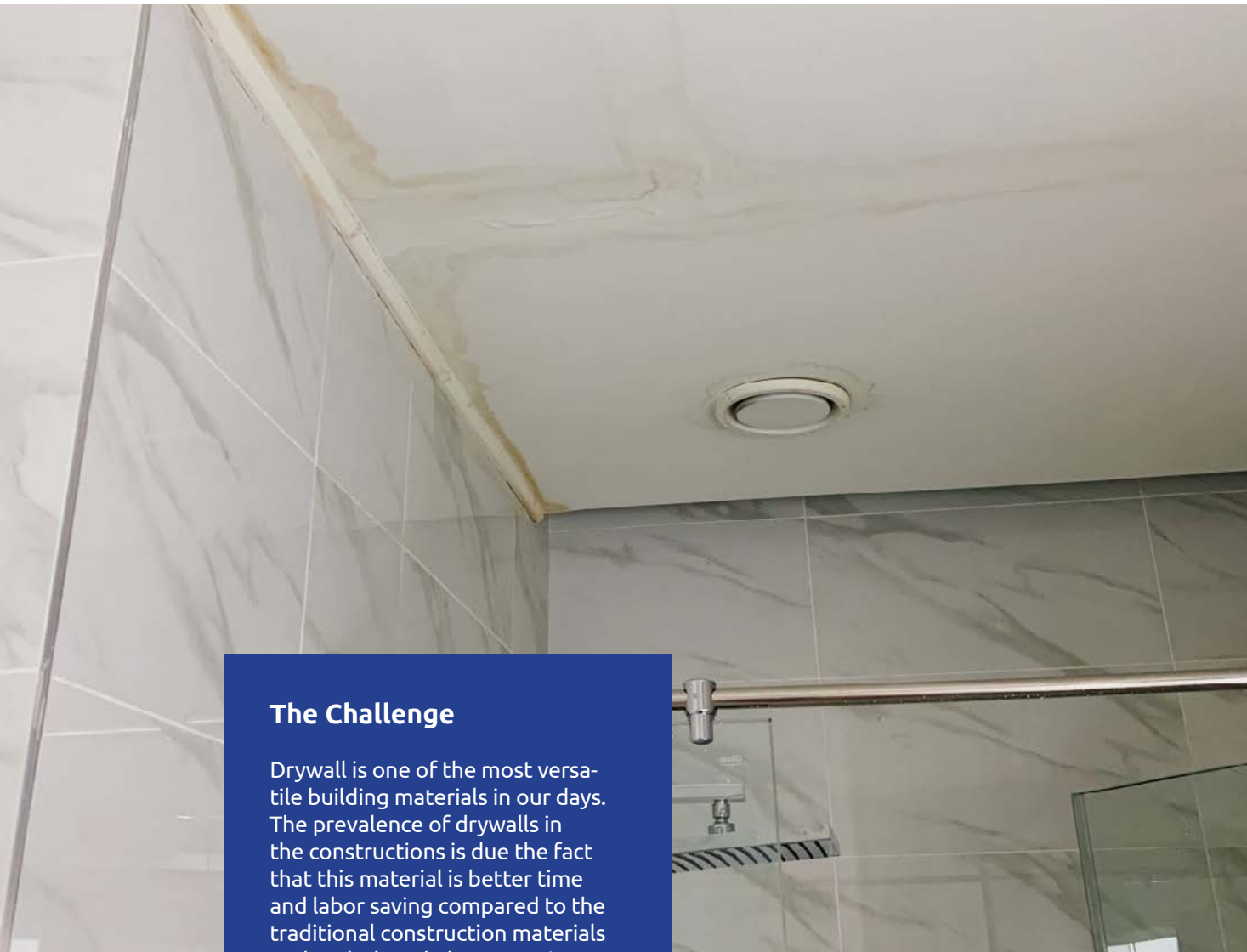


*Application of SurfaPore G on the glass surface of a smartphone.*



# 24.

## DRYWALL WATERPROOFING AND PRIMING



### The Challenge

Drywall is one of the most versatile building materials in our days. The prevalence of drywalls in the constructions is due the fact that this material is better time and labor saving compared to the traditional construction materials such as lath and plaster. Owing to its chemical nature (usually consist of gypsum, organic additives, paper, binders), can face some serious damage issues which has to be properly addressed. Drywalls are highly vulnerable to moisture thus water damage and mould is a common drawback.

*Non-waterproof drywalls installed on the rooftop of a shower room. Heavy damage would have been avoided by the use of SurfaPore F.*

## BILL OF MATERIALS

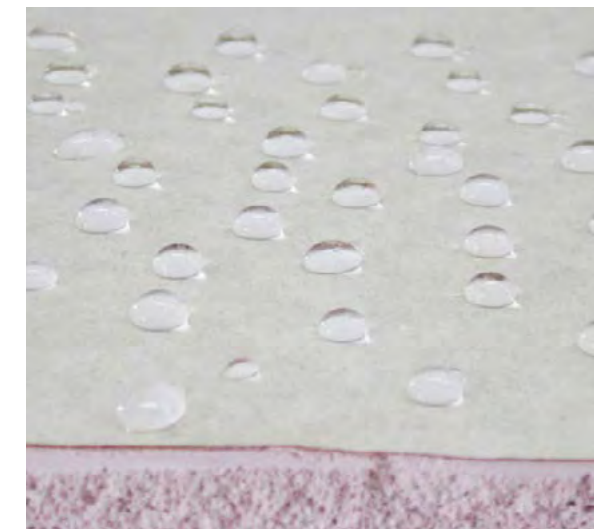
- SurfaPore F 6m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- SurfaPore F is the only formulation designed specifically for drywalls and fibrous materials.
- SurfaPore F is versatile: you select the areas prominent to water or humidity ingress.
- SurfaPore F eliminates the need for priming drywalls as it is a primer and protective formulation, simultaneously.



*Application of SurfaPore F as a primer on drywall, before the application of paint.*



*Water effect on SurfaPore F treated drywall.*

### The Solution

SurfaPore F is a water-based formulation that can be easily applied on fibrous surfaces, plasterboards, drywalls, composite wood and carton. It can be directly applied on gypsum plaster as well! SurfaPore F protects, oil- & waterproofs these sensitive fibrous surfaces, effectively repelling water and stains. Gypsum boards, drywalls and composite woods (particle boards and plywood) are protected from moisture, mould and microorganisms. It can also be used as a primer improving the adhesion of paints. SurfaPore F modified surfaces can last longer protected from weathering, swelling and warping.

### Application

The application surface should be dry and clean. Apply SurfaPore F by using a brush or roller. No dilution is required. On very absorptive surfaces re-apply within 3 hours. Maximum water repellence is achieved 24 hours post application.

**Estimated consumption rate:** 6 m<sup>2</sup>/L, strongly dependant on the properties of the surface applied.

### Expected Useful Life

**6 yrs** on weathering exposed application surface areas. Lifetime expected useful time, applied as a primer before painting walls and masonry.



# 25.

## MONUMENT RESTORATION



### The Challenge

The common use of fair-faced concrete, without coatings or painting, obviously increases its susceptibility to suffer decay, especially when subjected to an aggressive environment. Damage produced in concrete can be divided into 3 basic groups: physical effects, chemical effects and biological effects. The objective is to develop innovative products with improved properties and demonstrate their effectiveness in relevant environment (monuments). The ideal formulation should fulfil two requirements: (i) penetration into the concrete structure; (ii) preservation of the aesthetic qualities of historic buildings. Additionally, innovative properties, such as superhydrophobicity and self-healing action act beneficiary on the preservation and restoration of the cement monuments.

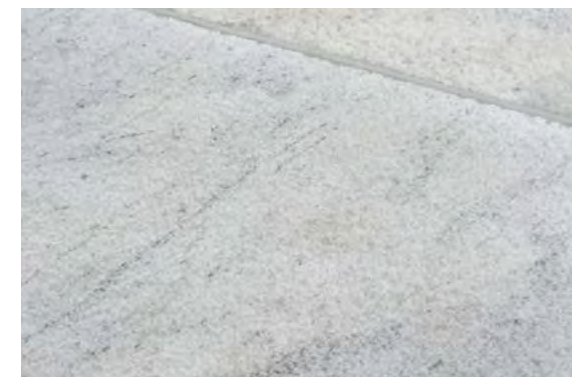


SurfaPore FX SB concept and consolidating nanoparticles

## BILL OF MATERIALS

- SurfaPore FX SB 10m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?



Application of SurfaPore FX SB on "flamed" floor marbles of Oslo Opera House, Oslo, Norway.



Application of SurfaPore FX SB at Chapel of the Archangels, Saint Catherine's Monastery in Sinai, Egypt.

### The Solution

Inspired by the ingredients of the best preserved ancient monuments, SurfaPore FX SB contains calcium modified nanoparticles that fix and bind together with building materials, resulting in the enhancement of their mechanical properties. The complete absence of organic ingredients and resinous compounds assures long term effectiveness and weathering resistance. SurfaPore FX SB can be also applied on sensitive surfaces to enhance abrasion resistance. It is highly recommended in the restoration of monuments, due to the natural and biomimetic character. SurfaPore FX SB is a solvent based calcium oxalate suspension. Due to the nanoparticles small size and solvent, penetration depth can reach more than 20mm (porous sandstone). After application nanoparticles penetrate the substrate, chemically attach on the application surface and covalently interconnect with each other. As the active ingredient is also inorganic, SurfaPore FX SB exhibits strong chemical affinity with building materials. The nanoparticles do not seal the pores but support the "walls" or cracks of the worn substrate. Therefore, natural

appearance, water vapour permeability and porosity of the treated surfaces remain unaffected. In addition, the cement surface after application transforms into superhydrophobic, thus prevent the entrance of water, which is an aggressive corrosion factor.



Application of SurfaPore FX SB at Panagia Pantovasilissa church, close to Bursa, Turkey.

### Application

Remove any dust, flaking or loose surface material. The cement surface has to be dry and clean. Shake the SurfaPore FX SB container well before use. No dilution is required. Apply by using a brush, a roller or airless spray gun. On very absorptive surfaces re-apply after 15 minutes. Suggested application temperature is 5-35°C. Test results on a small area before full scale application. **Drying time/Curing time:** Touch dry time is 30 minutes, depending on the relative humidity level and temperature. Maximum SurfaPore FX SB performance is achieved 30 days post application.

**Consumption rate:** Estimated consumption rate 6-8 m<sup>2</sup>/L, strongly dependant on

the properties of the surface applied.

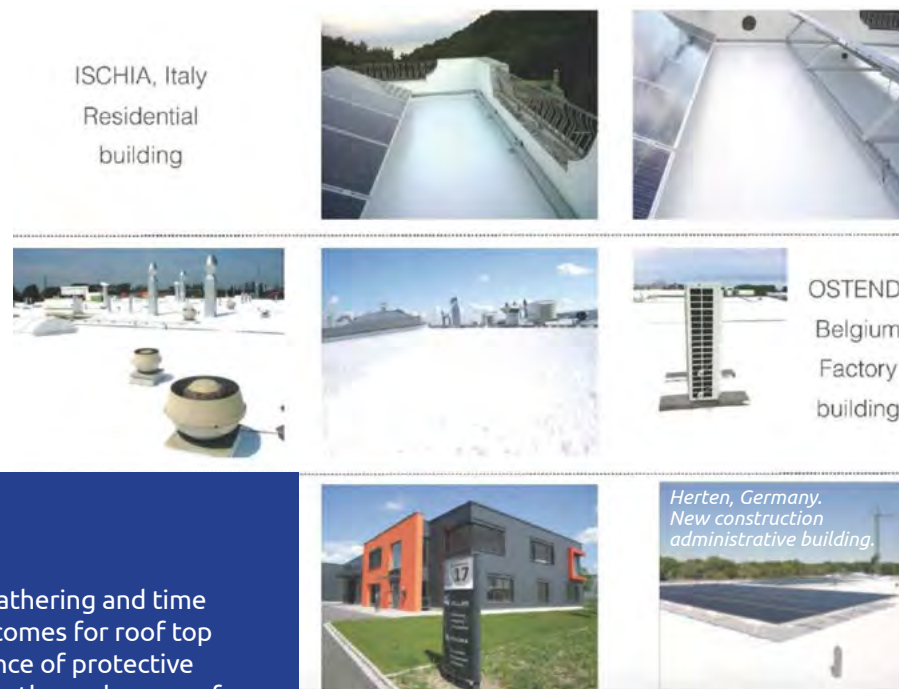
### Expected Useful Life

**At least 30 yrs**, upon proper application/installation.



## 26.

## SUPER DURABLE, COOL ROOF INSULATION



## The Challenge

Durability against weathering and time does matter when it comes for roof top coatings. The endurance of protective coatings should follow the endurance of the surfaces they protect, i.e. rooftops. Formulating a rooftop coating is really hard: how do you beat up time? Another most important element is the interaction of the rooftop with its natural, urban or rural environment. Dust, natural deposits, dirt, bird droppings; they all degrade heat reflecting properties of a cool top coat, and subsequently, cool properties are lost. How to maintain cool and heat reflecting properties without continuous maintenance and cleaning?

Application of super durable, PVDF containing roof coating in Europe (Property of Daikin Industries Ltd.).



## BILL OF MATERIALS

- SurfaPore FX WB 4m<sup>2</sup>/L (cementitious substrate only)
- SurfaMix Universal Primer 10m<sup>2</sup>/L
- SurfaPaint Roof Evo 1m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- Unique Cool properties and SRI values (SRI = 116).
- Versatility & Applicability: the application of SurfaMix Universal Primer assures strong bonding to substrate, regardless if it's porous (cementitious) or not (old polyurethane coatings or bitumen rolls).
- SurfaMix Universal Primer prevents bitumen stains.
- NanoPhos' system presents high emissivity; thus, it doesn't heat up.
- Application is easy by airless spraying or brushing.
- Prevents bitumen staining.
- Full Water insulation even under ponding water.
- Extreme durability against weathering.
- Maintains cool properties, due to low dirt pick-up.

## The Solution

Further to cement substrate fixing and mechanical enhancement by SurfaPore FX WB, NanoPhos has developed a three-layer insulation system that is easily applicable on cement or bitumen roof tops. Priming is essential as the substrate of cement or bitumen or old polyurethane rooftops may be heavily damaged from weathering and ponding water. SurfaMix Universal Primer assures perfect coating adhesion, even in low porosity substrates. Furthermore, it is a water and vapour sealer, ideal for roof tops. The application of SurfaMix Universal Primer on bitumen roll surfaces acts as a sealer and prevents bitumen stains diffuse to the surface of the insulating coating. Following priming, a super-long durable, heat reflecting, stain resistant elastomeric waterproofing paint for horizontal or inclining surfaces exterior surfaces. A single formulation designed to beat time: SurfaPaint Roof Evo. The superb solution for a cool, highly reflecting roof coating, armed with PVDF (polyvinylidene difluoride). Performs the best among known binders in terms of colour retention, gloss and elasticity. Ideal for extreme heating, high humidity or even freezing conditions. Remains unchanged under the most extreme UV conditions. Exceeds all known binders in terms of durability and expected lifetime. Cool properties are maintained for long, due to its extremely low dirt pick up values. It mirrors heat back to the environment and prevents moisture penetration, resulting in significant energy savings during both winter and summer. Ideal for ponding water. Ideal for eliminating Urban Heat Islands (UHIs). SurfaPaint Roof Evo is a cool paint, certified by the European Cool Roofs Council (ECRC).

## Application

New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Make sure that the rooftop is dry and free of mould, dirt, dust, oily residues or flaking parts. Apply SurfaPore FX WB by a brush or airless spraying and allow for two days curing. Application of SurfaPore FX WB should take place only on cementitious substrates and never on bitumen rolls insulated substrate. Apply SurfaMix Universal Primer by using an airless sprayer, at a consumption rate of 10m<sup>2</sup> per L. 8h after primer application apply SurfaPaint Roof Evo at a consumption rate of 1m<sup>2</sup> per L, by using an airless sprayer or roller. Ensure corners and edges are adequately covered. The application surface should be cross-rolled to ensure even application and to minimise roller mark. Additional coats should be applied 24 hours after the previous application.

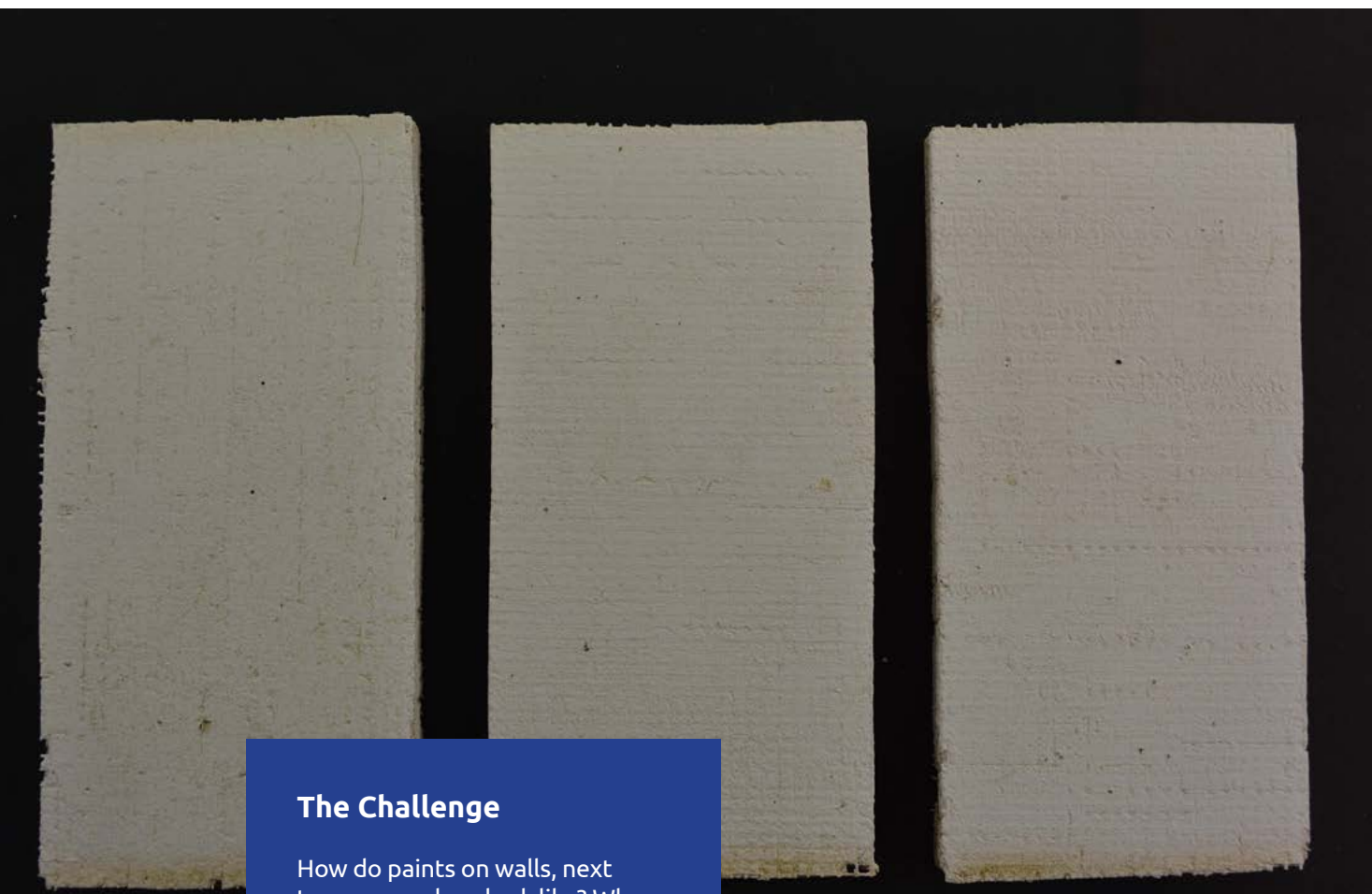
## Expected Useful Life

**30 yrs expected useful time**, upon proper application/installation and a maintenance plan of a single SurfaPaint Roof Evo top coat, every ten years.



## 27.

## PROTECTION OF WATERSIDE AND BATHROOM WALLS



## The Challenge

How do paints on walls, next to grass gardens look like? Why paints in bathrooms look always damp and fungi spots appear? What if a wall is subjected to sea spraying? How rain is affecting aesthetic appearance of coated masonry? There is no doubt that wherever water and paints co-exist, multiple problems arise. Water, as a natural dissolving medium, tends to disintegrate cured top coatings. Only formulas that prevent water ingress can stand in a humid environment.

*36 months exposure sample in the humid and hot environment of Florida. Any competing coating is developing fungi and mould growth, due to the dampness the coating is absorbing (Q-Lab testing ground, Exposure: 45° – South FL, USA).*

## BILL OF MATERIALS

- SurfaMix P 24 m<sup>2</sup>/L
- SurfaPaint AquaX 5m<sup>2</sup>/L
- SurfaShield C 12 m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- Waterproof, water-repelling; yet breathable system.
- Prevents mould growth without using biocides.
- Resists humid environment detrimental effects.
- Complete system proposition: while **SurfaPaint AquaX** passively protects from water ingress and deterioration, **SurfaShield C** actively depollutes and sterilizes surfaces.

