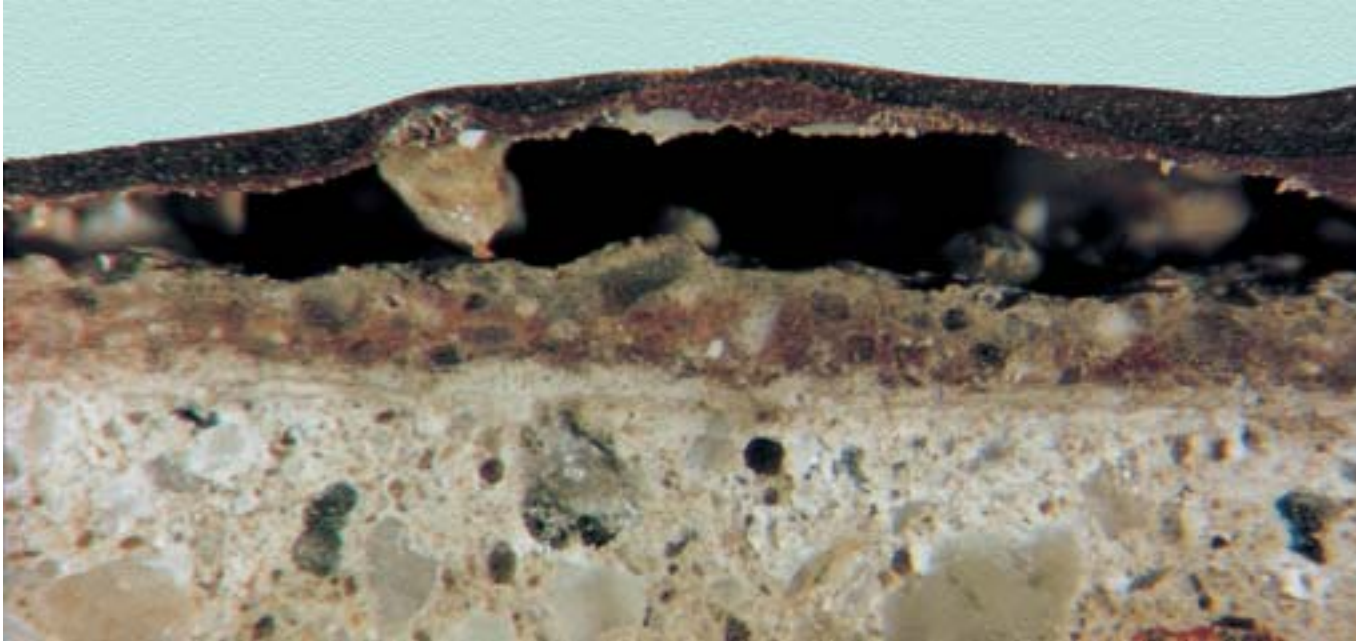


Construction



**No More Blistering!**



**Epo Cem**<sup>®</sup>

**Sika<sup>®</sup> EpoCem<sup>®</sup>**

Technology for green and  
damp Concrete

**Sika**<sup>®</sup>

# Blistering!

## Construction Time does not always agree with the Client's Time Scale.

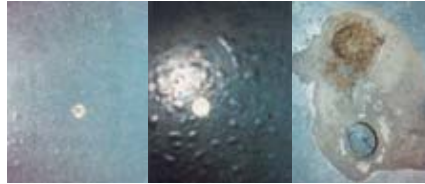
For the client, a major objective in any project is to reduce the construction period. Whether it is a new construction, conversion or refurbishment, economics demand that production starts as soon as possible. This means that the time required and the time available for programming needs to be clearly defined at the earliest stage.

Only systems which meet the following requirements should be specified:

- Immediate coating of fresh/green cementitious substrates even if they have high surface alkalinity or high moisture content
- Rapid installation of the complete system, with short intercoat waiting times between the various operations
- Fast top coat curing, to allow traffic as quickly as possible

**Sika® EpoCem® technology prevents and overcomes coating failures related to fresh and damp concrete.**

When coating cementitious substrates with reactive resins, the substrate moisture content must not exceed 4% (test method: SikaTramex or CM). The consequence of non-compliance is coating failures. Initial damages generally appear after a very short time with further successive phases developing the full extent of the damage. This failure, known as "osmotic blistering", must not occur!



## Blistering of Coatings and Floor Coverings is a tremendous Problem which results in:

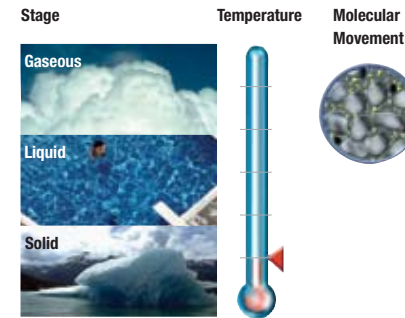
- Major delays and costs after completion
- Economic implication traumatism during production in industrial or commercial facilities

### Cause of Blistering

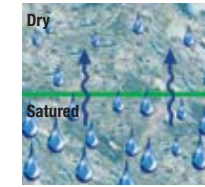
The cause of blistering is humidity that is present in concrete.

### Humidity = Water

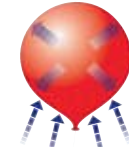
Water is the only element in nature that can exist in 3 different stages.



It's a physical law that water moves from saturated to dry conditions to achieve equilibrium and it moves in the form of vapour. The transport of vapour through a material is called diffusion.

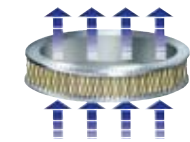


There are materials which don't allow water vapour diffusion.



Different coatings or floorings don't allow diffusion.

There are materials which allow the water diffusion.



Concrete and mortars, the base for coatings and floorings, allow vapour diffusion.



The application of this coatings or floorings on fresh or damp (saturated) concrete can lead to blistering.

## 1 Water is in Concrete and Mortar for different Reasons: By external causes

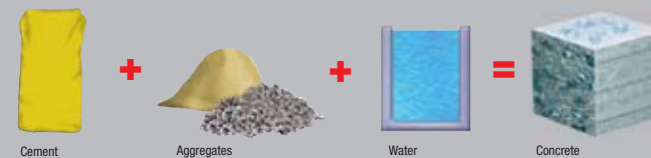


Soil Broken pipes Membrane defects Design defects

## 2 Liquid Water Content in Concrete By climatic conditions

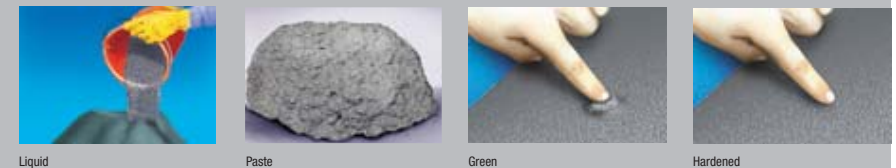


## 3 Concrete is produced with high Amounts of Water From its constituents



Cement Aggregates Water Concrete

By itself concrete can contain water in the liquid, solid and in the gaseous form. In new concrete part of the water used during the mix is consumed by chemical reactions and the rest is released to the environment or to the ground or base, during the hardening process.



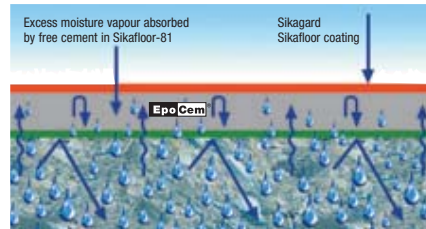
Liquid Paste Green Hardened

It is assumed that this process in a concrete (under normal conditions) takes approx. 28 days!

# EpoCem® The Solution against Blistering and Delays

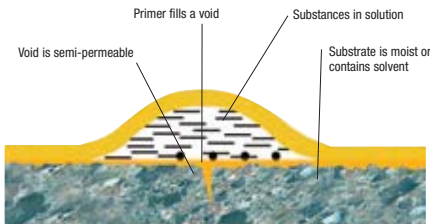
## What happens during these 28 Days or until a Concrete has reached a Humidity Content of less than 4%?

Concrete contains a lot of water and in the form of vapour it moves from saturated to dry conditions. Concrete is a porous material that allows this diffusion.