## The Solution

SurfaPaint AquaX is a waterproof and breathing paint, used for both exterior and interior surfaces. It waterproofs the treated surface by preventing humidity and rainwater to penetrate. Water-droplets remain on the surface and do not get absorbed by the paint. Due to its breathability, entrapped humidity can get relieved by evaporation. SurfaPaint AquaX is characterized as a cool paint, due to its high solar reflectance value.

Ideal for masonry surfaces that are exposed to water, humidity and adverse weather conditions, such as seaside areas. SurfaPaint AquaX treated surfaces are easy to clean due to the beading effect. Water droplets roll off the painted surface eliminating dirt and dust accumulation. Its water repellence restricts mould growth, due to the lack of humidity. SurfaPaint AquaX coating presents excellent substrate adhesion and elasticity. Available in the colour white and tinted only to light shades.

On the other hand, SurfaShield C decomposes organic stains and pollutants, prevents microbial growth, purifies the air, removes odours. It is an active nanotechnology formulation that can be easily applied on exterior porous surfaces, with beneficiary properties, such as self-cleaning, protection from mould and organic stains. SurfaShield C is a transparent top coat for harnessing surrounding light and decompose dirt or pollutants from the coated surface. In this way, cool properties of paints are maintained for longer.

## Application

**Substrate Priming:** SurfaMix P can be applied directly on exterior or interior wall surfaces (masonry, concrete, plaster, drywalls) and wherever emulsion paints are to be applied. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Adverse conditions during or immediately after application may affect the coating's properties. **Surface Preparation:** Ensure all surfaces are clean and dry prior to applica-

tion. **Application note:** Shake well before application. For its volume part of SurfaMix P, dilute by adding 3 volume parts of water (porous masonry substrates) or 4 volume parts of water (paint covered surfaces). Application temperature should be between 8-35°C. Apply one even coat using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered.

**SurfaPaint AquaX:** It can be applied directly on primed interior and exterior wall surfaces (masonry, concrete, plaster, drywalls) and wherever water based, acrylic paints are applied. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Ensure all surfaces are clean and dry prior to application. Remove any dust and dirt. Stir well before application. Do not dilute for bridging gaps and hairline cracks of up to 0,5 mm. For cracks bigger than 1mm, fill the gap with a suitable putty. If thinning is required add up to 10% water by volume. Application temperature should be between 8-35°C. Apply 2-3 even coats using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered. Additional coats should be applied 4-6 hours after the previous application. **Spreading Rate:** 10-12 m<sup>2</sup>/L. **Drying Time:** Typically, 1 hour depending upon coat thickness. Low temperatures and high humidity will lengthen drying times.

**SurfaShield C:** Shake or stir the container vigorously before use. The application surface should be dry and clean. Apply SurfaShield C with a brush, roller or spray gun. No dilution is required. If any excess remains on the application surface, remove by using a wet cloth. On very absorptive surfaces re-apply a second coating. **Estimated consumption rate:** 8-10 m<sup>2</sup>/L.

## Expected Useful Life

**At least 8 yrs**, upon proper application/installation. All the way that the paint is applied on substrate's surface.



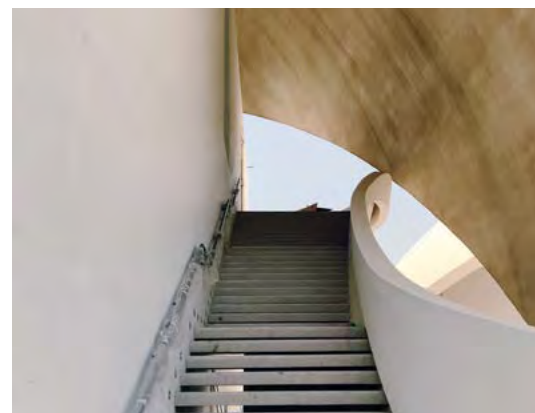
## 28.

DUST AND DIRT RESISTANT  
MASONRY PAINT

## The Challenge

Building structures are often found exposed in harsh environment, in terms of weathering and dirt. Name it environmental pollution, coastal areas with extreme salinity spraying or even desert-neighbouring areas with dust storms, the outcome is the accumulation of dirt on paints and masonry surfaces. In most cases, temperature variations result in humidity condensation on the surface of the paint that, combined with the accumulated dirt, creates mud or irremovable stains. Conventional paints present high porosity or “dirt anchoring” moieties that make the problem even worse.

*Dust pick-up underneath a dome, subjected to desert and seawater environment.*

BILL OF  
MATERIALS

- SurfaMix Universal Primer 10m<sup>2</sup>/L
- SurfaPaint SCP Concrete Acrylic Enamel Paint 4m<sup>2</sup>/L
- SurfaShield C 10m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- Extremely durable system against hard weathering conditions (tropical, desert, coastal).
- Acts as anti-carbonation shield.
- Water and humidity impermeable.
- Easy to apply by either spraying or roller.



## Application

Ensure that application surface is clean, dry and free from oil, grease or loose matter. Apply SurfaMix Universal Primer by using an airless sprayer or a roller, at a consumption rate of 10m<sup>2</sup> per L. Make sure that the roller is suitable for solvent based products. Apply SurfaPaint SCP Concrete Acrylic Enamel Paint, 8h after primer application, by using an airless sprayer or a roller at a consumption rate of 8m<sup>2</sup> per L, per coat. Make sure that the roller is suitable for solvent based products. Apply two coats minimum. Each coat must be applied after minimum four hours from the application of the previous one, at 20°C. For both SurfaMix Universal Primer and SurfaPaint SCP Concrete Acrylic Enamel Paint, use NPTB NanoPhos Thinner B if thinning is required. Thinner addition should not exceed 5-10% v/v. Use NPTB NanoPhos Thinner B for cleaning application equipment.

## The Solution

SurfaPaint SCP Concrete Acrylic Enamel Paint is a single component, solvent based, fast drying, enamel paint formulation for cementitious surfaces (masonry, concrete, cement boards, precast cement blocks). It provides long lasting protection for building and construction elements that are exposed to adverse weathering conditions. SurfaPaint SCP offers great alkali resistance. Easy to apply, while presenting great spreading rate and hiding power. Light shades do not yellow and offer cool properties (reflectance of incident InfraRed heat radiation). All shades present extreme UV resistance and remain unaltered even in harsh environmental conditions (high UV index and/or condensation). The structure of SurfaPaint SCP coating prevents adhesion of dirt and therefore it offers superior easy-cleaning performance. It is an ideal finishing coating on building and construction elements, such as cement slabs, masonry, walls, precast concrete, bridge structures, plaster, roof or cement tiles and wherever a mineral substrate exists. On the other hand, SurfaShield C decomposes organic stains and pollutants, prevents microbial growth, purifies the air, removes odours. It is an active nanotechnology formulation that can be easily applied on exterior porous surfaces, with beneficiary properties, such as self-cleaning, protection from mould and organic stains. SurfaShield C is a transparent top coat for harnessing surrounding light and decompose dirt or pollutants from the coated surface. In this way, cool properties of paints are maintained for longer.

## Expected Useful Life

**At least 8 yrs**, upon proper application/installation. All the way that the paint is applied on substrate's surface.

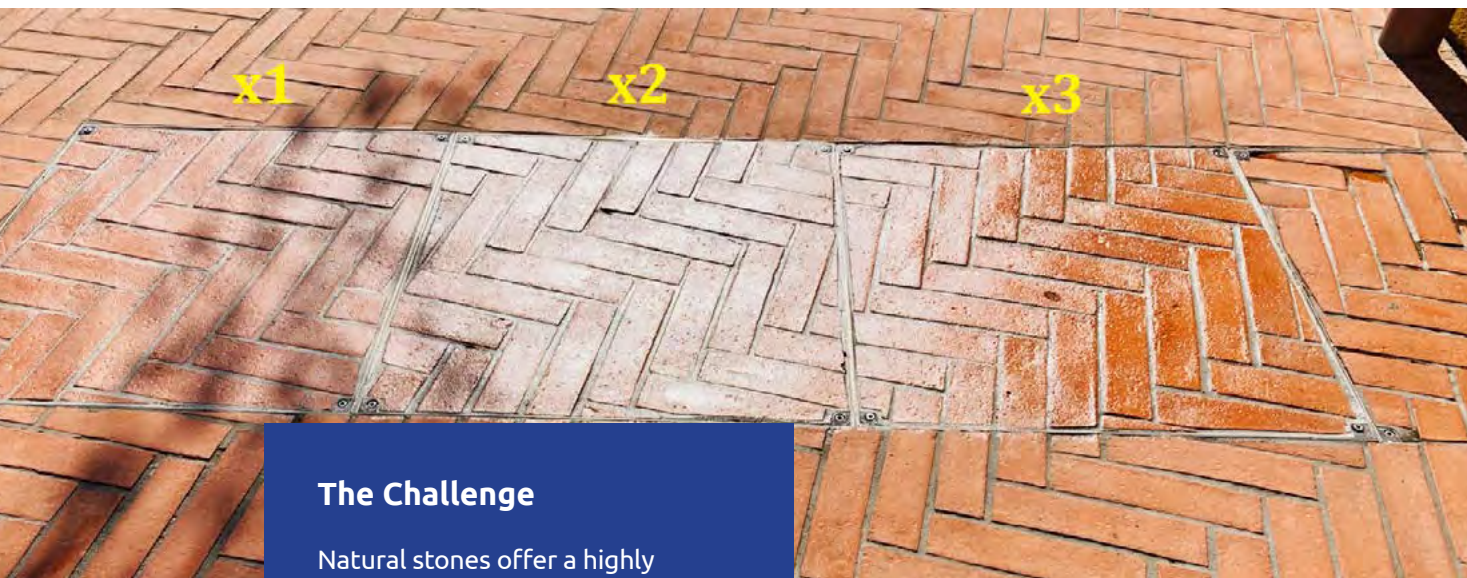


*Application of SurfaPaint SCP Concrete Acrylic Enamel Paint. The sample is exposed for six months on cleaned substrate. Note the difference on whiteness.*



## 29.

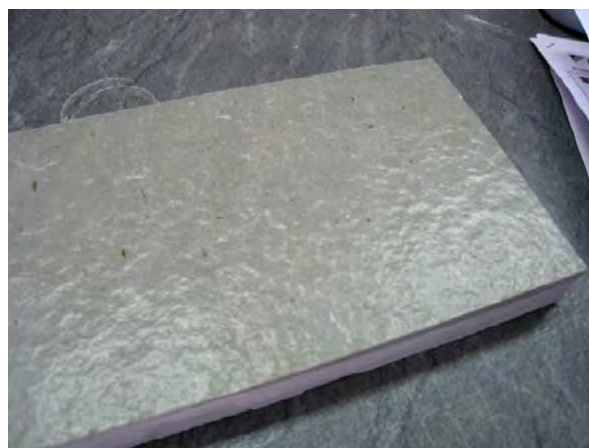
## COLOUR ENHANCEMENT AND PROTECTION OF NATURAL STONE FLOORING



### The Challenge

Natural stones offer a highly aesthetic design choice in outdoor, private or public places. Despite the fact that they are composed of hard, natural materials, aesthetic and durability issues are enormous: natural stones are absorptive and become “numb” after prolonged weathering exposure.

*Application of SurfaPaint Stone Varnish WB on cotto floor tiles, which have the same porosity structure as natural stones. Numbers depict how many coats were applied. The gloss effect gradient is clearly visible.*



*Staining (left) and cold-water cleaning (right) of a natural stone tile treated with SurfaPaint Stone Varnish WB.*

## BILL OF MATERIALS

- SurfaPaint Stone Varnish WB 2 to 10m<sup>2</sup>/L (depending on desired gloss and protection level)  
Matte or Glossy versions available

## WHY NANOPHOS SYSTEM?

- Simultaneously eliminates weathering “numb” appearance and protects from further weathering deterioration.
- Penetrates deeply due to nano-resinous content.
- Reduces dirt pick-up.
- Presents chemical resistance from wine, acids and oils.
- Available in matte, satin or glossy finish.
- Can be applied wet-on-wet.
- Weathering resistant and UV light stable.

### The Solution

SurfaPaint Stone Varnish WB is a clear acrylic water-based varnish ideal for stones. It creates a sealing-but-breathable film that protects against water based or oily stains. It is a versatile material, as its shininess is developed gradually, from satin to glossy, depending on the number of coats applied. Matte finish alternative is also available. Additionally, it protects surfaces from wear due to weather conditions, without peeling. The SurfaPaint Stone Varnish WB is based on nano-acrylic resin. The nanostructured polymer has the ability to penetrate much deeper compared to conventional polymers and attach chemically on the applied surface. Therefore, it provides very good adhesion of the varnish in combination with pore sealing. The resulting film provides excellent resistance to abrasion and scratches. Moreover, the polymer structure remains unaffected from surrounding UV light, providing a weathering resistant solution. It is also responsible for the exceptional chemical resistance and low dirt pick up.

### Application

The application surface should be dry and clean. Remove flaking and loose material from the application surface. Any oily residues must be removed from the application surface. Many failures attributed to poor surface preparation. Apply 2 coats of the matte SurfaPaint Stone Varnish WB version for a matte finish. Apply 1-2 coats of the glossy SurfaPaint Stone Varnish WB version for a satin finish or 3 coats for gloss finish. **Application method:** Brush, spray or roller. **Recoat-ing time:** 2 hours. **Touch dry time:** 60min. **Application temperature:** 5-35°C. It is recommended the modified surface not to be exposed to extreme weather conditions for 4-5 days after application. **Estimated consumption rate:** 8-10 m<sup>2</sup>/L per coat, depending on the porosity of the substrate.

### Expected Useful Life

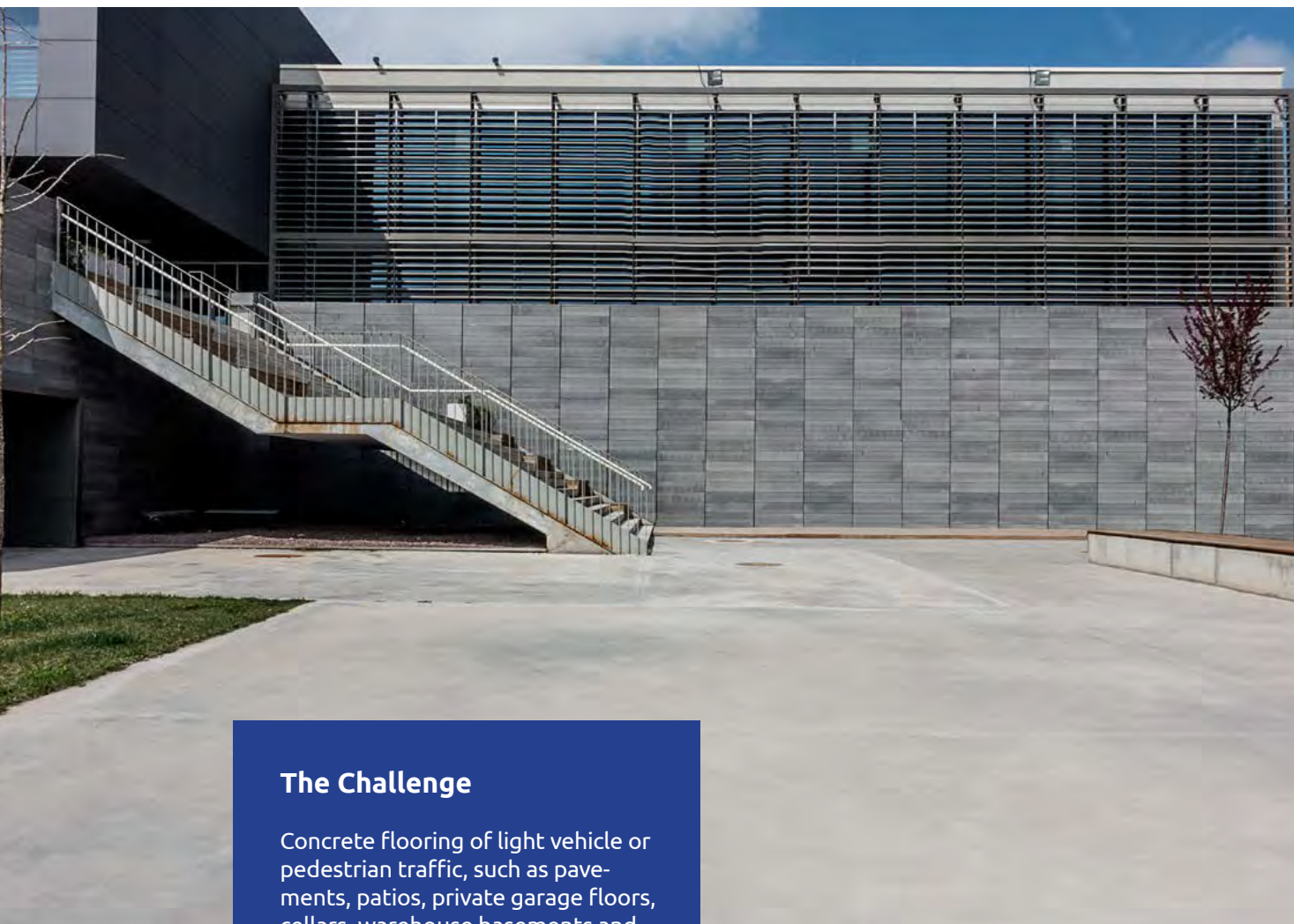
**At least 3 yrs** for pedestrian traffic flooring and **8 yrs** for vertical masonry application, upon proper application/installation.



*Application of SurfaPaint Stone Varnish WB on travertino natural stone tiles.*



## 30.

LOW TRAFFIC, BASEMENT,  
CONCRETE FLOOR PROTECTION

## The Challenge

Concrete flooring of light vehicle or pedestrian traffic, such as pavements, patios, private garage floors, cellars, warehouse basements and others require coating protection. The coatings except for aesthetic reasons are responsible for maintenance of the construction and for avoiding future damages (such as loss of material, degradation, stains). However, most prominent solution is based on epoxy floor decking. How protection and aesthetic appearance can be achieved, without the trouble and cost of sophisticated epoxy solutions?

BILL OF  
MATERIALS

- SurfaMix C 10%v/w
- SurfaPore FX WB 4m<sup>2</sup>/L
- SurfaMix P SB 8m<sup>2</sup>/L
- SurfaPaint Floor Paint 4m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- Very easy to apply and maintain.
- Cost effective, comparing to epoxy alternatives.
- Much durable for pedestrian and light vehicle traffic.
- Maintains the texture of cement flooring.

## The Solution

Before protecting a concrete floor surface, mechanical strength should be taken care of and water ingress from below the floor should be avoided: SurfaPore FX WB is the only solution to the above challenge. SurfaMix P SB is the primer between the waterproof, hydrophobic SurfaPore FX WB treated substrate and the subsequent SurfaPaint Floor Paint. SurfaPaint Floor Paint is a revolutionary coating formulation by NanoPhos for interior and exterior concrete surfaces. It offers an easy, safe, fast and long-lasting solution to floor protection and decoration. It was developed to address the needs for easy application, stain resistance and solid adhesion, on concrete floors. It provides a solution to a common problem: horizontal coatings are prominent to staining by water or oil-based stains (fuel, engine oil, grease, tire streaks). SurfaPaint Floor Paint prevents stain absorption due to its dense and durable coating matrix. All-in-all, SurfaPaint Floor Paint is ideal for interior or exterior use on concrete surfaces as it has excellent wear, impact and abrasion resistance, in mild pedestrian or low vehicle traffic conditions. It resists chemicals and standing water and has long lasting damage resistance. Applicable for protection against UV and weather wearing, as well as hot tyres and chemicals.

## Application

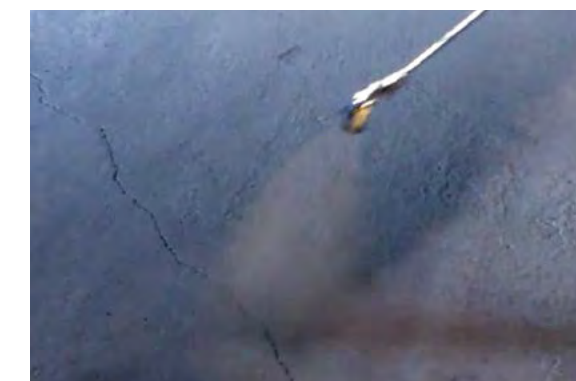
If new, make sure that the concrete floor has cured for at least fifteen days before application. Fill surface voids, gaps or cracks with repairing cement and SurfaMix C. Add water and SurfaMix C in small quantities (10% per weight) so as to prepare a workable repairing cement plaster. Apply SurfaPore FX WB by using brush, roller or airless sprayer. On very absorptive or worn surfaces reapply after 15 minutes. Suggested application temperature is 5-35°C. **Drying time/Curing time:** Touch dry time is 30 minutes, depending on the relative humidity level and temperature. Maximum SurfaPore FX WB performance is achieved 30 days post application. After 24 hours, proceed with priming. The application surface should be dry and clean. Any oily residues must be removed from the application surface, first. Use airless sprayer gun, roller or brush for the application of SurfaMix P SB. Apply a

single coat at a consumption rate of 125mL per square meter, depending on the absorption of the substrate.

**Application temperature:** 5-35°C. It is recommended the modified surface not to be exposed to extreme weather conditions for 1-2 days after application. Application of SurfaPaint Floor Paint coating is recommended 24h after the application of SurfaMix P SB. SurfaPaint Floor Paint can be applied directly on the primed surface. Adverse environmental conditions and/or humidity (>80%RH) during or immediately after application may affect the coating's performance or drying properties. Ensure all surfaces are clean and dry prior to application. Remove any dust and dirt. Stir the container of SurfaPaint Floor Paint thoroughly with a flat paddle until homogeneous and occasionally during use. Application temperature should be between 10-40°C and the relative humidity should be between 10% - 80% RH. Apply two coats: each coat at a consumption rate of 125mL per square meter, depending on the absorption of the substrate. **Recoat-ing time:** 2h. **Drying Time: Touch dry:** 30 min @ 25°C, **overcoating:** 2h @ 25°C, **Pedestrian traffic:** 16h @ 25°C, **Vehicle traffic:** 72h @ 25°C. Low temperatures and high humidity will lengthen drying times.

## Expected Useful Life

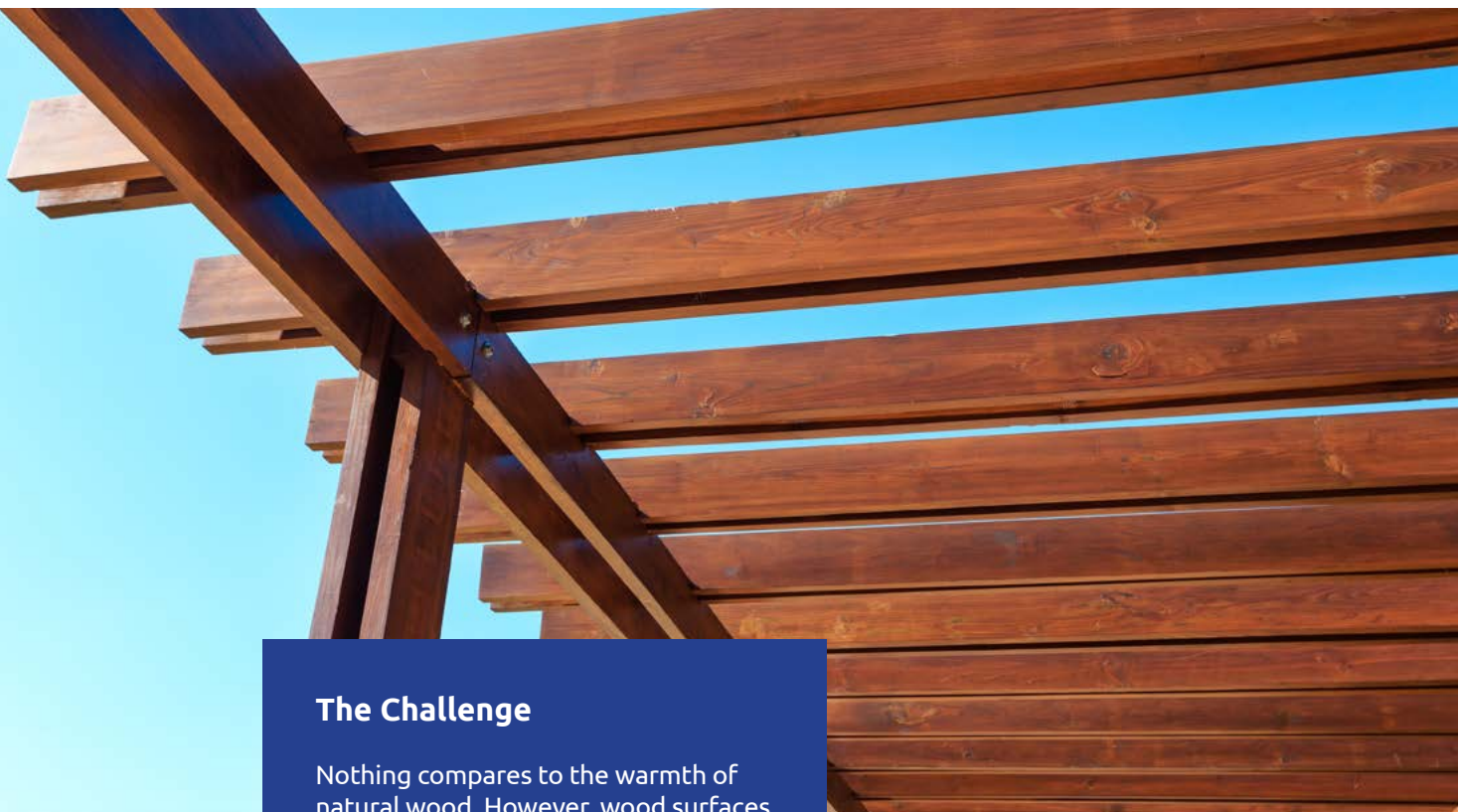
**At least 5 yrs** for pedestrian traffic flooring and **3 yrs** for mild vehicle traffic flooring, upon proper application/installation.



Application of SurfaPaint Floor paint on a warehouse cement floor.



## 31.

WATER, UV LIGHT AND STAIN  
WOOD PROTECTION

## The Challenge

Nothing compares to the warmth of natural wood. However, wood surfaces are susceptible to a) water ingress, b) staining, c) dimensional stability (warping) d) UV irradiation silvering and e) fungi, bacterial and woodboring insect attacks. As wood is a natural, almost living organism, threats are numerous. How can a coating enhance aesthetical appearance, intensify natural appearance and protect from all above at the same time?

*Wood pergola treated with SurfaPaint Wood Stain and SurfaPaint Wood Varnish - UV Blocker five years after application under Mediterranean sun, next to Mediterranean Sea.*



*Natural wood surface on SurfaPaint Wood Varnish (W04 Walnut Finish).*

BILL OF  
MATERIALS

- SurfaPaint Wood Stain 5m<sup>2</sup>/L
- SurfaPaint Wood Varnish – UV Blocker 5m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- Excellent waterproofing and stain resistance staining formulation.
- Prevents visual degradation and discoloration of wood by solar light and UV irradiation.
- Deep, uniform colour staining.
- Enhances the appearance of natural wood grains.
- Highly flexible - no cracking.
- Excellent weathering resistance.
- Rub and scratch resistance.
- Excellent adhesion on natural wood.
- Prevents hot water whitening.
- Water based and Low-Odour.

## The Solution

SurfaPaint Wood Stain is a high quality, water-based, clear or coloured impregnation stain varnish that protects any interior and, especially, exterior wooden surface from weathering and water or oily stains. Easy to apply and recommended both for DIY and industrial applications. Ideal when decorative application should be combined with wood protection from staining. SurfaPaint Wood Stain creates a deep penetrating, thin and transparent, protective film with excellent properties, in terms of adherence, durability and scratch resistance. It is ideal for uses such as doors, windows, frames, claddings, fences, pergolas and any stained or natural wooden surface. SurfaPaint Wood Stain is a wood impregnation formulation that enhances the appearance of natural wood grains. It prolongs the life-time of your wooden surfaces. It is recommended for new or untreated wood surfaces. Available as a clear coating or in eight natural shades: TR Transparent, C01 Cherry, O02 Oak, WM03 Medium Walnut, W04 Walnut, CH05 Chestnut, M06 Mahogany, G07 Green, B08 Blue, W09 White. Other colour shades are available on demand. But what about a wood "sunscreen"? How can the detrimental effect of Depleted Ozone Hole (DOH) not affect wooden surfaces? An overcoat with SurfaPaint Wood Varnish UV Blocker provides extra irradiation protection and satin finish. SurfaPaint Wood Varnish UV Blocker contains UV blocking ingredients (HALS compounds) that eliminate irradiation threat and maintain the original appearance of the surface protected.

*Note: As per Biocidal Products Regulation (BPR, Regulation (EU) 528/2012) adopted by European Union countries, SurfaPaint Wood formulations are biocide ingredients free, when to be applied in European Union member states.*

## Application

Wooden surfaces must be clean, dry and rubbed down with a suitable abrasive paper (in case of unpainted

surface). Use methylated spirits to remove oil excess, especially from tropical wood (e.g. teak wood). SurfaPaint Wood Stain is ready to use. Brush thinly and evenly working varnish well into the grain. Maintain a wet edge when painting. Thick coats wrinkle when dry. Avoid bubbles. Stir well before use. Apply 2 coats for good protection and 3 coatings for excellent protection. 3 coatings application may increase the colour depth. Do not over-brush. Additional coats should be applied 3-4 hours after the previous application. Lightly sand between coats if necessary, with fine sandpaper. Do not apply SurfaPaint Wood Stain if another wood stain or varnish system has been already applied and not adequately removed. **Consumption rate:** 10-12m<sup>2</sup>/L per coat, depending on surface absorption. **Cleaning:** All tools and equipment should be cleaned immediately after use with water and soap. Repeat application as above with SurfaPaint Wood Varnish – UV blocker, minimum after 3-4 hours after the application of SurfaPaint Wood Stain. Application of SurfaPaint Wood Varnish – UV blocker on SurfaPaint Wood Stain freshly coated surfaces does not require any previous cleaning or abrasive rubbing.

## Expected Useful Life

**At least 8 yrs**, upon proper application/installation.



*Rainwater droplets on SurfaPaint Wood Stain treated deck (left), in contrast to conventional wood stain treated surface (right).*



## 32.

## PLASTER/RENDER THERMAL AND WATER INSULATION

## The Challenge

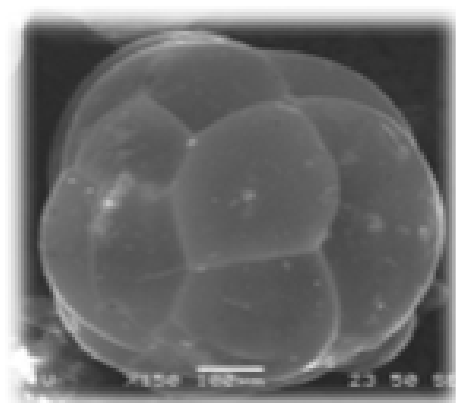
Plasters or renders are among most abundant building elements, used for the protective or decorative coating of walls and ceilings. The most common types of render/plaster mainly contain either gypsum, lime, or cement but all work in a similar way: The plaster is manufactured as a dry powder and is mixed with water to form a stiff but workable paste immediately before it is applied to the surface. The reaction with water liberates heat through crystallization and the hydrated plaster then hardens. This process is well experienced in buildings since ancient years.

As render/plasters are practically "dressing" every building, they are an "amazing" platform for functionalization. Indeed, since last decade, efforts have been made to create thermal insulating plasters by adding either polystyrene beads (poor mechanical properties, reduces workability, mediocre thermal conductivity) or perlite particles (increased water absorptivity that eliminates initial conductivity).

However, a unique formulation that could combine a) the ... world record for lowest plaster thermal conductivity, b) mechanical strength as the original plaster, c) water insulating properties, d) breathability, e) excellent fire rating and f) sound absorbing properties does not yet exist. Or is it?



Gentoo Penguins



Closed pack structure of thermal insulating particles

## BILL OF MATERIALS

- SurfaMix P WBQ 8m<sup>2</sup>/L
- FeatherPlast PA250F 0,78m<sup>2</sup>/L for d = 1mm or FeatherPlast PA1200D 1,08m<sup>2</sup>/L for d = 1,5mm or FeatherPlast PT400W/G 0,23Kg/m<sup>2</sup> for d = 5mm

## WHY NANOPHOS SYSTEM?

- Excellent Thermal Insulating - Extremely low thermal conductivity value  $\lambda$
- Lightweight
- Weathering resistant - does not crack
- Water repelling
- Highly breathable
- Excellent adhesion on substrate
- Sound absorbent
- Fire retardant
- Energy conserving
- Excellent workability
- Ready-to-mix

## The Solution

When thermal energy is transferred through walls and other surfaces, large amounts of energy are often necessary for cooling in the summer and heating in the winter. FeatherPlast family products are masonry, both water and heat insulating product. Gentoo penguin has inspired the development of FeatherPlast, for their thermal insulating and waterproof properties. To insulate himself, Gentoo penguin uses a thick, air-filled, waterproof coat, similar to a waterproof open-cell foam. Thus, he eliminates thermal conduction and reduces radiative and convective heat losses to a minimum. As such, FeatherPlast products use particles which are composed of many tiny closed air cells that provide a cellular structure resulting to its excellent insulation properties. FeatherPlast PT400 helps reducing overall material and labour costs, while improving thermal efficiency and lowering heating/cooling costs.

In contrast to conventional, perlite or polystyrene rendering and plastering mortars, FeatherPlast plasters/renders combine three unique elements: Extremely low thermal conductivity, improved mechanical strength and plasticity that underlines a crack-free behaviour, even in extreme weathering conditions.

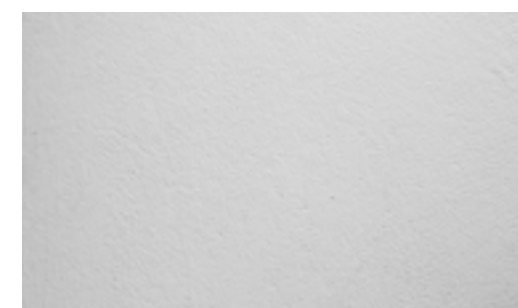
**FeatherPlast PT400W/G** combines three unique elements: Extremely low thermal conductivity ( $\lambda = 0,048$  W/(mK)), improved mechanical strength and plasticity that underlines a crack-free behaviour, even in extreme weathering conditions.

**FeatherPlast PA250F** is a unique acrylic, thermal protective plaster with low thermal conductivity ( $\lambda = 0,102$  W/(mK)), high reflectance to the incident heat (IR) radiation and resistance to weathering or mould growth.

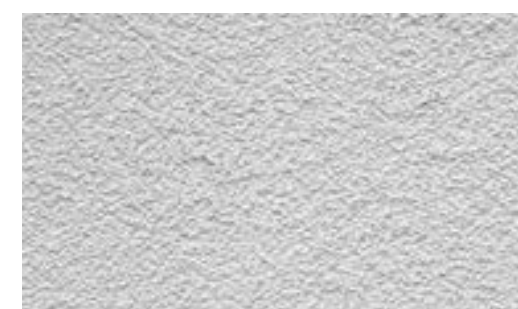
**FeatherPlast PA1200D** is a unique acrylic, thermal protective plaster, it combines three unique elements: Low thermal conductivity ( $\lambda = 0,093$  W/(mK)), high reflectance to the incident heat (IR) radiation and resistance to weathering or mould growth.



FeatherPlast PT400 finish.



FeatherPlast PA250F finish.



FeatherPlast PA1200D finish.



The following tables summarize the unique properties of FeatherPlast product family:

Conventional Cementitious		FeatherPlast PT400W/G
Perlite Plastering Mortar		Plastering Mortar
Thermal Conductivity	0,290 W/(mK)	0,048 W/(mK)
Coverage	1,25 Kg/m <sup>2</sup> for d=1mm	0,45 Kg/m <sup>2</sup> for d=1mm
	Requirements for covering 1sqm @ d=10mm	
Mass/Volume per sqm	12,5 Kg	4,5 Kg
Thermal Resistance R	0,0345 (m <sup>2</sup> .K)/W	0,2083 (m <sup>2</sup> .K)/W
	Requirements for Thermal Resistance R=0,15 (m <sup>2</sup> .K)/W	
Thickness	43,5 mm	7,2 mm
Mass/Volume per sqm	54,38 Kg	3,24 Kg

*FeatherPlast PT400 W/G performance comparison with a conventional perlite-based render.*

Conventional Acrylic		FeatherPlast PA250F
Plaster		Acrylic Fine Plaster
Thermal Conductivity	0,700 W/(mK)	0,105 W/(mK)
Coverage	1,80 Kg/m <sup>2</sup> for d=1mm	0,90 Kg/m <sup>2</sup> for d=1mm
Density	1,82 Kg/L	0,775 Kg/L
	Requirements for covering 1sqm @ d=1mm	
Mass/Volume per sqm	1,80 Kg or 0,99 L	0,90 Kg or 1,16 L
Thermal Resistance R	0,0014 (m <sup>2</sup> .K)/W	0,0095 (m <sup>2</sup> .K)/W
	Requirements for Thermal Resistance R=0,10 (m <sup>2</sup> .K)/W	
Thickness	70,0 mm	10,5 mm
Mass/Volume per sqm	126,0 Kg or 69,2 L	9,5 Kg or 12,2 L

*FeatherPlast PA250F performance comparison with a conventional acrylic plaster.*

Conventional Acrylic		FeatherPlast PA1200D
Plaster		Acrylic Plaster
Thermal Conductivity	0,700 W/(mK)	0,093 W/(mK)
Coverage	1,80 Kg/m <sup>2</sup> for d=1mm	0,90 Kg/m <sup>2</sup> for d=1mm
Density	1,82 Kg/L	1,00 Kg/L
	Requirements for covering 1sqm @ d=1,5mm	
Mass/Volume per sqm	2,7 Kg or 1,48 L	1,35 Kg or 1,35 L
Thermal Resistance R	0,0021 (m <sup>2</sup> .K)/W	0,0161 (m <sup>2</sup> .K)/W
	Requirements for Thermal Resistance R=0,10 (m <sup>2</sup> .K)/W	
Thickness	70,0 mm	9,3 mm
Mass/Volume per sqm	126,0 Kg or 69,2 L	8,4 Kg or 8,4 L

*FeatherPlast PA1200D performance comparison with a conventional acrylic plaster.*

## Application

SurfaMix P WQB can be applied directly on exterior or interior wall surfaces (masonry, concrete, plaster, drywalls), and wherever emulsion paints are to be applied. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Apply SurfaMix P WBQ, by using a roller and at a consumption rate of 8m<sup>2</sup>/L. Ensure that the primer formulation is well stirred before application.

**FeatherPlast PA250F:** The application surface must be free of dust, surface contaminants, grease, corrosion deposits and loose or friable materials. Special attention should be given to old-painted surfaces. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Apply by hand uniformly all over the surface using a spatula, so that the coat gets the size of the plaster grain. Wait until the coating has just begun to set and then use a special float or metal spatula to float the surface, according to the desired result. Suggested application temperature should be between 8-35°C. **Setting:** 24 hours in normal conditions and good ventilated areas. **Estimated consumption rate:** 0,78 L/m<sup>2</sup> (0,90 kg/m<sup>2</sup>), strongly dependent on the properties of the surface applied.

**FeatherPlast PA1200D:** The application surface must be free of dust, surface contaminants, grease, corrosion deposits and loose or friable materials. Special attention should be given to old-painted surfaces. New substrates from cement or masonry should have cured for more than 3-4 weeks before primer application. Apply by hand uniformly all over the surface using a spatula, so that the coat gets the size of the plaster grain. Wait until the coating has just begun to set and then use a special float or metal spatula to float the surface, according to the desired result. Suggested application temperature should be between 8-35°C. Stir well and homogenize by using a steel spatula.

**FeatherPlast PT400W/G:** The application surface must be free of dust, surface contaminants and loose or friable materials. Substrates should be thoroughly dampened, before the application of FeatherPlast PT400W/G. Avoid application on non-porous substrates (e.g. granite) without using a mesh net, so as to ensure proper adhesion. To ensure adhesion on

smooth surfaces (e.g. painted walls) score the wall at 10cm intervals before application. FeatherPlast PT400 W/G can be mixed using a drum or plasterer's paddle mixer in a tub (use only a quarter of the amount speed for gentle mixing) or by hand using a trowel. Initiate mixing by pouring a quarter of the amount of clean water into a flat-bed mixing container. Empty the FULL bag content slowly (do not use part bag mixes) into the same mixing container. Add a half of the amount of water to the mixture and proceed with thorough mixing. Continue adding the remaining water while mixing until the desired consistency and workability is achieved. Ensure that no dry material has escaped the mixing process. The plaster is applied by hand or by using a plastering pump machine for lightweight pre-mixed products. It is straightened by using a float or trowel and the plaster is then smoothed by hand, using a spongy float, after it has sufficiently set. Points and reference bands can be used in order to obtain the required thickness. Points and reference bands can be created with the same product. Alternatively, it is possible to use steel or wood edging. Apply successive layers after underlying substrate is left to dry for 24 hours. Do not exceed unique layer thickness by 15 mm. Wet substrate before application of each layer. Use appropriate plaster mesh when layers thickness is greater than 4cm. Working time depends on substrate absorptivity, ambient temperature and water content of the mixture. If the mixture has been left standing for a while and has become slightly stiff, then mix again by hand or mechanically and if needed add a small amount of water while mixing to soften. **Setting:** Three (3) days in normal conditions and good ventilated areas (depends on the weather and the thickness application). Protect during setting time from harsh weather conditions such as frost, rain, direct sunlight and extreme temperature changes. **Estimated consumption rate of dry powder:** 4.5 kg/m<sup>2</sup> per 10 mm of thickness.