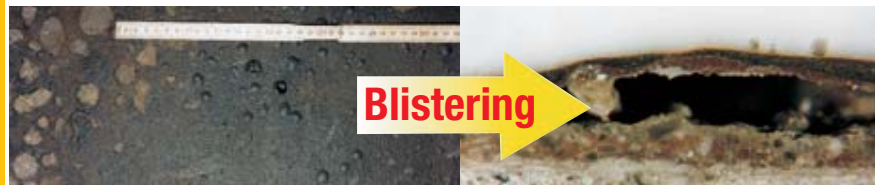


Vapour transportation in concrete

## What happens if we apply a Floor or Coating on fresh or damp Concrete?



Normally a vapour barrier is applied under a concrete slab and there is no problem of diffusion. But if we apply a coating or flooring which is intended to bond to the concrete and is impervious to vapour, what happens?

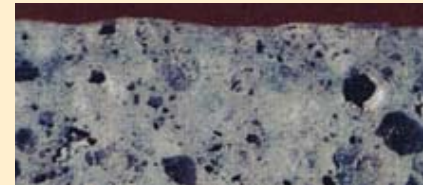


The pressure generated by this vapour causes bond failure of the coating and blistering appears.

To ensure the humidity in concrete or mortar is less than 4%, this normally means a waiting time of 28 days after casting the concrete!

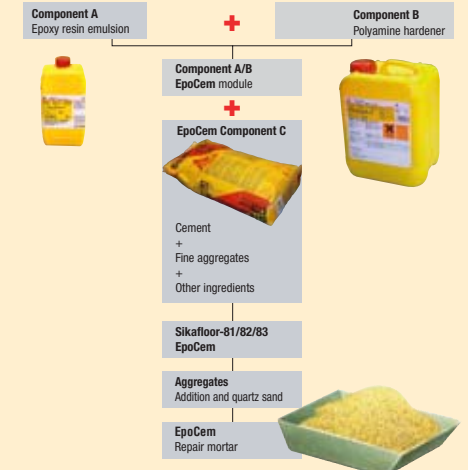
## The Solution EpoCem®

Sika® EpoCem® is an intermediate temporary moisture barrier that reduces the high initial substrate moisture content of concrete, allowing the application of a coating or flooring to a green or damp concrete, reducing completion time and eliminating the risk of blistering.

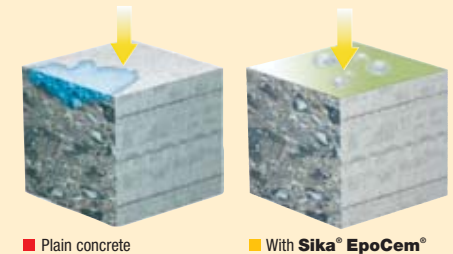
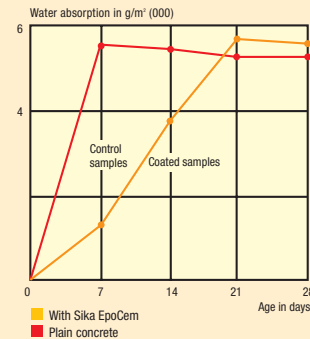


### But, what is Sika® EpoCem®?

A generation of mortars which combines the positive physical properties of cement with water soluble epoxy resins.



If we compare the moisture content of a plain concrete and a concrete coated with Sika® EpoCem®, it's clear that there is a strong reduction of the water absorption and that means that we have a temporary moisture barrier.



The simultaneous cement and epoxy reactions form the basis for the successful development of the temporary moisture barrier.



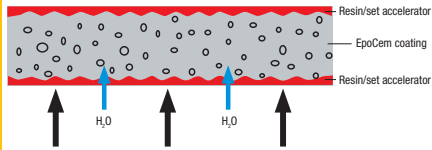
1. Hatched areas = build-up of lamellar epoxy segments; dotted areas = cement stone before hydration
2. Hatched areas = build-up of lamellar epoxy segments; radial areas = cement crystals formed by hydration
3. Black areas = small spherical epoxy particles; radial areas = cement crystals

The homogeneously mixed emulsion in the Sika® EpoCem® module is responsible for the formation of a cross-linking epoxy "molecular sieve" within a cementitious honeycomb structure.

In the first phase, the mix liquid provides the water for cement paste formation which surrounds the resin and set accelerator. While the mortar is being applied to the primed substrate, a waterproofing layer is formed by diffusion of the pre-emulsified material at the interface with the concrete substrate, and forms a chemical bond!

# EpoCem® The Solution against Blistering and Delays

Simultaneously, a Migration or Concentration of the pure Resin Proportion on the Coating Surface takes Place. This is assisted by the Consistent and uniform Settlement Behaviour of the EpoCem® Aggregates.

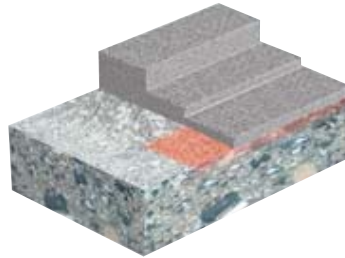


An integral curing action of the system (provided by the resin-enriched mortar surface) prevents excessive drying out or shrinkage. Increased heat generation caused by accelerated hydration also promotes physical drying of the system. The continuous cement matrix formation, accompanied by penetration of the epoxy structure by cement hydration/crystallisation, increases the strength development!

## Time and Money Saving!

### Temporary Moisture Barrier on Green or Damp Concrete Slab and Screed

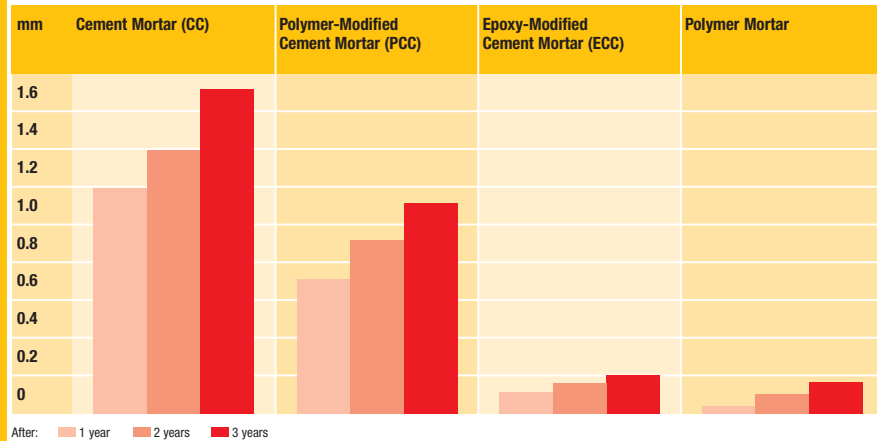
- For cementitious floors with damaged or missing waterproof membrane
- No waiting time on fresh concrete
- No blisters when coating damp concrete
- Coatable with liquid-proof coatings
- Adjustable site-related thickness layers



Temporary moisture barrier:  
 Primer: **Sikafloor®-155 W**  
**Sikafloor®-81 EpoCem®**  
 2-3 mm  
**Sikafloor®-82 EpoCem®**  
 4-7 mm  
 Primer: **SikaTop®-Armatec**  
**110 EpoCem®**  
**Sikafloor®-83 EpoCem®**  
 >8 mm

No Osmosis Use as a temporary moisture barrier for following Sikafloor toppings

**Surface Decomposition after 3 Years Immersion in Sewer Aeration Tanks at the Water Line Level**  
 EpoCem® floorings or coatings achieved the required final curing and the required substrate moisture of 4% after 24 hours at 23 °C with a relative humidity of 75% and then it is safe to apply a polymer coating or flooring.



## Time Saving with Sika EpoCem®



The Installation of Industrial Flooring and the Time before it can be trafficked represent a Time Factor which should not be underestimated.

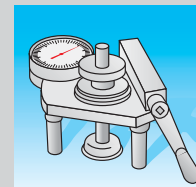
No more waiting.  
No more delays.