## Expected Useful Life

**At least 30 yrs**, upon proper application/installation. All the way that the paint is applied on substrate's surface.



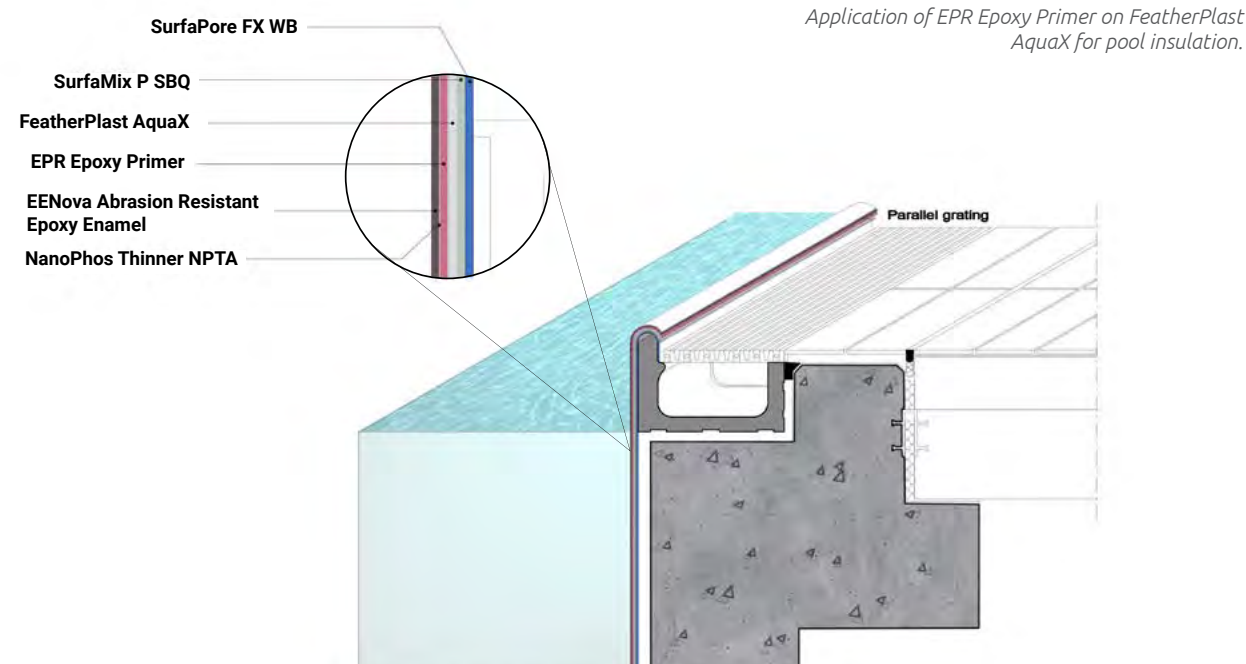
# 33.

## POOL INSULATION (NO TILING)



### The Challenge

Apart from the aesthetic result, coating application on pools is a challenging project for the following reasons: a) hydrostatic pressure of water is a permanent weight load on coating system and can range from 1,1atm to 2,0 atm (depth 1-10m), b) the coating system should present elasticity to withstand dimensional changes resulting from temperature or load stresses on the pool surface. The solution presented by NanoPhos refers to a pool insulation system that will not be tiled; therefore, the coating system will be visible and in contact with the pool water.



### BILL OF MATERIALS

- SurfaPore FX WB 4m<sup>2</sup>/L
- SurfaMix P SBQ 6m<sup>2</sup>/L
- FeatherPlast AquaX 2,67 Kg/m<sup>2</sup> for d=2mm
- EPR Epoxy Primer 3,00m<sup>2</sup>/L (total EPR DFT = 200µm)
- EENova Abrasion Resistant Epoxy Enamel 4,00m<sup>2</sup>/L (total EENova DFT = 150µm)
- NPTA NanoPhos Thinner A 17,40m<sup>2</sup>/L

### WHY NANOPHOS SYSTEM?

- Simple, easy to apply and efficient.
- Can stand high hydrostatic pressure that exceed 5 atm.
- Elastic – absorbs stresses without cracking.
- Abrasion resistant on Nova technology.
- Tintable to any RAL shade.

### The Solution

NanoPhos offers a system set of three products: SurfaPore FX WB will penetrate deep, restore the strength of the substrate and induce a waterproofing barrier. SurfaPore FX WB penetrates deeply in the mass of the cementitious substrate, creating a barrier against liquid water movement. At the same time SurfaPore FX WB will increase the strength of the cementitious substrate and protect from cracks; even under heavy loads. SurfaMix P SQB is applicable as a primer on the hydrophobic SurfaPore FX WB substrate and contains quartz sand that will make the subsequent FeatherPlast AquaX formulation bond efficiently. On the other hand, FeatherPlast AquaX is a waterproof, breathable cementitious mix, ideal for repairing the cracks and holes, created during the reparation of the original surface. FeatherPlast AquaX is a unique paint top-coat that acts as a water barrier (intense water beading effect and water repellence), combined with a smooth finish. Finally, epoxy technology that NanoPhos has developed from the oceangoing marine applications, EPR Epoxy Primer and EENova Abrasion Resistant Epoxy Enamel completely seal and insulate the pool substrate. Both epoxy formulations present elasticity and withstand heavy abrasion loads. All in all, the proposed system can withstand the water pressure load and meet the needs of modern pool insulation without unreasonable cost and application effort.

### Application

Using a spatula, remove all loose material from the application substrate area. Make sure that after removal of loose material, the application surface area is dry, free of mould, dirt, dust or oily residues. Apply SurfaPore FX WB and allow for one day curing. Apply SurfaMix P SBQ as a primer. Three hours after priming, apply FeatherPlast AquaX. FeatherPlast AquaX can be mixed using a drum or plasterer's paddle mixer in a tub (gentle mixing) or by hand using a trowel. Initiate mixing by pouring a quarter of the amount of clean water into a flat-bed mixing container. Empty the full 25Kg bag content slowly (do not use part bag

mixes) into the same mixing container. Add a half of the amount of water to the mixture and proceed with thorough mixing. Continue adding the remaining water while mixing until the desired consistency and workability is achieved. The cementitious mix is applied by hand trowel or by using a plastering pump machine for cementitious premixed products. Prevent applying thickness greater than 1mm for each application round to avoid cracking. Allow FeatherPlast AquaX to cure and dry-off for at least five days. The application of epoxy coatings can be done through conventional sprayers, airless sprayers and rollers. These are indicative methods of application and it is to the judgement of each applicator which method will be applied. Brush or roller application is recommended for stripe coating or small areas. Substrate temperature should be minimum 5° above the environmental temperature and at least 3°C above air dew point. Good ventilation is required to ensure proper drying. Stir or shake thoroughly before use and occasionally during application. Read all label and Material Safety Data Sheet (SDS) information prior to use. For the EPR Epoxy Primer apply two coats at 6 m<sup>2</sup>/L each one and within three hours from each other. For EENova Abrasion Resistant Epoxy Enamel, one coat application of 4 m<sup>2</sup>/L is feasible.

**Airless Spray - Minimum requirements:** Pressure 3000 psi, tip 0.039", flow rate 4 gal/minute. Spray equipment must be handled with due care and in accordance with manufacturer's recommendations. High pressure injection of coatings into the skin by airless equipment may cause serious injury.

**Brush:** China Bristle Brush for small areas.

**Roller:** 3/4" -1" nap lamb wool for smooth surfaces 1" nap lamb wool for rough surface.

**Thinning:** Dilute up to 8% v/v with NPTA NanoPhos Thinner A.

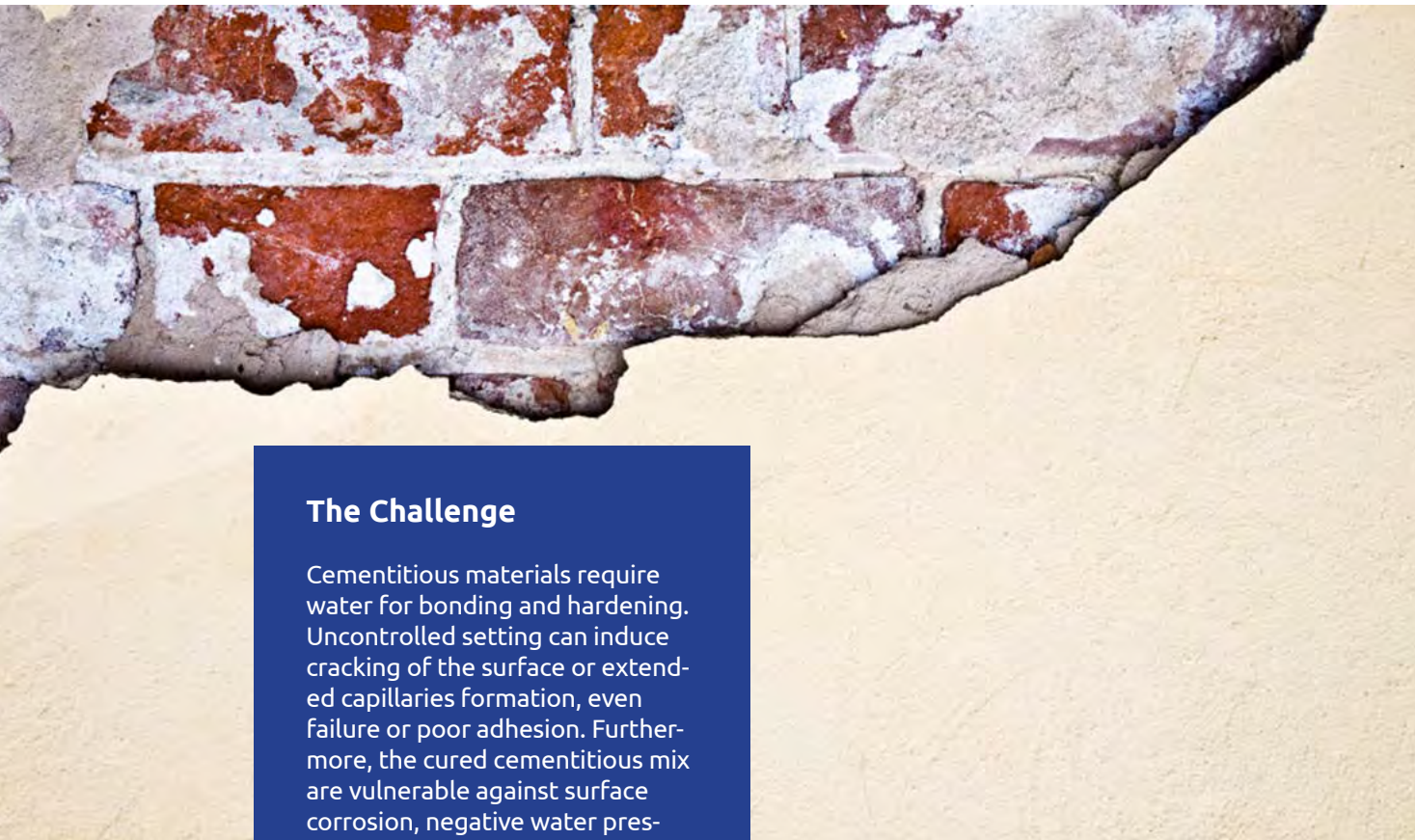
Tools must be cleaned immediately after the application with NPTA NanoPhos Thinner A, soap and water.

### Expected Useful Life

**At least 15 yrs**, upon proper application/installation.



## 34.

ELASTICITY AND WORKABILITY  
OF CEMENTITIOUS MIXTURES

## The Challenge

Cementitious materials require water for bonding and hardening. Uncontrolled setting can induce cracking of the surface or extended capillaries formation, even failure or poor adhesion. Furthermore, the cured cementitious mix are vulnerable against surface corrosion, negative water pressure, frost threat and extreme weather conditions.

*Performance comparison of weathering effect between SurfaMix C (lower part) and a Latex SBR render (upper part) after three years exposure in Mediterranean environment.*

## Cementitious Mix



*Depiction of how SurfaMix C works: Cementitious materials require water for bonding and hardening. Uncontrolled setting can induce cracking of the surface or extended capillaries formation (left side). SurfaMix C controls the water reaction with cementitious materials, decreasing rapid shrinkage and cracking. At the same time, a bonding grid fills the microscopic gaps, enhances the elasticity of the material and promotes bonding on the application surface (right side).*

## SurfaMix C Addition

BILL OF  
MATERIALS

- SurfaMix C 5-10% per dry cement content

WHY  
NANOPHOS  
SYSTEM?

- Enhances (doubles) adhesion
- Promotes bonding
- Improves workability
- Prevents cracking
- Reduces water penetration
- Reduces/eliminates lime use
- Latex SBR free
- UV and weather resistant (does not become yellowish)
- Extends working time
- Can be applied as a primer

## The Solution

SurfaMix C is a water-based, latex-free admixture for cementitious mortars, grouts, renders and plasters that enhances adhesion and bonding on application surfaces. Further, it improves elasticity and reduces cracking, shrinkage and the formation of water absorbing capillaries. SurfaMix C is an ideal admixture for exterior or interior masonry coatings, patch, repair and re-profiling mortars, mortar grout and as an enhancing agent for adhesive materials used when laying ceramic tiles and stones. It reduces surface dusting on floor screeds/overlays and can be used as a primer to improve the adhesion of surfaces. SurfaMix C improves workability and extends the working time of the mix. Furthermore, it reduces water absorption by up to 70%.

SurfaMix C is a completely water based, liquid formulation. It can be mixed with cementitious powders to enhance their adhesion and bonding on application surfaces. SurfaMix C makes mixing easier and setting times can almost double, enabling larger mix volumes and increasing workability during application. Due to its concentrated formulation, SurfaMix C is added in small quantities (5-10% per weight) and always as a function of the cement content and not of the total mix, that may include water and inert material (sand gravel, lime, etc.). The use of lime in renders, plasters or exterior coatings may be significantly reduced, due to the doubling in adhesion and bonding strength of the mix.

How SurfaMix C works? In any cementitious mix, the addition of water is essential for setting, curing and the development of mechanical strength. Water promotes a process called hydration. During hydration, individual cement particles react with each other and create a strong and durable solid phase. Most frequently, the hydration process is inefficient, resulting in extensive cracking, failure or poor adhesion of the cured cement. The active ingredients of SurfaMix C control the hydration process and prevent the shrinkage and subsequent failure of the final product. Simultaneously, an extended network of material fills the void volume of the cement and promotes surface ad-

hesion and bonding. This also reduces surface dusting. The final SurfaMix C modified material remains visually unchanged, even though its elasticity and mechanical properties are enhanced. Individual nanoparticles exhibiting water repelling properties dress the pores of the mix and reduce water absorption. This process results in renders, plasters or cement surfaces that are very resilient to weathering. For example, it prevents unwanted moisture, that may rise through the structure (i.e. rising damp) or penetrate from the outside (i.e. condensation). Finally, the cured cementitious mix is more durable against surface corrosion, negative water pressure, frost threat and extreme weather conditions. As a result, SurfaMix C modified cement surfaces last longer.

## Application

Do not add or mix SurfaMix C with cement for load bearing structures.

**Mixing:** Add SurfaMix C directly in the cementitious mix, at a ratio of 5-10% by weight of the cement used. Alternatively, add 2,5 - 5 Kg of SurfaMix C for every 50 Kg of cement. Adding SurfaMix C can reduce or eliminate the use of other binding agents (e.g. lime) in the mix.

**Surface Application:** When placing a cementitious mix on top of an existing surface, enhance adhesion by applying SurfaMix C, using a roller or a brush. The application surface should be dry and clean. SurfaMix C can be diluted by up to 1:5 with water (1 part SurfaMix C and 4 parts of water).

For improved water repellence use SurfaPore C on dry cement-based surfaces.

## Expected Useful Life

**Lifetime, upon proper application/installation.** All the way that the plaster or render is applied on substrate's surface.



## 35.

ACTIVE SELF-CLEANING,  
ANTI-POLLUTION PAVEMENT SLABS

## The Challenge

Pavement slabs and cement blocks occupy significant area in urban environment. Moreover, they are usually placed next to highly polluted areas, like roads or highways. How is it possible to turn those surface areas into a forest of depolluting trees, ...without planting trees? Is nanotechnology able to turn those blocks into light-activated machines that enhance outdoor air quality?

Industrial application of SurfaShield Cx on pavement slabs.



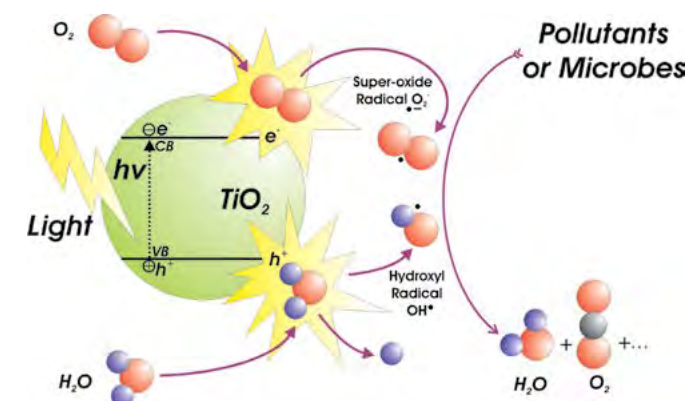
The effect of SurfaShield Cx in the fungi-rich environment of Norway, six months after installation.

BILL OF  
MATERIALS

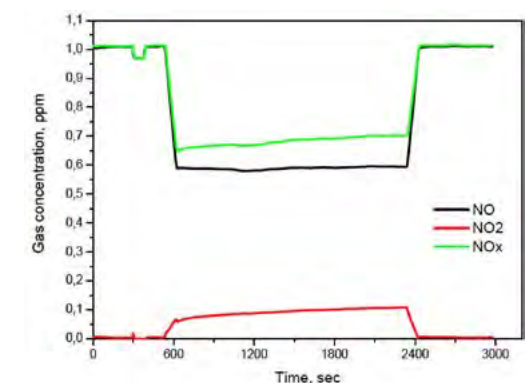
- SurfaShield Cx 4m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- Easy to apply at industrial level without heating.
- Transforms building surfaces to self-cleaning.
- Does not consume – light activated.
- Inorganic formula that stays unaffected by weathering.



Photocatalytic mechanism depiction: Light activates the titanium dioxide nanoparticles to produce radicals, capable of burning (oxidizing) organic or inorganic pollutants at room temperature.



Experimental results during ISO EN 22197 (2007) photocatalytic performance certification process. SurfaShield Cx illumination resulted into a steep reduction of NOx pollutants.

## The Solution

By harnessing the surrounding light, treated surfaces become Self-Cleaning and Self-Sterilizing. SurfaShield Cx coated surfaces efficiently decompose organic stains, bacteria, mould and gaseous pollutants keeping the surface clean for a longer period. SurfaShield Cx decomposes organic stains and pollutants, prevents microbial growth, purifies the air, removes odours. It is an active nanotechnology formulation that can be easily applied on exterior porous surfaces, such as cement, render or plaster, mortar grout, walls, stones or even unpolished marble. By harnessing the surrounding light, treated surfaces become Self-Cleaning and Self-Sterilizing. SurfaShield Cx coated surfaces efficiently decompose organic stains, bacteria, mould, gaseous pollutants, even odours. Therefore, surfaces are safer, without the use of hazardous disinfectants or chemicals, and are preserved as new. SurfaShield Cx is for industrial use and can be applied by spray gun after manufacturing or after installation. By harnessing nanotechnology achievements, effectiveness, continuous and minimal change to the original natural appearance of the application surface are assured. SurfaShield Cx acts by absorbing surrounding light and transforming it in chemical power. As a semiconducting catalyst, SurfaShield Cx nanoparticles are activated by light to produce short-lived

oxidizing compounds: oxygen and hydroxyl radicals. Bacteria, Viruses, Mould, Gaseous Pollutants, Odours, Stains; they all decompose and break down to harmless inorganic compounds. Thus, the application surfaces remain actively clean. The treated surfaces become super-hydrophilic and as a result, pollutants are washed away. It also acts as an air purifier as it decomposes harmful organic substances such as volatile organic compounds (VOC), car exhaust fumes and nitrogen oxides (NOx). In this way, nanotechnology assures permanently cleaning and a safer environment just by absorbing light.

## Application

Shake or stir the container vigorously before use. The application surface should be dry and clean. Apply SurfaShield Cx by spray gun (airless, HVLP) after manufacturing or after installation. No dilution is required. Two applications are necessary in order to achieve the desired functionality of the coating. Re-apply after half an hour, time strongly dependant on weather conditions.

## Expected Useful Life

**Lifetime, upon proper application/installation.** All the way that SurfaShield Cx remains unscratched on substrate's surface.



# 36.

## CORROSION INHIBITION OF STEEL BARS



### The Challenge

Corrosion inhibition is crucial on substrates like steel bars: Even though cement is the perfect corrosion inhibitor due to the alkaline environment when steel bars are installed, the time period between production of steel bars and inside cement installation may reach six or even twelve months. Stored usually in open air or even next to sea salty environment, steel bars get corroded and, subsequently, become unacceptable by the end user. Plasticizing the steel bars is no solution: Any coating around steel bars should be completely inorganic; else, it might jeopardise the encasement of steel bars in load bearing concrete. Is there any inorganic coating that can delay corrosion without affecting the nature of steel bar itself?

*Steel bars need corrosion inhibitors to prevent corrosion development before installed in cement base.*

### BILL OF MATERIALS

- SurfaGuard Metals 6m<sup>2</sup>/L equals to SurfaGuard Metals 14, 1L/tn of 12mm Ø steel bar (= 1124m of 12mm Ø steel bars)

### WHY NANOPHOS SYSTEM?

- Hinders corrosive action and inhibits rust formation (up to 10 times), even in extreme environment (e.g. marine, high temperature).
- Extends the lifetime of the metal.
- Promotes the adhesion of metal paints and coatings.
- Application by dipping, brush or spraying.
- No need for heat treatment.



### The Solution

**SurfaGuard Metals** is a water-based, nanotechnology formulation that can be easily applied on metal surfaces to prevent corrosion. After application, double protection is achieved: The metal surface becomes passivated and a 3D nanoparticles network prevents corrosive agents to react with the metal. Thus, corrosion rate is delayed up to 10 times and the metallic gloss remains unchanged, even when exposed to a corrosive environment. SurfaGuard Metals can be applied easily, without heating and by using a brush, a roller or dipping. At the same time, SurfaGuard Metals prepares the metallic surface for paint application, as the adhesion of a polymer coating is enhanced. SurfaGuard Metals modifies chemically the metal surface to form a passive layer and creates a 3D protective network of nanoparticles which "block" the transfer of oxygen and water to the metal. As a result, the surface of the metal remains passivated and, at the same time, the corrosive agents cannot contact the metal surface. SurfaGuard Metals creates a protective surface preventing humidity and oxygen to come in contact with the metal. The induced (molecular

level) surface roughness increases the adhesion of polymer coatings. Therefore, metal paints will remain on the metal surface unaffected for a longer period of time. The application of SurfaGuard Metals in stainless steel helps to preserve its "gloss" and shiny appearance.

### Application

Shake the container vigorously before use. The application surface has to be clean and dry. Clean the surface, prior to application, with an alkaline, acidic or neutral cleaner or solvent. Apply SurfaGuard Metals by a) immersing the metal for 3 - 10 minutes, or b) spraying for 1-3 minutes or c) brushing 2 coats using a brush or a roller. After removal of the application excess, curing takes place within 2 hours in ambient temperature.

### Expected Useful Life

**Delays corrosion development by 3x to 10x times.**



## 37.

NON-POTABLE WATER  
TANK INSULATION

## The Challenge

Water insulation of non-potable water tanks is a challenging application as a) Insulation should be perfect for content that is (usually) rich in corrosive chemicals and extreme pH values, b) coating insulation should be able to follow the elasticity of concrete and c) earthquakes, vibrations, carbonation and corrosion fight against a successful and permanent insulation scheme.

*Septic tank preparation for a residential building in Greece. The reinforced concrete tank has to be perfectly insulated to prevent leakage to the neighbouring buildings.*

BILL OF  
MATERIALS

- AES Asphalt Epoxy Sealer 1 m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- **AES Asphalt Epoxy Sealer** is the only to combine epoxy and asphaltic technology.
- **AES Asphalt Epoxy Sealer** is easy and fast to apply.
- **AES Asphalt Epoxy Sealer** is the only to withstand high values of water hydrostatic pressure.
- **AES Asphalt Epoxy Sealer** is versatile in application areas and can be applied in absolute combination with the cementitious load bearing structure.
- **AES Asphalt Epoxy Sealer** is resistant to corrosive chemicals and extreme pH values.



## The Solution

AES Asphalt Epoxy Sealer combines two powerful elements of the water insulation industry: Epoxy resin and asphaltic component. Epoxy is durable, permanent, chemically inert and cannot decompose. Asphalt creates the perfect water barrier – both in vapour and liquid form. The fact that AES Asphalt Epoxy Sealer is a brushable formulation results in a seamless coating, which follows the substrate texture and prevents rupture that may result in waterproofing defects. AES Asphalt Epoxy Sealer is applied directly on the surface of the concrete tank. Applying AES Asphalt Epoxy Sealer assures that the load bearing structures of the tank will be free of internal water ingress, even if they are in direct contact with corrosive ingredients.

## Application

AES Asphalt Epoxy Sealer is a two-component formulation, where the Part A Base is mixed with Part B Hardener at equal volumes. After mixing Base and

Hardener, application of the mixture takes place by a roller, thick brush or sprayer. While brush application results in thick coatings, airless sprayer application can reach hidden spots and assure a more uniform application pattern. As AES Asphalt Epoxy Sealer is a 100% volume solids formulation, a consumption rate of 1L per m<sup>2</sup> will result in film thickness of 1mm. In case of extreme water pressures due to tank volumes exceeding 100m<sup>3</sup> or highly corrosive content that raises environmental concerns, increase consumption rate at 2L per m<sup>2</sup> or 2mm dry film thickness. Any subsequent structural element can be casted 12h after the application of AES Asphalt Epoxy Sealer. In case of interlocking elements (e.g. floor and wall element) apply AES Asphalt Epoxy Sealer at least in half the interlocking surface.

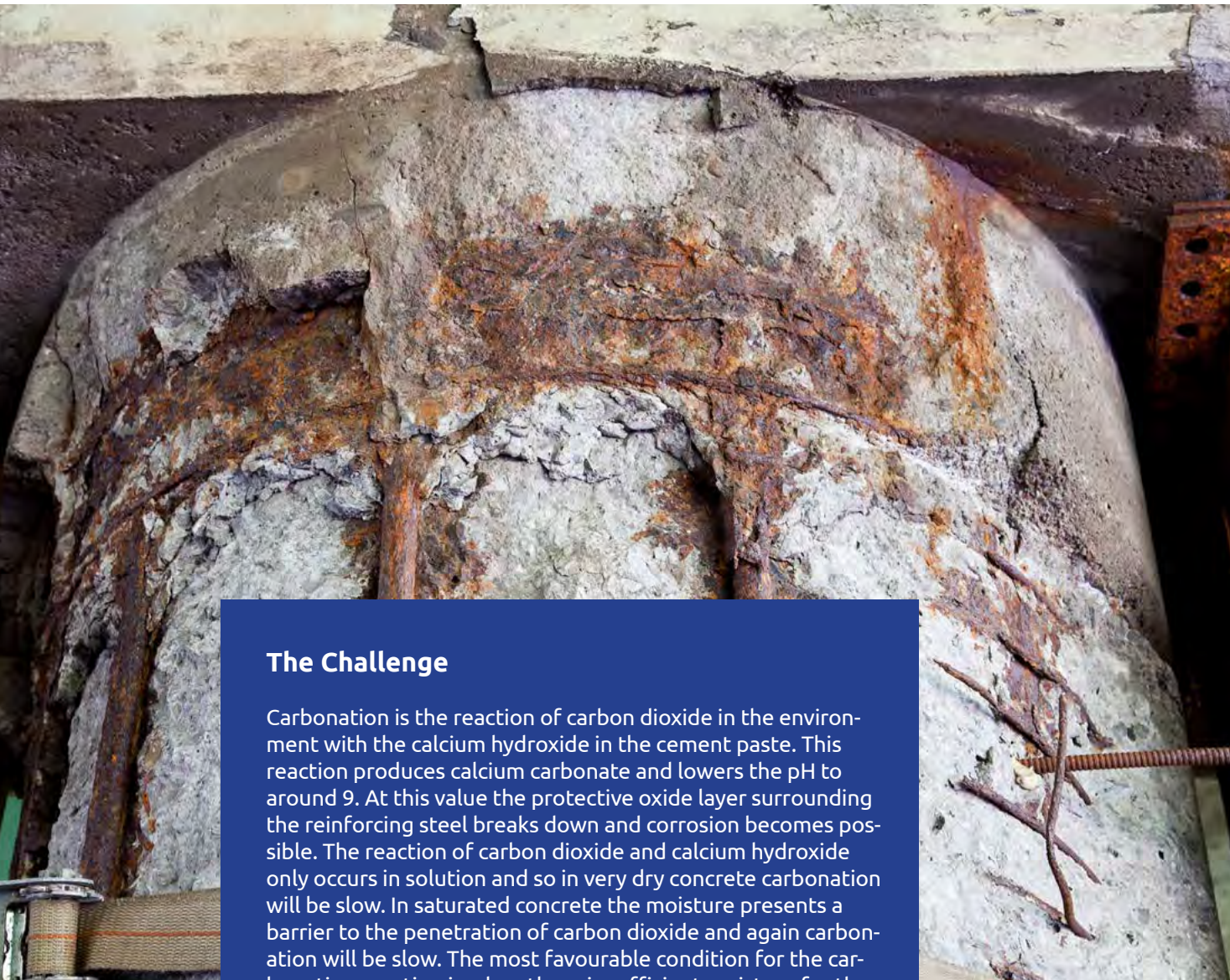
## Expected Useful Life

**Lifetime expected useful time**, upon proper application/installation.



# 38.

## CARBONATED CEMENT RESTORATION



Carbonation on a bridge cement pillar.

### The Challenge

Carbonation is the reaction of carbon dioxide in the environment with the calcium hydroxide in the cement paste. This reaction produces calcium carbonate and lowers the pH to around 9. At this value the protective oxide layer surrounding the reinforcing steel breaks down and corrosion becomes possible. The reaction of carbon dioxide and calcium hydroxide only occurs in solution and so in very dry concrete carbonation will be slow. In saturated concrete the moisture presents a barrier to the penetration of carbon dioxide and again carbonation will be slow. The most favourable condition for the carbonation reaction is when there is sufficient moisture for the reaction but not enough to act as a barrier. In most structures made with good quality concrete, carbonation will take several (or many) years to reach the level of the reinforcement. However, carbonation does appear very often and in most cases in buildings of significant load bearing, such as tunnels and bridges. Especially, urban bridges and tunnels that find themselves in a high carbon dioxide environment (vehicles and combustion engines exhaust fumes) the carbonation rate is much higher than average. In cases that carbonation appears (cracked cement with corroded steel bars) immediate restoration action is required.

### BILL OF MATERIALS

- SurfaPore FX SB 3m<sup>2</sup>/L
- SurfaGuard RCS – Rust Converter & Stabilizer 4 m<sup>2</sup>/L
- FeatherPlast AquaX 4 Kg/m<sup>2</sup> for d=3mm
- SurfaMix P SB 8m<sup>2</sup>/L
- SurfaPaint SCP Concrete Acrylic Enamel Paint 4m<sup>2</sup>/L

### WHY NANOPHOS SYSTEM?

- It assures both restoration and protection.
- Unique as per the natural pH restoration, due to nanoparticles of **SurfaPore FX SB**.
- Enhances mechanical strength of old concrete.
- Impermeable by water.
- Impermeable by carbon dioxide.
- Does not require grid blasting or power tooling for eliminating rust from steel bars.

### The Solution

NanoPhos can assist confirming carbonation degradation of concrete by supplying reactant indicators, such as phenolphthalein test: The phenolphthalein indicator solution is applied to a fresh fracture surface of concrete. If the indicator turns purple, the pH is above 8.6. Where the solution remains colourless, the pH of the concrete is below 8.6, suggesting carbonation. A fully-carbonated paste has a pH of about 8.4. - presented by Kimball J. Beasley, Journal of Performance of Constructed Facilities, Vol. 29, Issue 1, is indicative of the carbonation areas determination. NanoPhos can also provide testing for determining chloride (sea salt) depth of penetration. After determining and removing the carbonated areas by mechanical means, the use of SurfaPore FX SB helps in restoring the normal pH and increase the strength of cement. SurfaPore FX SB penetrates deep in the cementitious structure and the fact that it comprises of calcium hydroxide nanoparticles helps restoring the original nature of cement. The corroded steel reinforcement may be treated with SurfaPaint RCS – Rust Converter and Stabilizer to control further corrosion development and transform existing rust into passivated iron compounds that do not catalyse further degradation. Filling any gaps with FeatherPlast AquaX will help restoring natural humidity and prevent dissolvment of CO<sub>2</sub> in the structure. Finally, after priming with SurfaMix P SB, the use of SurfaPaint SCP Concrete Acrylic Enamel Paint concludes restoration and can assure that a CO<sub>2</sub> impermeable barrier exists. All-in-all, NanoPhos system assures that carbonated surfaces have been restored and no further carbonation phenomenon can occur.

### Application

Undertake hammer test to establish all loose areas of concrete. Hack off loose concrete from around the exposed steel bars. Ensure the cement surface is clean and free from dust, grease or other surface contaminants.

#### Apply SurfaPore FX SB on exposed cement surface:

Shake the SurfaPore FX SB container well before use. No dilution is required. Apply by using a brush, a roller or airless spray gun. Continue application up to saturation. Suggested application temperature is 5-35°C. Touch dry time is 30 minutes, depending on the relative humidity level and temperature.

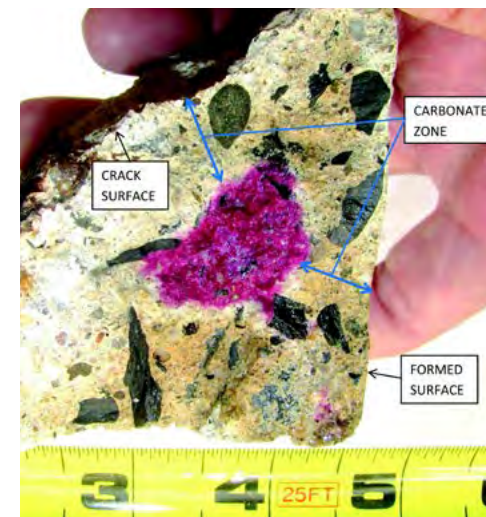
#### Apply SurfaPaint RCS – Rust Converter and Stabilizer on the exposed steel bars:

Make sure that loose rust flakes have been removed. Eliminate loose rust particles by using a metal brush and blow the dust away. SurfaGuard RCS can be applied with a brush or roller. Substrate temperature should be minimum 5°C above environmental temperature and at least 3°C above air dew point.

Good ventilation is required to ensure proper drying. Allow SurfaGuard RCS coating cure for minimum 6 hours before filling the gaps with cementitious repairing mortar.

#### Patch repair areas of concrete using FeatherPlast AquaX:

FeatherPlast AquaX can be mixed using a drum or plasterer's paddle mixer in a tub (gentle mixing) or by hand using a trowel. Initiate mixing by pouring a quarter of the amount of clean water into a flat-bed mixing container. Empty the full 25Kg bag content slowly (do not use part bag mixes) into the same mixing container. Add a half of the amount of water to



Carbonated and non-carbonated concrete areas, as per the phenolphthalein indicator test.

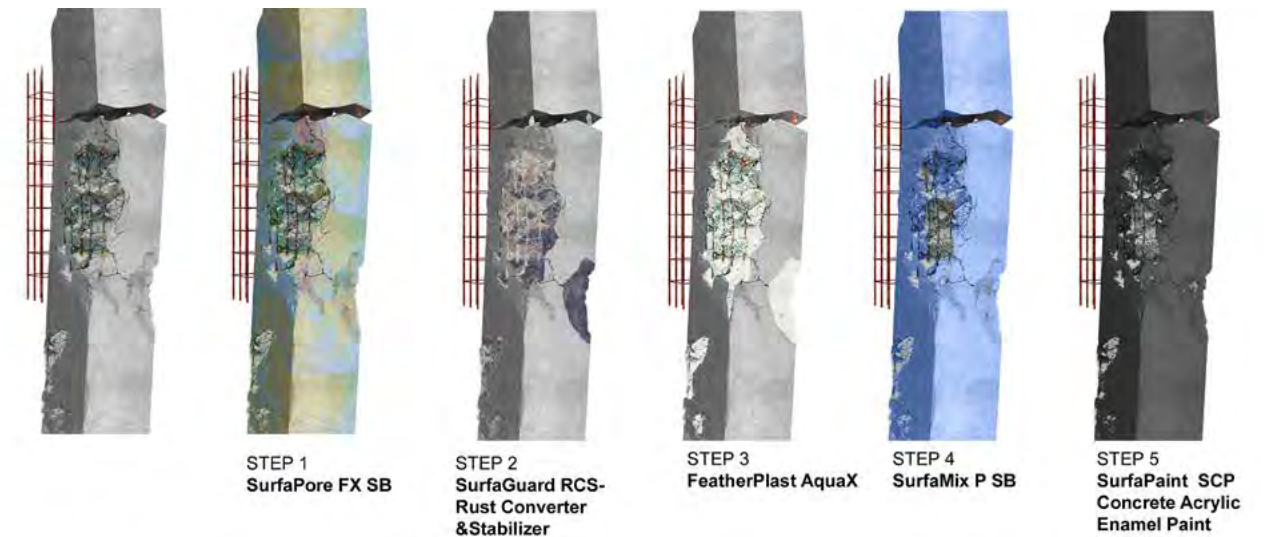




Carbonation on a highway bridge.



Damaged bridge support close-up.



3D illustration of the proposed system.

the mixture and proceed with thorough mixing. Continue adding the remaining water while mixing until the desired consistency and workability is achieved. The cementitious mix is applied by hand trowel. Prevent applying thickness greater than 1,5mm for each application round to avoid cracking. Allow minimum five days drying, before the application of paint primer SurfaMix P SB and SurfaPaint SCP Concrete Acrylic Enamel Paint.

#### Paint Priming:

Use airless sprayer gun, roller or brush for the application of SurfaMix P SB. Apply a single coat at a consumption rate of 125mL per square meter, depending on the absorption of the substrate. Application temperature: 5-35°C. It is recommended the modified surface not to be exposed to extreme weather conditions for 1-2 days after application. Application of SurfaPaint SCP Concrete Acrylic Enamel Paint coating is recommended at least 6h after the application of SurfaMix P SB.

#### Paint application:

Apply SurfaPaint SCP Concrete Acrylic Enamel Paint by using an airless sprayer or a roller, at a consumption rate of 8m<sup>2</sup> per L, per coat. Make sure that the roller is suitable for solvent based products. Apply two coats minimum. Each coat must be applied after minimum four hours the application of the previous one, at 20°C.

For both SurfaMix P SB and SurfaPaint SCP Concrete Acrylic Enamel Paint, use NPTB NanoPhos Thinner B if thinning is required. Thinner addition should not exceed 5-10% v/v. Use NPTB NanoPhos Thinner B for cleaning application equipment.