Traditional Construction Programme	Week 1	Week 2	Week 3	Week 4	Week 5
Concreting works	Curing/drying time				
Resin coating/flooring					
Primer					
Base coat					
Top coat					
Coating ready for foot traffic					
Coating ready for use					

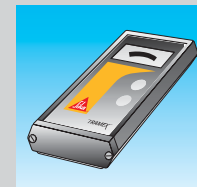
Programme Sika System	Week 1	Week 2	Week 3	Week 4	Week 5
Concreting works					
Resin coating/flooring					
Sika® EpoCem® Temporary moisture barrier					
Primer					
Base coat					
Top coat					
Coating ready for foot traffic					
Coating ready for use					

Time Saving with Sika® EpoCem®	Week 1	Week 2	Week 3	Week 4	Week 5
Traditional					
Coating ready for foot traffic					
Coating ready for use					

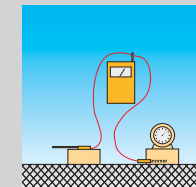
## Substrate, Inspection and Preparation



Determining the cohesive strength



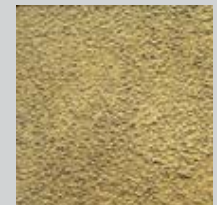
Substrate moisture content



Ambient climate



Preparation and cleaning



# Technology Selection – Industrial Flooring on green and damp Concrete

## Stage of Concrete Curing

## Industrial Flooring Technology

Substrate Humidity	Substrate Condition	CC System	PCC System	PC System	Sika® EpoCem®	Conclusion
> 25%	<b>Fresh applied concrete</b> (min. 4 – max. 20 hours old) Surface aspect mat damp					
	Suitable thin layer system	Not available	Not available	Fresh concrete impregnation	Not available	There is no perfect working system solution available so far. The fresh concrete impregnation technology is only recommended to use in combination with water proofing membranes (for traffic structures, e. g. bridge decks) like polymer bituminous sheets or liquid polymer membranes topped with poured asphalt.
	Substrate preparation	–	–	No	–	
	Special curing measures	–	–	No	–	
	Waiting time prior to apply industrial flooring system reactive resins based	–	–	Not for industrial flooring	–	
> 20%	<b>Green concrete</b> (several days old)					
	Suitable thin layer system	>5 mm only	Not suitable	Not available	<b>Sikafloor® EpoCem®</b>	CC systems take a long curing time and are sensitive to cracking the thinner the layers are. PCC systems are based on moisture swellable polymers, therefore they have to be applied on a dry effective water-proofing layer only.
	Substrate preparation	Mechanical	–	–	Mechanical	
	Special curing measures	Min. 5 days curing using damp hessian or plastic sheets	–	–	No	
	Waiting time prior to apply industrial flooring system reactive resins based	>28 days, substrate humidity < 4%	–	–	After 1 day at 20 °C, 75 r.h., substrate humidity < 4%	
> 4%	<b>Damp concrete</b> (>14 days old)					
	Suitable thin layer system	> 5 mm only	Not suitable	PC screed > 4 mm	<b>Sikafloor® EpoCem®</b>	CC and PCC systems either have long curing with risk of cracking in thin layers or swelling of the polymer. PC systems are based on moisture sensitive reactive resins limited to use with substrate humidity conditions < 4%. By extending the resin/hardener mix with an excessive amount of graded silica aggregates, a moisture transmission is feasible. Topping these screeds is only recommended with water vapour permeable coating systems. Risks for coating failures due to osmosis are high.
	Substrate preparation	Mechanical	–	Mechanical	Mechanical	
	Special curing measures	Min. 5 days curing using damp hessian or plastic sheets	–	No	No	
	Waiting time prior to apply industrial flooring system reactive resins based	> 14 days, substrate humidity < 4%	–	After 1 day at 20 °C, 75 % r.h., substrate humidity < 4%	After 1 day at 20 °C, 75 % r.h., substrate humidity < 4%	
Seasonal changes 3 – 6%	<b>Damp aged concrete</b> (Rising moisture)					
	Suitable thin layer system	Not available	Not available	Water-based EP	<b>Sikafloor® EpoCem®</b>	Concrete slabs on ground with a chance for high water tables in combination with not existing or damaged water proofing membranes bear a high risk for coating failure due to osmosis. The only solution is using <b>Sika® EpoCem®</b> technology!
	Substrate preparation	–	–	Mechanical	Mechanical	
	Special curing measures	–	–	–	No	
	Waiting time prior to apply industrial flooring system reactive resins based	–	–	–	After 1 day at 20 °C, 75 % r.h., substrate humidity < 4%	

CC = Cement – Concrete PCC = Polymers – Cement – Concrete PC = Polymers – Cement EC = Epoxy – Cement



# System Selection on green and damp Concrete

## Product Performance Sika® EpoCem® Systems

(according to LPM system testing)