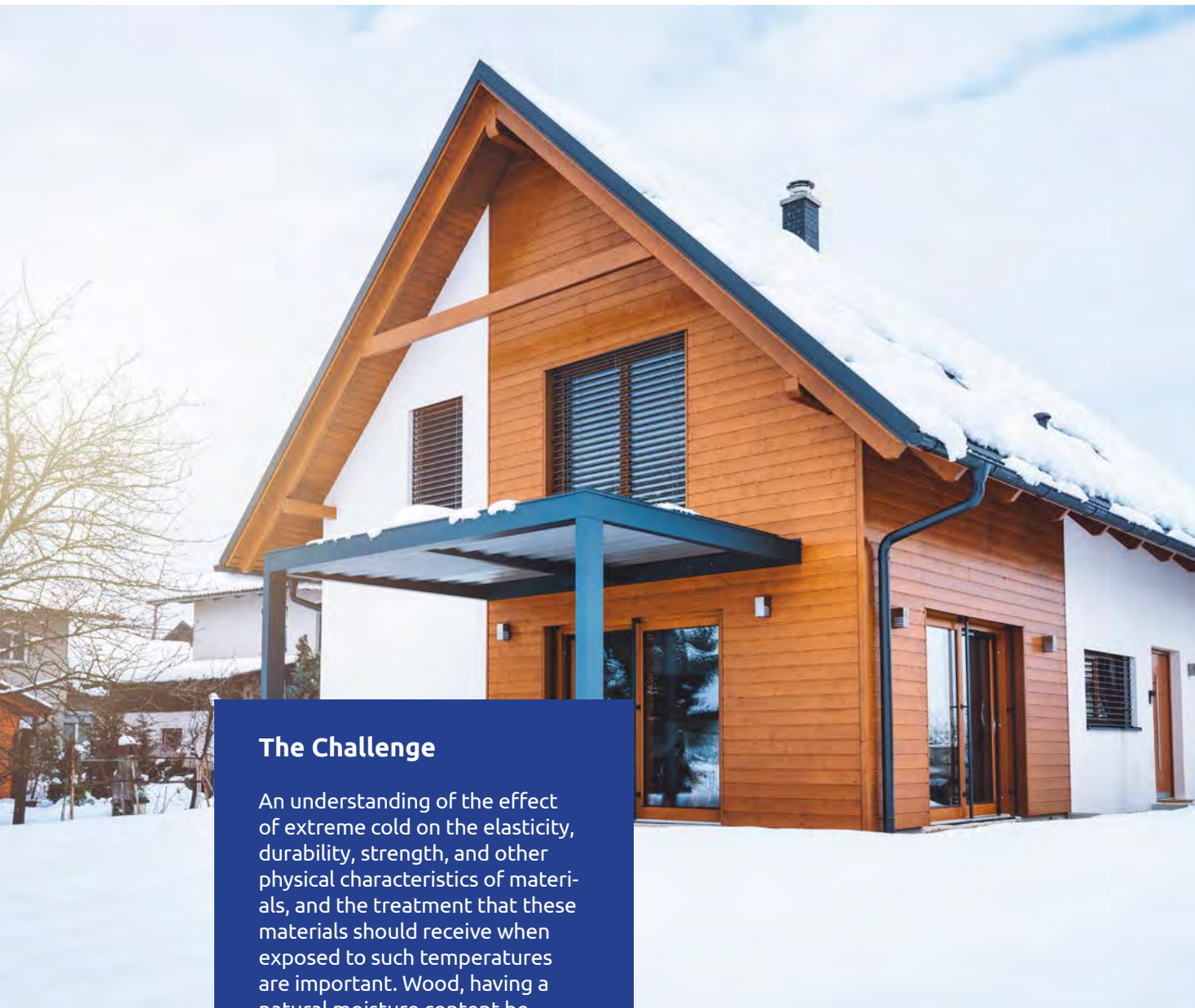
#### Expected Useful Life

**At least 15 yrs**, upon proper application/installation. All the way that the SurfaPaint SCP Concrete Acrylic Enamel Paint remains applied on substrate's surface and has not been scratched off.



39.

## ENAMEL PAINT WOOD PROTECTION IN ARCTIC CONDITIONS



### The Challenge

An understanding of the effect of extreme cold on the elasticity, durability, strength, and other physical characteristics of materials, and the treatment that these materials should receive when exposed to such temperatures are important. Wood, having a natural moisture content between 15-20%, requires special attention, as sub-freezing conditions may detrimentally affect its strength, elasticity and ability to act as a natural thermal insulating material. How can a coating protect in such harsh conditions?

*Test application of both SurfaPaint Wood Arctic and SurfaPaint Wood Stain/Varnish-UV blocker in arctic conditions in Scandinavia.*

### BILL OF MATERIALS

- SurfaPaint Wood Enamel "Super Arctic" 4-6m<sup>2</sup>/L

### WHY NANOPHOS SYSTEM?

- The only wood enamel designed for arctic, sub-freezing conditions.
- Durable in icing conditions and water ingress.
- Performs under extreme weathering.
- Does not yellow upon exposure in light.
- High gloss – Low dirt pick-up.



### The Solution

NanoPhos has developed a special coating for direct application on wooden surfaces that can endure super cold conditions and preserve wood, while maintaining original paint appearance for long. SurfaPaint Wood Enamel "Super Arctic" is a water-based acrylic enamel for exposure even in arctic conditions, which is much easy to apply, requires no priming, presents exceptional levelling and high gloss finish. UV irradiation proves harmless to SurfaPaint Wood Enamel "Super Arctic" and, subsequently, no yellowing develops. It is not only the weatherproof behaviour of the coating itself, but its ability to protect wooden substrates from the effect of icing and freezing cold conditions. Maintains the natural humidity of wood and prevents warping, especially when wood surface is subjected to temperature variations between the interior and exterior surface (dimensional stability). Finally, due to its solid resinous matrix and glossy finish, SurfaPaint Wood Enamel "Super Arctic" presents low dirt pick-up and resistance to staining.

### Application

No need for priming. Apply two coats of SurfaPaint Wood Enamel "Super Arctic" on existing acrylic, old paint or three coats of SurfaPaint Wood Enamel "Super Arctic" on bare, light sand-papered wood; each coat being at a **consumption rate** of 12m<sup>2</sup>/L. Do not over-brush. Additional coats should be applied 3-4h after the previous one, at 15°C. Application temperature 5-35°C. Low application temperatures may prolong drying times. All tools and painting equipment may be cleaned immediately after use by using fresh, tap water.

### Expected Useful Life

**At least 8 yrs**, upon proper application/installation.



# 40.

## MARBLE STAINS REMOVAL



### The Challenge

Marbles and natural stone kitchen tops and flooring are amazing as a decoration option; however, their porosity makes them prominent to staining. Even more challenging is the fact that removal of stains has to take place without irreversibly harming (i.e. etching) marble surfaces. Marble, being a natural material, is mainly composed by calcium carbonate, which is so sensitive against acidic attacks. Household cleaners, vinegar, muriatic acid would definitely remove organic stains from marbles, but the end-result would be less than cheerless for the marble itself: a destroyed marble surface. How stains can be removed without harming the marble itself?

*Would you dare doing placing grinded coffee beans on unprotected marble surface? What if it happens so?*

## BILL OF MATERIALS

- DeSalin T 3m<sup>2</sup>/Kg

## WHY NANOPHOS SYSTEM?

- The effective formulation, without acidic additives, designed for marbles, granites and sensitive polished stones.
- Does not change the "shiny", polished appearance.
- Removes the "yellowish" essence of old surfaces, by removing persistent, deeply absorbed stains (like wine or coffee).
- Easily applicable.
- Concentrated formulation.

### The Solution

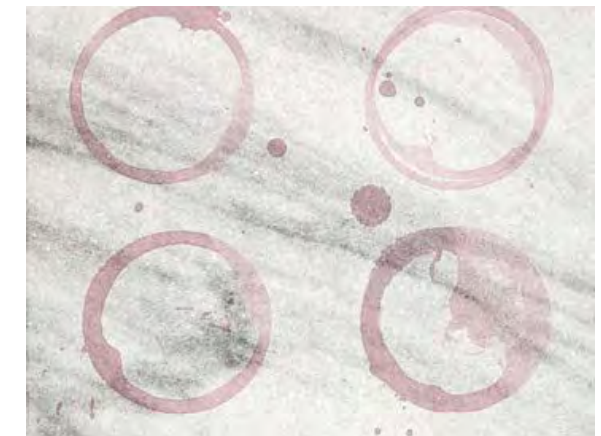
DeSalin T is an extremely active cleaner, specially formulated to be applied on polished, sensitive surfaces like marble or granite. Based on alkaline formulation, your favourite surfaces will not lose their shine, colour, texture or essence, no matter the duration of application. Ideal for persistent, deeply absorbed stains like coffee, wine, oil, tomato or other organic based materials. Acid-free formulation.

### Application

Apply DeSalin T on the stained surface, by rinsing it. Protect from stepping on it and let it act, for as long as it takes for the stain to disappear. If the liquid evaporates or for extremely persistent stains, reapply by adding DeSalin T. Alternatively, cover the application surface with a cotton piece. **Attention!** Always wear protective clothing and gloves. Avoid contact with skin and eyes. Do not apply on metal surfaces. Do not mix with strong acids, bases or chlorine-based liquids (bleach, sodium hypochlorite). Remove any heating devices or objects.

### Expected Useful Life

**Immediate stain removal.** Non-protected areas are subject to re-staining.



*Whine stains on Thassos marble*

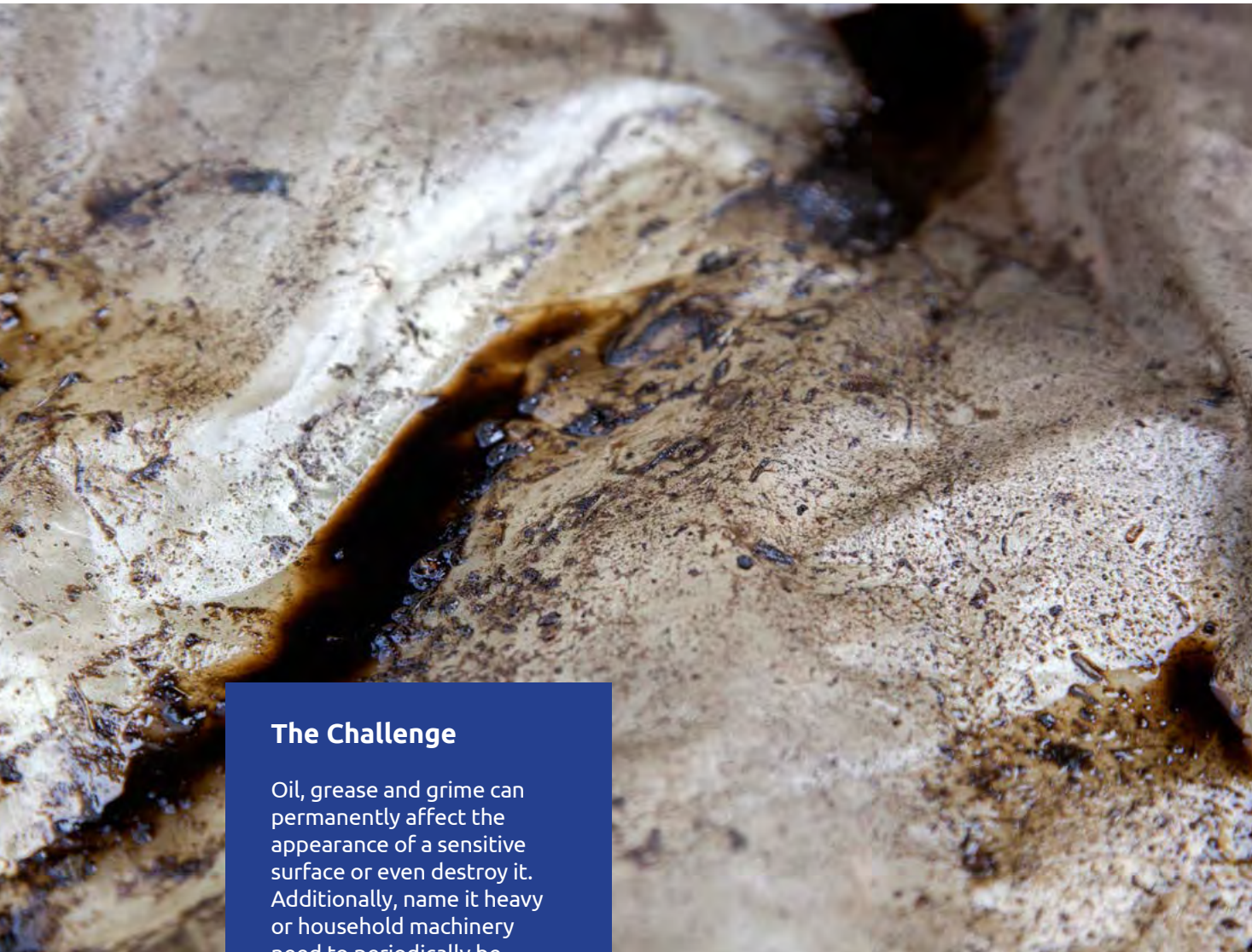


*Whine stains on Thassos marble*



# 41.

## SURFACE DEGREASING



*Engine Oil Stains*

### The Challenge

Oil, grease and grime can permanently affect the appearance of a sensitive surface or even destroy it. Additionally, name it heavy or household machinery need to periodically be cleaned from old grease so as to expand their lifetime. Barbeque stains, carbon residues or fatty deposits need a strong remover to restore original appearance of surfaces.

## BILL OF MATERIALS

- DeSalin DG 4m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- Easily emulsifies oily stains
- Water-based
- Broad Action
- Does not produce acidic by-products
- Evaporates fast
- Easy application
- No Ozone Depleting ingredients



### The Solution

DeSalin DG is a biodegradable, water-based, heavy-duty degreaser that easily cuts through, emulsifies and removes oil, grease and grime. Cleans and dissolves heavy soils. Ideal for sensitive surfaces, as it generates no acid or acidic by-products. Highly considered as a remover of grease, oil, fuel and sludge. Recommended for professional use; can be used in Do-It-Yourself (DIY) applications, as well. Due to the non-applicable Flash point, DeSalin DG significantly reduces the risk of fire caused by incidental contact with live equipment. Evaporates fast: Minimizes downtime associated with "clean-in-place" cleaning methods. It contains no Class I or II Ozone Depleting Chemicals.

### Application

Spray liberally and allow running off. Use extension tube for hard-to-reach areas. Rinse thoroughly with water to remove emulsified grease or stains. Allow equipment to fully dry and vent before using. Using a dry, absorbent cloth can accelerate drying time. Do not use on plastics such as acrylic, ABS and polycarbonate. If uncertain, check with the manufacturer or test on a small area before using. Not for use on sensitive electronics. For personal safety, do not use while equipment is energized.

### Expected Useful Life

**Immediate stain removal.** Non-protected areas are subject to re-staining.

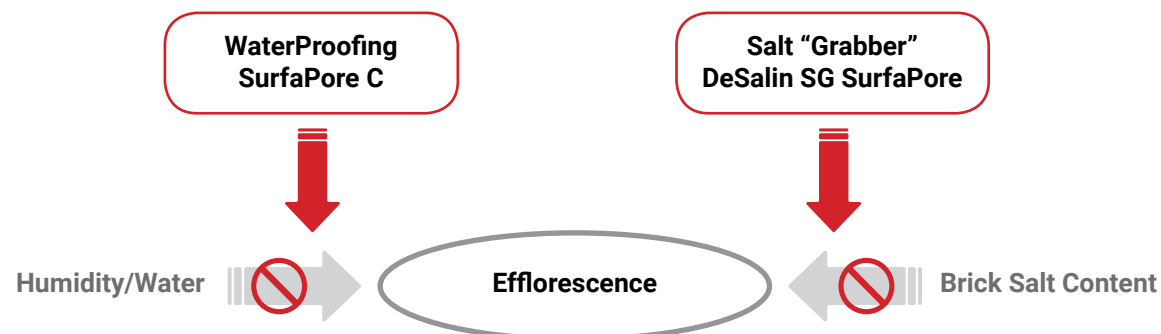


## 42.

EFFLORESCENCE REMOVAL  
AND PROTECTION

## The Challenge

Classic or ceramic bricks are highly susceptible on efflorescence attack. The influence of humidity, offshore environment, or (even worse) seawater results to salt formation on the bricks surface and visible aesthetic degradation of the products. Furthermore, structural degradation of the bricks may be incurred if a non-breathing waterproofing method is applied. In that case, salt accumulation at the waterproof – non waterproof interface may induce surface flaking by “swelling” (absorption of excess water and transformation to highly hydrated salts) of the accumulated salts. NanoPhos has identified that (as shown below) two are the most crucial factors that can induce efflorescence and/or surface flaking: a) Humidity or water content in the mass of the brick that dissolves soluble and “fast moving” salts. Those dissolved salts migrate to the surface, where by evaporation of the aqueous solvent white, salty deposits are formed. b) The salt content of the brick itself and especially the calcium, magnesium cations which are creating characteristic and distinctive white spots.



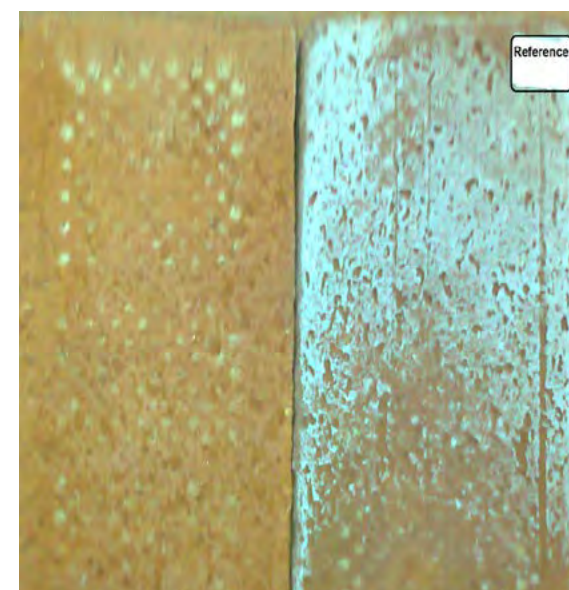
Handling the factors that affect efflorescence.

BILL OF  
MATERIALS

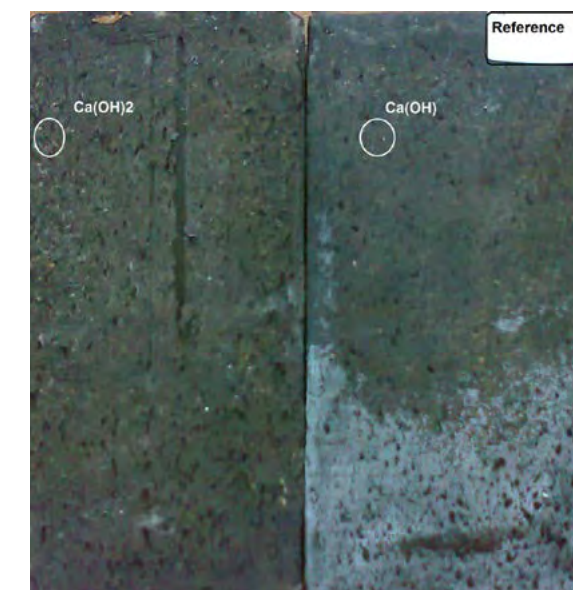
- DeSalin C 3m<sup>2</sup>/L
- DeSalin SG 2m<sup>2</sup>/L
- SurfaPore C 8m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- Not only removes but also “grabs” salt deposits changing their chemical composition.
- Prevents the development of new efflorescence deposits.
- Breathable solution – does not film or block pores.
- Permanent solution against efflorescence.



Red clay bricks subjected to salt chamber testing: left is NanoPhos' system treated, while right remains untreated.



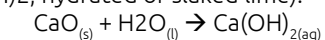
Black clay bricks subjected to salt chamber testing: left is NanoPhos' system treated, while right remains untreated.

## The Solution

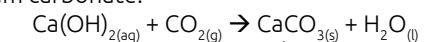
DeSalin C, based on concentrated, natural acid formulation, is effective for dissolving residues from cement surfaces, mortar, grout, stucco, natural or artificial stones. Ideal for removing efflorescence, can also be applied on surfaces affected with mould. DeSalin C ingredients, apart from dissolving salt deposits, have the ability of complexing some of the key cations that produce salts, changing their chemical composition and removing them from building surface. DeSalin SG is a water-based solution that can be applied by spraying or dip coating on the bricks, following the bricks exit from the furnace. It is a concentrated formulation that can be diluted up to 1:3 (triple the original volume). The active ingredient is a high-

strength and high-stability cation complexing agent that blocks calcium, magnesium and other insoluble cations from forming their white hydroxide spots.

Mechanism: Calcium oxide is the main calcium form, after heat treatment of the bricks at temperatures above 825°C. Calcium Oxide (CaO, quicklime) readily reacts with humidity or water to form calcium hydroxide (Ca(OH)<sub>2</sub>, hydrated or slaked lime):



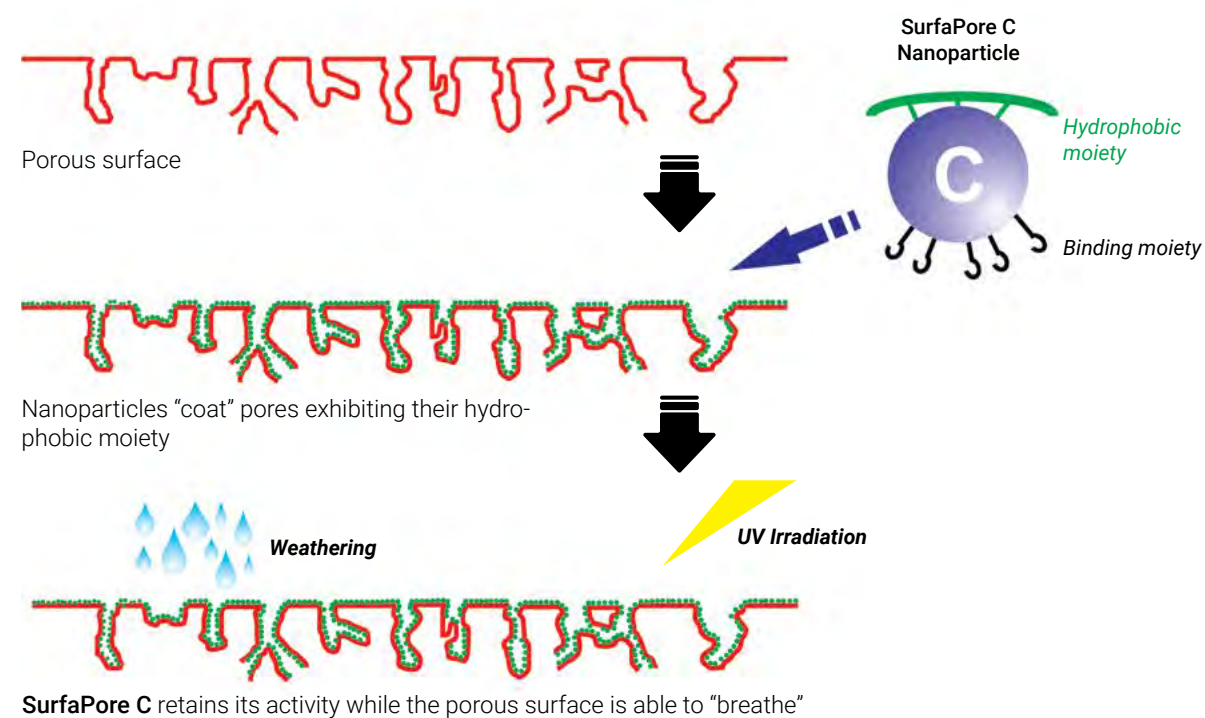
Calcium hydroxide can easily react with ambient environment carbon dioxide to form white, precipitating calcium carbonate:



Those precipitates are quite abundant on the surface of any efflorescent samples as large, distinctive,



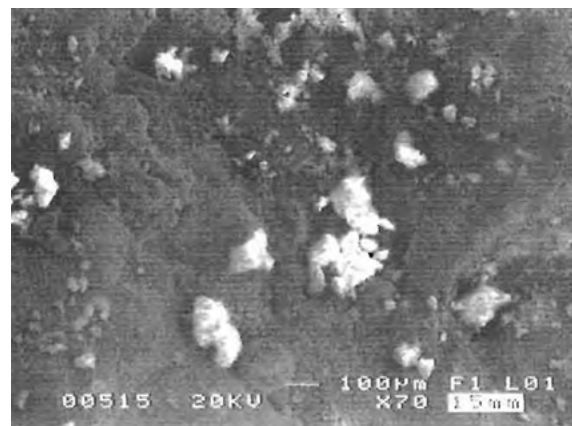
## SurfaPore C Protection



SurfaPore C action mechanism.



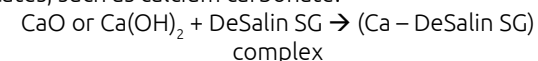
Freshly treated cotto floor tiles (bottom, right, wet) vis-a-vis untreated areas (top, left, dry). The final stage of treatment (SurfaPore C) has not concluded.



Microscopical analysis of an efflorescent surface. White areas present efflorescence deposits.

white spots with soft essence and insoluble in water. It is characteristic that only acid can remove them from surface.

DeSalin SG can react with Calcium Oxide or Calcium Hydroxide, before reacting with atmospheric carbon dioxide, thus blocking the formation of white precipitates, such as calcium carbonate:



The reaction result is that the cation is fully immobilized and protected by an "inert crown" that prohibits any further reaction. Even though salt grabbing has been underlined for the calcium or magnesium salts (as they represent the greatest percentage of the brick's mobile salt content), DeSalin SG is highly reactive with other metals or cations and prevents the formation of many, insoluble carbonate salts.

Finally, SurfaPore C formulation acts completely differently, when compared to any two-component (2K) or silicone/silane/siloxane based formulations, as they do not create a "plastic film" on the surface applied. SurfaPore C protects and waterproofs surfaces, by deeply penetrating the pores of cement/clay-based substrates: Instead of sealing the pores, nanoparticles "dress them", assuring that water or other corroding factors are effectively repelled by chemical forces.

In this manner, protection is provided deeply in the substrate which is therefore not affected by abrasion or mechanical wear. As nanoparticles do not form polymer chains, SurfaPore modified surfaces can last longer; even after ten years they exhibit 95% of their original activity or functionality. SurfaPore modified surfaces are more resistant to the "hard" part of solar light (UV radiation) which does not induce the "yellowing" effect.

A most important advantage of SurfaPore technology is the "breathing" of the modified surfaces. In particular, in case of leakage behind the SurfaPore C modified surfaces, the liquid water can be evaporated to the environment, without accumulating inside the building surface. This is evident, as water vapour can still travel inside the pores of the material and reach the open environment. The internal pressure developed is relieved by evaporation. At the same time, water is also blocked from the environment to be transferred inside the material. In this way, building failures (swelling, cracking, warping) are prevented. All in all, SurfaPore C modified surfaces remain dry and unchanged in both appearance and mechanical properties.

## Application

Rinse the stained surface with DeSalin C without diluting or up to 1:5 dilution ratio for slightly stained surfaces. Wait for DeSalin C to act on the surface for 10 minutes. Remove residues by scrubbing with a hard sponge (do not use metallic sponges). After removal, wash with plenty of water. DeSalin SG follows DeSalin C application to chemically convert and grab salt deposits: Apply by rinsing the surface by DeSalin SG at a consumption rate of 500mL per square meter. Do not wash off. Some spots that result from the active ingredient of DeSalin SG will disappear after application of SurfaPore C. Let the surface dry and apply SurfaPore C 24h after the application of DeSalin SG.

For preventing efflorescence appearance SurfaPore C should be applied: The application surface should be dry and clean. Apply SurfaPore C by using a brush, roller or spraying at a consumption rate of 8m<sup>2</sup>/L. No dilution is required. On very absorptive surfaces re-apply within 3 hours. Curing of SurfaPore C concludes 24h after surface application.

## Expected Useful Life

At least 5 yrs, upon proper application/installation.



# 43.

## STAIN AND PAINT/CEMENT RESIDUE CLEANING



### The Challenge

Have you ever needed something like a really strong cleaner? Something that even cement cannot stand? A formulation that is so strong that it may etch the substrate applied? What about cementitious residues after tiling? Or even those nasty stains on balconies, beneath flower pots, that is something in-between rust and solid soil dirt. Can a formulation be that strong?

*DeSalin K is an effective cleaner against cementitious residues, after tiles grouting.*

## BILL OF MATERIALS

- DeSalin K 3m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- Ideal for removing grout residue after laying floor tiles.
- Removes rust from stones and cement surfaces.
- Quick and effective action.
- Can be diluted with water, for lightly soiled surfaces.
- Should not be applied on sensitive surfaces, such as marbles.



### The Solution

DeSalin K is a special cleaning formulation for fast and effective action. It is ideal for the removal of stains created by the use of "sticky" paint resins, cement residues and adhesive building material. Stucco, mortar, grout and plastic components can be removed efficiently. Rust residues can also be removed in the case they have penetrated deep in the surface. Moreover, mortar and grout surfaces can be cleaned and restored. For minor stain loads, DeSalin K can be diluted with tap water. The acidic nature of DeSalin K makes it also a disinfectant base, especially for mould and fungi.

### Application

Rinse the stained surface with DeSalin K without diluting or up to 1:5 dilution ratio for slightly stained surfaces. Wait for DeSalin K to act on the surface for about a minute. Remove residues by scrubbing with a hard sponge (do not use metallic sponges). After removal, wash with plenty of water. **Attention:** The use of protective clothing (gloves and resistant clothing) is required due to the acidic character of the formulation. Do not apply on metallic surfaces. Test the formulation on a minor non-visible surface to determine its chemical resistance and prevent potential damages. Always wear protective clothing and gloves. Avoid contact with skin and eyes. Do not apply on metal surfaces. Do not mix with strong acids, bases or chlorine-based liquids (bleach, sodium hypochlorite). Remove any heating devices or objects.

### Expected Useful Life

**Immediate stain removal.** Non-protected areas are subject to re-staining.



# 44.

## LAKE INSULATION



Original substrate appearance

### The Challenge

How is it possible to waterproof a lake without using membranes? How is it possible to waterproof a lake but its bottom preserve the natural appearance? The challenge was met in recent years after the inquiry of a royal project: Protect a natural heritage area without even showing protection is there. 11000m<sup>2</sup> of a project proved impossible has become (nanotech) possible.



Final appearance, five years after application.



Illustration of the proposed NanoPhos' system

## BILL OF MATERIALS

- SurfaPoxy Primer 7m<sup>2</sup>/L
- SurfaPoxy Elastoment 4m<sup>2</sup>/L
- SurfaPoxy Top Coat 8m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?

- SurfaPoxy is the only one globally in making a water bed waterproof without changing natural appearance.

### The Solution

SurfaPoxy Primer is a nanotechnology based, two-part, high performance, penetrating epoxy barrier that offers the chemical inertness, toughness and bonding properties of high-performance epoxy resins. It is recommended for loose grounds. SurfaPoxy Primer is formulated with special resins of a low viscosity that deeply penetrate soil and loose ground, filling their surface pores and stabilising the ground. This product prevents penetration of moisture providing excellent adhesion to additional, subsequent coatings, e.g. SurfaPoxy Elastoment. SurfaPoxy Elastoment is a nanotechnology based, one component cement-based sealer that doubles as a membrane forming curing compound and a long-lasting sealer, especially formulated for ponding water applications. It is elastic and can coat the substrate without cracking. SurfaPoxy Elastoment is coloured on the specific tinting of the substrate. This product increases the waterproofing properties of the substrate. In the case of ponding water, it has to be used in combination with the SurfaPoxy System. SurfaPoxy Top Coat is a nanotechnology driven, two-part, high performance, epoxy barrier that offers the chemical inertness, toughness and bonding properties of high-performance epoxy resins. It is recommended for waterproofing pools. SurfaPoxy Top Coat is formulated with special resins of a low viscosity that film cement-based substrates providing a durable water barrier. This product has excellent adhesion on SurfaPoxy Elastoment.



Proper on application of NanoPhos' system.

parts of component A with 1 part of component B by weight. Mix with a mixing blade for approximately 1 minute at low speed. It is very important that these two parts are mixed thoroughly otherwise the coating will not perform to specifications. **Mix Ratio (parts per weight):** 2 to 1 (A to B). **Pot life (at 30°C):** 20-30 minutes. **Colour:** Clear. **Curing before extra treatment:** 24 hours. **Consumption:** 6-8 m<sup>2</sup>/L, strongly dependant on absorption properties of the application surface.

#### SurfaPoxy Elastoment application note:

SurfaPoxy Primer has to cure for at least 24 hours before the application of SurfaPoxy Elastoment. SurfaPoxy Elastoment is a ready to use product. Stir well before use. No dilution is required. Apply SurfaPoxy Elastoment using airless sprayer. The treated area has to be cured for 24 hours before extra treatment. **Consumption:** 2-6 m<sup>2</sup>/L.

#### SurfaPoxy Top Coat application note:

SurfaPoxy Elastoment has to cure for at least 24 hours before the application of SurfaPoxy Top Coat. Apply SurfaPoxy Top Coat using airless spraying. Mix 2 parts of component A with 1 part of component B by weight. Mix with a mixing blade for approximately 1 minute at low speed. It is very important that these two parts are mixed thoroughly otherwise the coating will not perform to specifications. Mix Ratio (parts per weight): 2 to 1 (A to B). Pot life (at 30 °C): 20-30 minutes. Consumption: 8-10 m<sup>2</sup>/L, strongly dependant on absorption properties of the application surface.

### Expected Useful Life

**At least 30 yrs**, upon proper application/installation. All the way that the SurfaPoxy system remains unhurt and undamaged on the surface.

### Application

The application surface has to be dry and clean of oils. **SurfaPoxy Primer application note:** Apply SurfaPoxy Primer using airless spraying. Mix 2



# 45.

## RUST REMOVAL



### The Challenge

How do you eliminate rust from metallic or non-metallic surfaces, without mechanical treatment? Even though sand-blasting or power-tooling are the best procedures for preparing metallic substrates before protective coating applications, reaching those surfaces is often very difficult. Especially in cases of special equipment already installed in confined metallic boxes or curvy metal railings or just vertical metal surfaces mechanical rust removal is most often impossible.



Rust on a vertical metal surface.



Application of DeSalin Gel Rust Remover on a vertical metal surface.



Final result of rust removal, within 10min of DeSalin Gel Rust Remover application.

## BILL OF MATERIALS

- DeSalin Gel Rust Remover 2m<sup>2</sup>/Kg

## WHY NANOPHOS SYSTEM?

- Powerful formulation
- Gel form to reduce dripping on vertical surfaces
- Fast action
- Interrupts rusting process
- Deep cleaning action
- Water rinsable
- Leaves no residues
- Removes rust without smoke or fumes
- Prepares metal surface for paint job and increases lifespan of paint job
- Contains no solvents



Rust deposits on a chemicals-resistant granite piece.



Application result of DeSalin Gel Rust Remover. Rust has been completely removed.

### The Solution

DeSalin Gel Rust Remover is a chemical formula in gel form that removes rust without any needs of mechanical treatment. DeSalin Gel Rust Remover can remain without dripping even on an overhead concrete slab with exposed, corroded steel bars and remove rust effectively. Apart from its action as a heavy-duty rust remover, its active ingredients help to the transformation of rust to a phosphating coating that creates an early corrosion resistant layer. Therefore, apart from being a remover, it also prevents early development of rust (flush rust inhibitor). DeSalin Gel Rust Remover is also ideal to prepare rust surfaces for application of paints. Eliminates also the rust stains on concrete, tile or porcelain. DeSalin Gel Rust Remover active ingredients help to the transformation of rust to a phosphating coating that creates an early corrosion resistant layer. Therefore, apart from being a remover, it also prevents early development of rust and prepares the surface for painting.

### Application

The application surface must be free of dust and friable materials. Remove loose rusted pieces and rust dust by means of a metallic brush. Apply DeSalin Gel Rust Remover, without prior dilution, by using a paint brush. Allow to act on the surface for 10-20 minutes. If possible, "massage" DeSalin Gel Rust Remover gel formula during application. Scrub with a soft sponge or a soft non-metallic brush. Wash thoroughly with plenty of water. For persistent rust stains reapply.

### Expected Useful Life

**Immediate rust stain removal.** Non-protected areas are subject to re-rusting.



## 46.

MASONRY WALLS  
CRACKS RESTORATION

## The Challenge

Several types of cracks occur in masonry walls in a building which can be minor and insignificant, some requiring expensive repairs and in some extreme cases the only solution is total demolition of the wall. For those cases that cracks are of decorative essence (e.g. non-earthquake or poor insulation expansion issues), repairing can be easy and fast.

*Wall cracking after exposure to weathering on poor render quality.*

BILL OF  
MATERIALS

- SurfaPore FX WB 4m<sup>2</sup>/L
- SurfaMix P SB 8m<sup>2</sup>/L
- FeatherPlast AquaX 1,33 Kg/m<sup>2</sup> for d=1mm
- SurfaMix P 32m<sup>2</sup>/L (after dilution 1:3 with water)
- SurfaPaint AquaX 5m<sup>2</sup>/L

WHY  
NANOPHOS  
SYSTEM?

- In contrast to conventional systems, NanoPhos proposes a breathing system, ideal for negative water pressure.
- SurfaPore FX WB enhances the mechanical properties of the substrate, fixing the degraded, loose matter.
- NanoPhos' system acts smart: allows vapour pressure circulation and water pressure mitigation, while preventing efflorescence and swelling. It is the only system that addresses breathability and resistance to negative water pressure, simultaneously.

## The Solution

NanoPhos offers a system set of three products: **SurfaPore FX WB:** Penetrates deeply in the mass of the cementitious substrate, strengthening masonry elements and creating a barrier against liquid water movement. It does not affect the breathing capacity of the building surface therefore, accumulated water may evaporate without dampen the building surface. **FeatherPlast AquaX:** Is an elastic, waterproof, breathable cementitious mix, ideal for repairing the cracks and holes, created during the reparation of the original surface. **SurfaPaint AquaX:** Is a unique paint top-coat that acts as a water barrier (intense water beading effect and water repellence), combined with superior breathability. In-between the repairing coatings, SurfaMix P SB and SurfaMix P are needed to ensure bonding. SurfaMix P SB is applicable on the hydrophobic SurfaPore FX WB substrate and will make the subsequent FeatherPlast AquaX formulation bond efficiently. SurfaMix P is waterborne, can be diluted four-times its original volume with tap water and will result paint (SurfaPaint AquaX) adhere on the cementitious substrate, without affecting its breathing capability. All in all, the proposed system will strengthen the crack substrate, present elastic repairing materials and provide an elastomeric final top-coat to protect the repaired surface from weathering.

## Application

Using a spatula, remove all loose material from the damaged, cracked or swollen surface area. Make sure that after removal of loose material, the application surface area is dry, free of mould, dirt, dust or oily residues. Apply SurfaPore FX WB and allow for one day curing. In case of accumulated moisture, allow for one week curing in order for the moisture pressure to be relieved and for the humidity to evaporate and dry. Apply SurfaPore FX WB by using brush, roller or airless sprayer. On very absorptive or worn surfaces reapply after 15 minutes. Suggested application temperature is 5-35°C. **Drying time/Curing time:** Touch dry time is 30 minutes, depending on the relative humidity level and temperature.

**Apply SurfaMix P SB as a primer:** Use airless sprayer gun, roller or brush for the application of SurfaMix P SB. Apply a single coat at a consumption rate of 125mL/m<sup>2</sup>,

depending on the absorption of the substrate. **Application temperature:** 5-35°C. It is recommended the modified surface not to be exposed to extreme weather conditions for 1-2 days after application. Three hours after priming, apply FeatherPlast AquaX which can be mixed using a drum or plasterer's paddle mixer in a tub (gentle mixing) or by hand using a trowel. Initiate mixing by pouring a quarter of the amount of clean water into a flat-bed mixing container. Empty the full 25Kg bag content slowly (do not use part bag mixes) into the same mixing container. Add a half of the amount of water to the mixture and proceed with thorough mixing. Continue adding the remaining water while mixing until the desired consistency and workability is achieved. The cementitious mix is applied by hand trowel or by using a plastering pump machine for lightweight premixed products. Prevent applying thickness greater than 1,5mm for each application round to avoid cracking. Allow FeatherPlast AquaX to cure and dry-off for at least 5 days.

**Apply SurfaMix P as a primer:** Shake well SurfaMix P before application. For one volume part of SurfaMix P, dilute by adding 3 volume parts of water. Apply one even coat using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered. Typically, drying time is 1 hour depending upon coat thickness. Low temperatures and high humidity will lengthen drying times. As a good practice, apply emulsion paints 24h after primer application.

**Apply the appropriate paint:** SurfaPaint AquaX for breathable water ingress protection. Stir well before application. Do not dilute for bridging gaps and hairline cracks of up to 0,5 mm. For cracks bigger than 1mm, fill the gap with a suitable putty. If thinning is required add up to 10% water by volume. Application temperature should be between 8 - 35°C. Apply 2-3 even coats using a good quality brush, roller or by spraying with a tip of a diameter 1,4mm or more. Do not over-brush. Ensure corners and edges are adequately covered. Additional coats should be applied 4-6 hours after the previous application.

## Expected Useful Life

**At least 5 yrs,** upon proper application/installation.



47.

## ZEBRA CROSSINGS AND ROAD MARKINGS SELF-CLEANING EFFECT



### The Challenge

“Stop, look, listen and follow the zebra crossing” is a lesson that every child learns for crossing the road. The significance of high-quality road markings is essential for the safety of pedestrians, especially after considering that one out of five road accidents involves foot-travellers. Bright and easy-to-see road markings are important to driver safety, and it is widely believed that state and local municipalities should make easy-to-see road lines a priority. This case demonstrates the photocatalytic ability of SurfaShield C and its resilience in an especially harsh and heavy traffic area. Road marking paints lose their contrast due to heavy traffic loads. Tire markings, dirt, pollution, weathering and intense UV radiation fade the intensity or cover the paint, resulting poor identification from drivers and raising significant safety concerns.

### BILL OF MATERIALS

- DeSalin DG 5m<sup>2</sup>/L (for cleaning and restoration)
- SurfaShield C 5m<sup>2</sup>/L (for self-cleaning effect)

### WHY NANOPHOS SYSTEM?

- Easy to apply and maintain.
- Activated by the power of light – active ingredients do not get consumed.
- Enhances traffic safety with low CAPEX involved.



*The effect of SurfaShield C on a heavy-traffic pedestrian zebra crossing, three months after treatment. Upper side is the original road traffic paint, while the lower part has been treated with SurfaShield C.*

### The Solution

SurfaShield C is an environmentally friendly solution that absorbs light and transforms its energy into chemical power. In this way road markings are transformed to self-cleaning. All organic stains and pollutants are continuously decomposed, just by using surrounding light. The action of SurfaShield C is photocatalytic, meaning that it works continuously, without being consumed. It adheres permanently on the surface of the paint and preserves its high contrast.

### Application

Make sure that the road marking paint is dry and free of mould, dirt, dust or oily residues. Use DeSalin DG to remove stains or oily residues from the surface of the grout. Rinse with plenty of water and let the surface dry for 24h.

**SurfaShield C application:** Shake or stir the container vigorously before use. The application surface should be dry and clean. Apply SurfaShield C with a brush, roller or spray gun. No dilution is required.