	Sikafloor®-81 EpoCem®	Sikafloor®-82 EpoCem®	Sikafloor®-83 EpoCem®	Sikagard®-720 EpoCem®	SikaTop®-Armotec® 110 EpoCem®	Sikadur®-45 EpoCem®
<b>Green concrete</b> (Several days old)	No water puddles, concrete must be able to take mechanical preparation. Primer <b>Sikafloor®-155 W</b>			Primer <b>SikaTop®-Armotec® 110 EpoCem®</b>	Primer Saturation with water	Primer <b>SikaTop® Armotec® 110 EpoCem®</b>
<b>Damp concrete</b> (>14 days old)	Minimum thickness layer for <b>Sikafloor® EpoCem®</b> = 2 mm			Minimum thickness for <b>Sikagard®-720 EpoCem®</b> = 2 mm		
<b>Damp aged concrete</b> (Rising moisture)						
Thickness layer	1.5 to 3 mm	3 to 7 mm	7 to 100 mm	0.5 to 3 mm	1 mm	6 to 30 mm
Water absorption kg/(m <sup>2</sup> /h)	0.02	0.02	0.02	0.03		0.03
Water vapour diffusion (μH <sub>2</sub> O)	200	260	350	850	700	
CO <sub>2</sub> diffusion (μCO <sub>2</sub> )	1200	3000	680	10 000	40 000	

### Application Field

<b>Industrial flooring</b>	Repair, levelling and protection of monolithic and vacuum concrete resin floorings/coatings					
	Time saving on damp concrete No osmotic blistering High affinity to resin floors High mechanical strength	Levelling of medium surface roughness Optional possibility for broadcast floors with coloured quartz	Levelling of high surface roughness	Quick repair or monolithic mortar floor	Pore filler and levelling and protective coating for sewage environments	Corrosion protection for rebars Bonding bridge for cementitious screeds and repair mortars
<b>Structures in aggressive atmosphere</b>	Repair, levelling and protective coating in sewage treatment plants, sewage reactive resin coating					
	Time saving on damp concrete No osmotic blistering High resistance to CC and PCC mortars No special curing measures	Horizontal levelling of medium surface roughness	Horizontal levelling of high surface roughness	Horizontal repair and patching	Vertical pore filling, levelling and protective coating for sewage environments	Bonding bridge for cementitious screeds and repair mortars Vertical repair and patching
<b>Industrial structures</b>					Repair and levelling system prior to waterproofing membranes in/on tunnels, galleries and bridge and parking decks	
	Time saving on damp concrete Fair-faced concrete Without special curing measures				Vertical pore filling, levelling and protective coating for high resistance	Corrosion protection for rebars Bonding bridge for repair mortars/concrete Vertical repair and patching
<b>Traffic structures</b>	Repair and levelling system prior to waterproofing membranes					
	Time saving on damp concrete No osmotic blistering Quick surface drying time No special curing measures	Horizontal levelling of medium surface roughness prior to resin-based parking deck membranes	Horizontal levelling of high surface roughness prior to torched or liquid polymer	Horizontal repair and patching	Vertical pore filling, levelling prior to protective coating, torched, liquid polymer membrane	Corrosion protection for rebars Bonding bridge for repair mortars Vertical repair and patching



# Sika® EpoCem®

## The Technology for green and damp Concrete

### The System Components

Bonding bridge	<b>SikaTop®-Armatec® 110 EpoCem®</b>
Bonding bridge Repair mortar 6–30 mm	<b>SikaTop®-Armatec® 110 EpoCem®</b> <b>Sikadur®-45 EpoCem®</b>
Levelling mortar/pore filler (vertical use) 0.5–30 mm	<b>Sikagard®-720 EpoCem®</b>
Primer Levelling mortar (horizontal use) 1.5–3.0 mm 3.0–7.0 mm	<b>Sikafloor®-155 W</b> <b>Sikafloor®-81 EpoCem®</b> <b>Sikafloor®-82 EpoCem®</b>
Bonding bridge Mortar screed 7–30 mm	<b>SikaTop®-Armatec® 110 EpoCem®</b> <b>Sikafloor®-83 EpoCem®</b>

### Also available from Sika



Our most current General Sales Conditions shall apply. Please consult the Technical Data Sheet prior to any use and processing.

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