### Expected Useful Life

**At least one year**, upon proper application/installation, strongly dependent on the traffic pattern.



# 48.

## UNDERFLOOR HEATING CAGING

### The Challenge

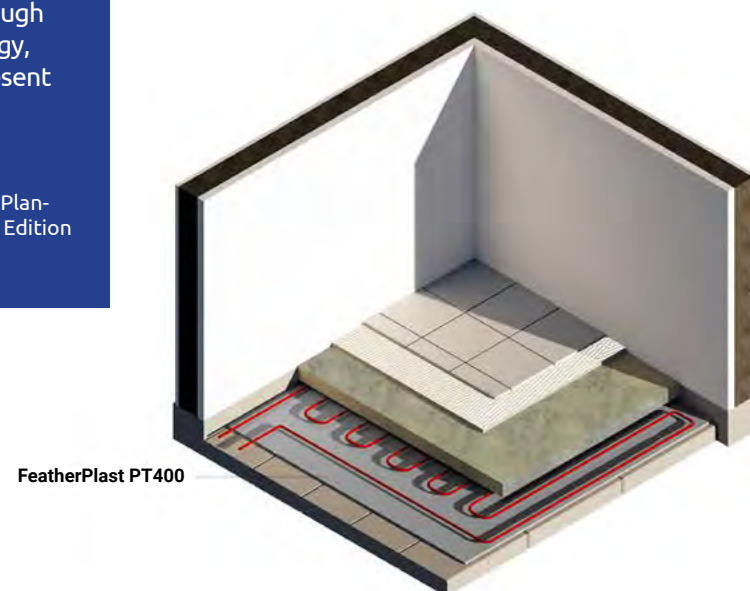
Evidence of “baked floors” are found foreshadowing early forms of kang and dikang “heated floor” in Manchuria and Korea respectively, even 5000 years BC<sup>1</sup>. Underfloor heating remains the oldest way of heating buildings for achieving indoor climate control for thermal comfort. Nevertheless, the challenge remains the same: how do you direct heat from underfloor heating system to indoor space? How do you prevent losses of heating to the load bearing structure (backbone) of the building? How do you increase efficiency of underfloor heating system?

Additionally, underfloor heating systems operate in a much different way of radiant heaters: water temperature is much less than the radiant heaters, as the exposed heating surface (floor) is much higher. It is impossible to heat up underfloor heating system to 60°C or 80°C, just like the circulating water of radiant heaters. Even though this saves important amounts of energy, underfloor heating system do not present an interrupted (switch on/off) mode.

<sup>1</sup> Guo, Q., (2005), Chinese Architecture and Planning: Ideas, Methods, Techniques. Stuttgart: Edition Axel Menges, Part 1, Chpt 2, pg 20-27.



High thermal conductivity cement encasing of underground floor heating system, supported on FeatherPlast PT400.



FeatherPlast PT400

## BILL OF MATERIALS

- FeatherPlast PT400 0,45Kg/m<sup>2</sup> for d = 10mm

## WHY NANOPHOS SYSTEM?

- Heat directional system.
- Increases efficiency of underfloor heating system – prevents heat losses.
- Increases thermal comfort.
- Waterproofs and protects from potential leakages.
- Reduces expansions on heating cycles.

### The Solution

Regardless if the underfloor heating system is using electric resistance or hydronic (heated liquid flowing in plastic pipes) elements, those elements are encaged in a cementitious “sandwich” of 20-30mm below and 50-70mm above. If there is a significant thermal conductivity between the lower and upper cementitious encasement then heat will naturally flow to the side of higher thermal conductivity. Therefore, by selecting proper materials, heat is actually directed to the floor and not the building’s backbone, increasing overall heating efficiency.

FeatherPlast PT400, exhibiting a thermal conductivity as low as 48 mW/(mK), is used for creating the base on which the heating elements are installed. Unique features like high compression strength (7MPa), easy levelling and waterproofing insulation (especially for hydronic systems) make it ideal as installation base for the heating elements. Heat just doesn’t like flowing to FeatherPlast PT400 – it prefers flowing to high density compaction cement over the heating elements and, subsequently, reach the floor surface.

### Application

Make sure that the concrete base, where the underground flooring system is to be installed is dry, clean has fully cured. FeatherPlast PT400 can be mixed using a drum or plasterer’s paddle mixer in a tub (use only a quarter of the amount speed for gentle mixing) or by hand using a trowel. Initiate mixing by pouring a quarter of the amount of clean water into a flat-bed mixing container. Empty the full bag content slowly (do not use part bag mixes) into the same mixing container. Add a half of the amount of water to the mixture and proceed with thorough mixing. Continue adding the remaining water while mixing until the desired consistency and workability is achieved. Ensure that no dry material has escaped the mixing process. The plaster is applied by

hand or by using a plastering pump machine for light-weight premixed products. It is straightened by using a float or trowel and the plaster is then smoothed by hand, using a spongy float, after it has sufficiently set. Points and reference bands can be used in order to obtain the required thickness. Points and reference bands can be created with the same product. Alternatively, it is

possible to use steel or wood edging. Apply successive layers after underlying substrate is left to dry for 24 hours. Do not exceed unique layer thickness by 15 mm. Wet substrate before application of each layer. Use appropriate plaster mesh when layers thickness is greater than 4cm. Working time depends on substrate absorptivity, ambient temperature and water content of the mixture. If the mixture has been left standing for a while and has become slightly stiff, then mix again by hand

or mechanically and if needed add a small amount of water while mixing to soften. **Setting:** three (3) days in normal conditions and good ventilated areas (depends on the weather and the thickness application). Protect during setting time from harsh weather conditions such as frost, rain, direct sunlight and extreme temperature changes. **Estimated consumption rate:** of dry powder 4,5 kg/m<sup>2</sup> per 10 mm of thickness.

Apply the heating elements on a thin PVC or plastic membrane to ensure good compatibility on expansion patterns between the thermal insulating and thermal conductive cementitious layers. For the cementitious encasement, overlying the heating elements, use high density cementitious mixes to increase their thermal conductivity. Always foresee the use of appropriate expansion joints on underfloor heating systems.

### Expected Useful Life

**Lifetime expected useful time,** upon proper application/installation.



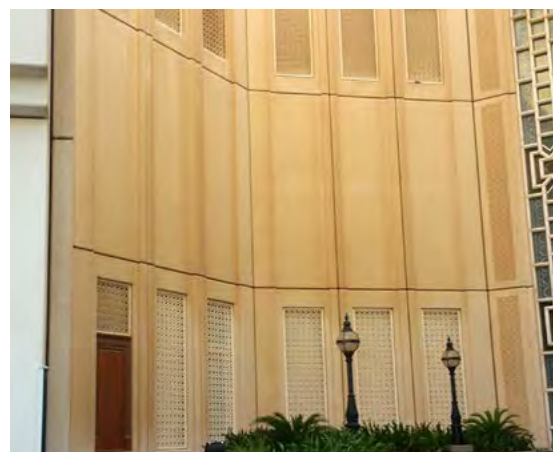
## 49.

# FAIR FACED CONCRETE AND RENDERED BUILDING FACADES PROTECTION

## The Challenge

Modern architecture is unimaginable without fair-faced concrete. For decades concrete priority was given to the unique load-bearing properties and unequalled cost/performance ratio as a structural building material. It is only in recent years that the incredible design versatility and the creation of many different finishes have also come to the fore. The beauty and aesthetic appearance of non-painted, cementitious rendering is apparel. However, those surfaces tend to pick up dirt by the combined effect of humidity and dusting. Actually, humidity condensates tend to turn the dust or soiling into mud, eliminating any element of elegance from those natural-looking surfaces.

*Fair-faced concrete is an architectural trend.*



*A palace made of cementitious rendering. Note the dirt accumulation.*



*A palace made of cementitious rendering. The rendered façade appears yellowish on the upper part, while cleaned and fresh in the lower part, as of intense maintenance and cleaning efforts.*

## BILL OF MATERIALS

- SurfaPore C 4m<sup>2</sup>/L for surface application
- SurfaShield C 8m<sup>2</sup>/L for surface application

## WHY NANOPHOS SYSTEM?

- Does not change original natural appearance – preserves application surfaces as new.
- Easy to apply.
- Long-time expected service life.
- Activated by light – active ingredients do not get consumed.

### The Solution

Waterproof cementitious facades and make them self-cleaning: This is the idea behind the solution NanoPhos can offer. The use of SurfaPore C can prevent humidity entering the pores of the fair-faced concrete or porous renders. Even if it “dares” touching the waterproof surfaces, SurfaShield C will “take over” eliminating dirt and electrostatically preventing dust accumulation.

SurfaPore C formulation acts completely differently, when compared to any two-component (2K) or silicone/silane/siloxane-based formulations, as they do not create a “plastic film” on the surface applied. SurfaPore C protects and waterproofs surfaces, by deeply penetrating the pores of cement/clay-based substrates: Instead of sealing the pores, nanoparticles “dress them”, assuring that water or other corroding factors are effectively repelled by chemical forces. In this manner, protection is provided deeply in the substrate which is therefore not affected by abrasion or mechanical wear. As nanoparticles do not form polymer chains, SurfaPore modified surfaces can last longer; even after ten years they exhibit 95% of their original activity or functionality. SurfaPore modified surfaces are more resistant to the “hard” part of solar light (UV radiation) which does not induce the “yellowing” effect.

In order to prevent dirt pick-up that would eventually reduce the aesthetic perfection of rendered or fair-faced concrete, an active, self-cleaning, transparent coating is proposed. SurfaShield C decomposes organic stains and pollutants, prevents microbial growth, purifies the air,

removes odours. It is an active nanotechnology formulation that can be easily applied on paint surfaces. By harnessing the surrounding light, treated surfaces become Self-Cleaning and Self-Sterilizing. SurfaShield coated surfaces efficiently decompose organic stains, bacteria, mould, gaseous pollutants, even odours. SurfaShield C modified surfaces are safer, without the need to use hazardous disinfectants or chemicals, and are preserved as new. Most important, the semiconductive character of titanium dioxide nanoparticles contained in SurfaShield C prevents dust and inorganic deposits accumulation.

hazardous disinfectants or chemicals, and are preserved as new. Most important, the semiconductive character of titanium dioxide nanoparticles contained in SurfaShield C prevents dust and inorganic deposits accumulation.

### Application

All application surfaces should be dry, clean and free of dust.

#### SurfaPore C application:

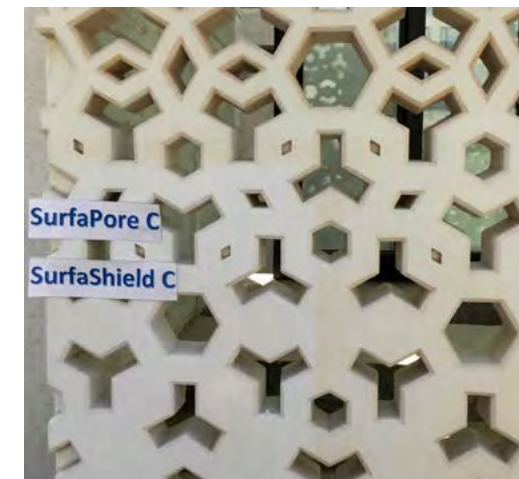
Apply two coats of SurfaPore C by using a brush, roller or spraying at a consumption rate of 8m<sup>2</sup>/L per coat. No dilution is required. On very absorptive surfaces re-apply within 3 hours. Curing of SurfaPore C concludes 24h after surface application.

#### SurfaShield C application:

Shake or stir the container vigorously before use. The application surface should be dry and clean. Apply SurfaShield C with a brush, roller or spray gun. No dilution is required. If any excess remains on the application surface, remove by using a wet cloth. On very absorptive surfaces re-apply a second coating. **Estimated consumption rate:** 8m<sup>2</sup>/L.

### Expected Useful Life

**At least 15 yrs**, upon proper application/installation.



*The effect of NanoPhos' system on dirt pick-up of glass reinforced cement (GRC) element. Note the lower dirt pick up on NanoPhos treated surface area.*



# 50.

## ASBESTOS STABILIZATION



### The Challenge

Once marketed as a “magic mineral,” asbestos is now an infamous public health menace. Asbestos is a naturally occurring mineral substance that can be pulled into a fluffy consistency. Asbestos fibres are soft and flexible yet resistant to heat, electricity and chemical corrosion. Pure asbestos is an effective insulator, and it can also be mixed into cloth, paper, cement, plastic and other materials to make them stronger. These qualities once made asbestos very profitable for business, but unfortunately, they also make asbestos highly toxic. Microscopic asbestos fibres cannot be seen, smelled or tasted, and asbestos exposure does not cause any immediate symptoms, so it is easy for a person to inhale or swallow asbestos dust without realizing it. Once asbestos fibres are in the body, they never dissolve, and the body has extreme difficulty expelling them. Over years of time, trapped asbestos fibres can cause inflammation, scarring and eventually genetic damage to the body’s cells. Asbestos-related illnesses often take 20-50 years to develop, which means most cases diagnosed today were caused by asbestos exposures that occurred before modern safety regulations came into effect.

Asbestos removal after stabilization with SurfaPore FX SB.

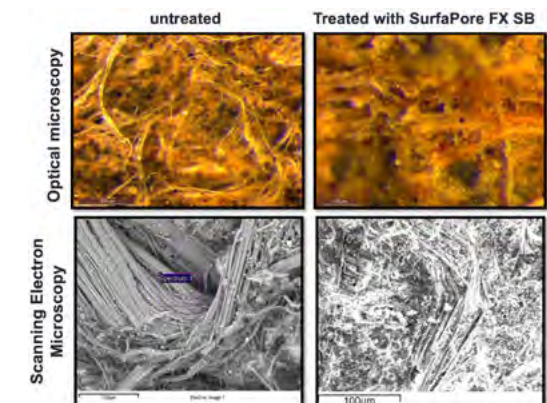
## BILL OF MATERIALS

- SurfaPore FX SB 4m<sup>2</sup>/L

## WHY NANOPHOS SYSTEM?



Picture 147 - Asbestos occurrence on building structures.



The effect of SurfaPore FX SB on chrysotile asbestos fibres before (left column) and after (right column) stabilization, as observed from optical (upper row) and SEM (lower row) microscopy.

### The Solution

Supported and pioneered by the intense research activities of Technical University of Crete, School of Architectural Engineering, Prof. P. Maravelaki<sup>1</sup>, SurfaPore FX SB has been developed to stabilize asbestos by surrounding its chemical structure with inert, non-hazardous consolidants skin. In this way, asbestos fibres form large particles that cannot become airborne. Even if inhaled, the size and shape of the particles can be expelled from tissues and prevent accumulation that may result infections or lung related diseases.

The application of SurfaPore FX SB on asbestos is an immediate measure to mitigate the extreme risk of asbestos exposure and significantly decrease any health concerns. However, it is not a solution that prevents proper asbestos removal actions.

<sup>1</sup> A. Valouma et al., Journal of Hazardous Materials, 305 (2016) 164-170.

### Application

Rinse freely any surface suspected to be asbestos containing with SurfaPore FX SB. Full consolidation of asbestos particles may require three weeks; however, most of the particles are consolidated in a few days period.

### Expected Useful Life

**Immediate action** measure to consolidate asbestos fibres. Proper asbestos removal action plan should be subsequently implemented.



# NOTEWORTHY



# PROJECTS



**SurfaPore W** protects the Austrian spruce of the Festival's Termit Pavilion at **London Zoo**.



**SurfaPore C** was used to protect the strips of unpolished white marble outside of Onassis Cultural Center in Athens, **Greece**.

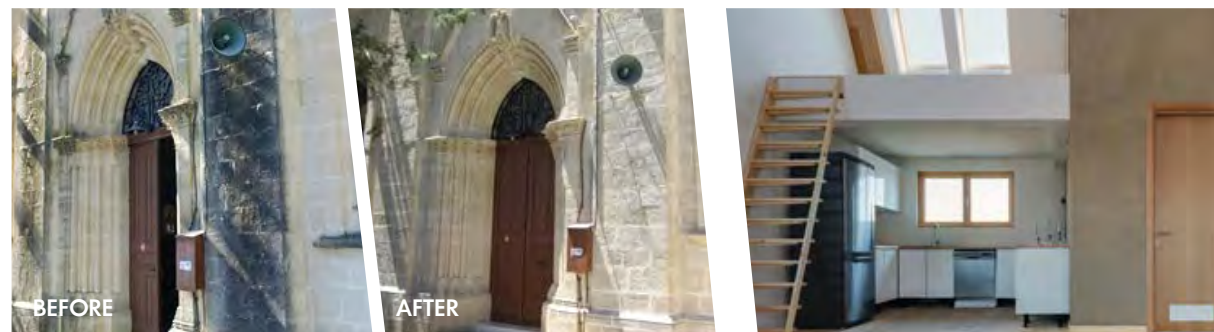


**SurfaPore W** was selected to protect this wooden monument at the Hakone Open-air Museum in **Japan**.



Solar panels of Hirosaki City Hall in Aomori, **Japan** produce more power by using **SurfaShield G**.



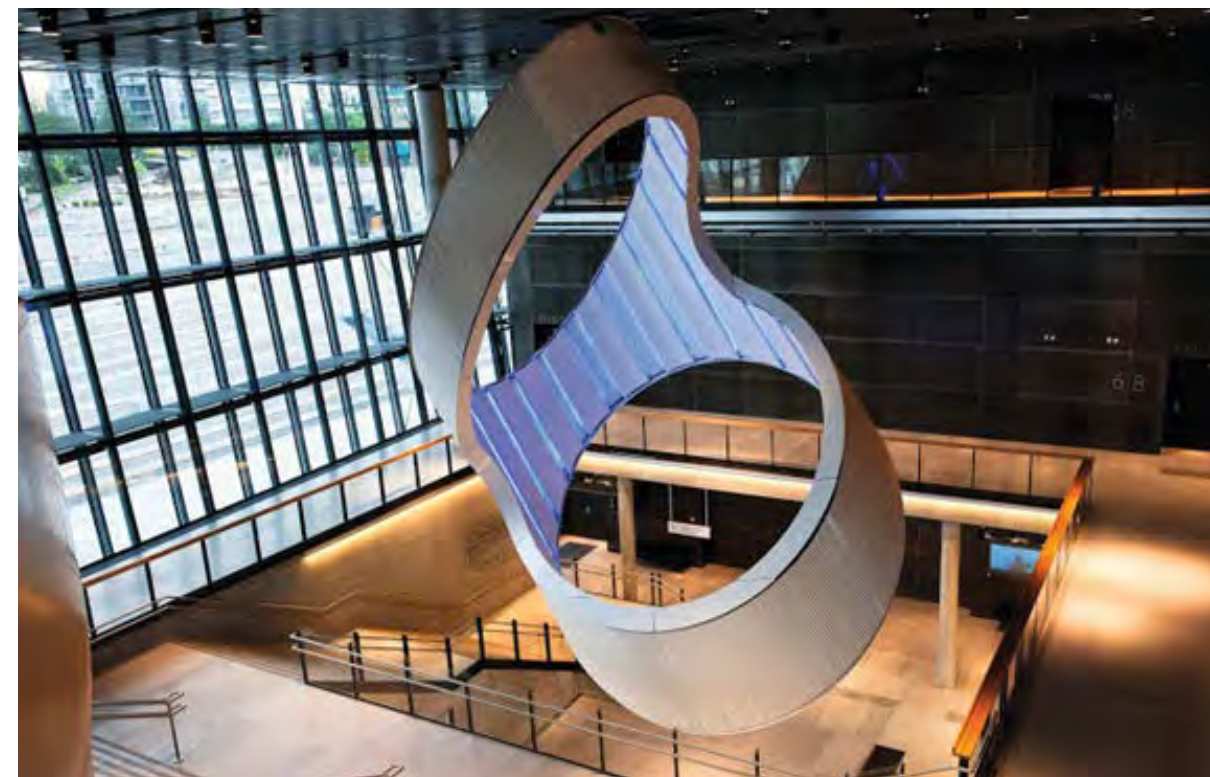


**DeSalin C** was used to remove algal greening and restore the surfaces of chapel in **Dora, Cyprus**. The porous walls were subsequently protected with **SurfaPore C**.

Romanian University students build ECO-house using **SurfaPore F** for the interior gypsum boards and excel at **Solar Decathlon Europe**.



**SurfaPaint ThermoDry Exterior** for heat protection, **Dubai** Airport Freezone Area Warehouse.



The granite floor surfaces in the Stavanger Concert Hall, **Norway** were protected from staining by using **SurfaPore T**.



Keeping areas around ponds clean with **SurfaShield C** at Mall and Park in Cha Am in **Thailand**.

**SurfaPore C** was used to protect the precious cement based surfaces that dominate the Koncerthuset, DR Concert Hall in Copenhagen, **Denmark**



**SurfaGuard Metals** protects stainless steel railing on **Reef Island, Bahrain**.



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**NanoPhos**

*Pioneering  
Nanotechnology*



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