KÖSTER

Waterproofing systems

# Moisture mitigation systems for concrete floors

## Moisture mitigation systems

Concrete is one of the most important building materials of our time. Most floor slabs are made from concrete. While concrete itself is very water vapor permeable, most modern floor coverings and floor coating systems have high diffusion resistance and are therefore prone to problems with water vapor diffusion. KÖSTER VAP I 2000 systems were specially developed to avoid problems and damage resulting from this. The systems are also known as moisture protection systems or "vapor barriers", they reduce the water vapor diffusion to a level that is harmless to the floor coating.

## Why is water vapor diffusion an important issue?

Rear-facing moisture penetration under floor coverings and coatings has caused millions in damage over the decades. Typical damage patterns are, for example: "osmotic blistering" in industrial floor coatings, strongly discolored seams, failure of adhesives, loose, warping or tearing PVC tiles and coverings, warping wooden floors, and damp and mold-infested carpets.

Moisture and high pH values dissolve adhesives ...

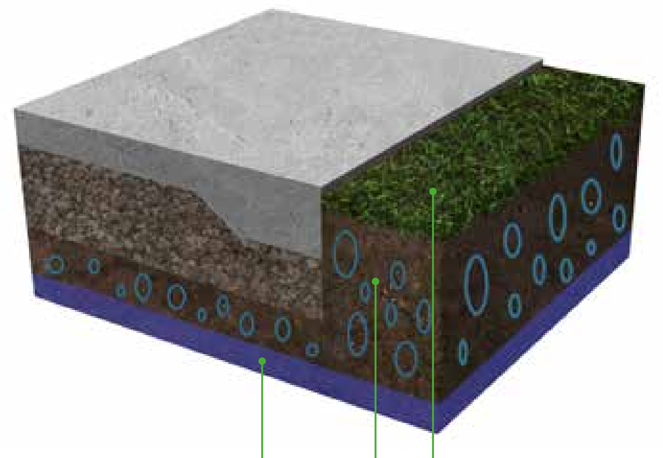

... and causes downtime and high repair costs

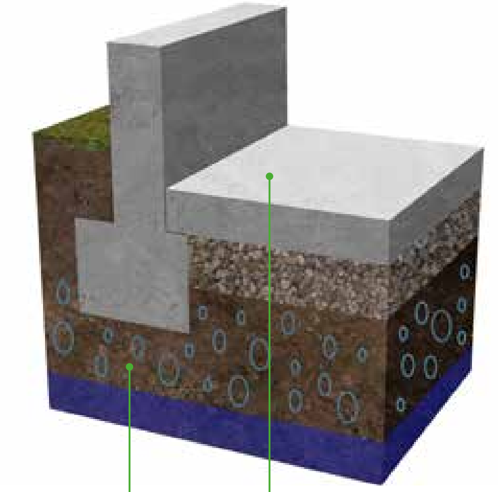
Typical blister formation, the content of which is ...

... a highly alkaline liquid.

## Where does water vapor in concrete floors come from?

Water is present almost everywhere on the building site, in liquid form as groundwater or as water vapor. Floor slabs and concrete basements are surrounded by damp soil or are even partly standing permanently in the groundwater. Moisture can also rise capillarily from the groundwater level or rise as water vapor and thus come into contact with the concrete.




## The causes of moisture in concrete floors are numerous

Water is an essential component of concrete and is required in its manufacture. While part of this water is chemically used and bound during the setting process, the rest of the water remains in the concrete and evaporates away over a longer period of time. The more water that is added to the concrete during manufacture or processing, the longer it takes to dry to a moisture level suitable for floor coatings or floor coverings.

Air conditioning systems dehumidify the air in buildings. Since water vapor always moves from an area of high humidity to an area of low humidity, a vapor diffusion flow is set in motion. This process creates a moisture gradient in the floor slab. A lack of floor slab waterproofing can therefore ensure a regular replenishment of moisture from the ground in older floor slabs.

Other sources of water can also be burst pipes under a floor slab, leaked water on the concrete, kitchens or sanitary rooms, cleaning and maintenance, rain and snow, humidity or condensation.

## What other factors can affect moisture in concrete floors?

### In new buildings:

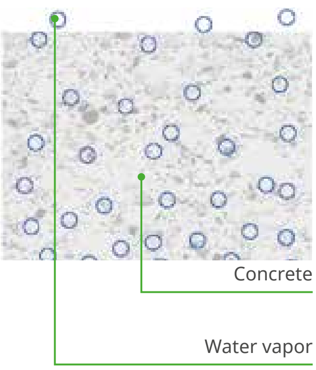
- A missing or damaged waterproofing below ground slabs prevents concrete from drying to the equilibrium moisture content.
- Tight schedules often mean that coatings are to be applied before the concrete has been given enough time to dry.
- Lightweight concrete is used in building construction for above ground floors in order to save weight. When producing lightweight concrete, the light aggregates are saturated with water before being added to the concrete mix. This additional water means that lightweight concrete needs significantly more time to dry to an acceptable level.

## In existing buildings:

- Repair of floor coatings: In the past, floor coverings were mostly used that were similar to concrete in its vapor permeability. In addition, the adhesives used were solvent-based systems that were very resistant to moisture and alkalinity. Nowadays the majority of the floor coatings used have a high vapor diffusion resistance compared to concrete. If a non-breathable coating is applied to concrete, the water vapor is trapped in the concrete. The mechanism created by this leads to damage and failure of the floor coverings.
- Changing environmental conditions: Water and moisture conditions under a floor slab can change over a long period of time. For example, increasingly heavy rains cause increasing moisture levels in the soil.

# How are floor coatings damaged by moisture?

Concrete without
a floor coating

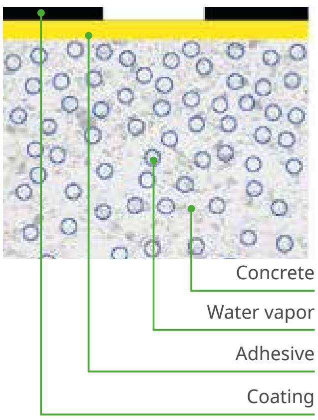



Concrete is a porous material. Therefore, water vapor can flow through concrete. This process is called water vapor diffusion.

As long as water vapor can flow through the concrete unhindered, a moisture gradient is created. On the surface the floor slab is drier, closer to the ground it is more humid.

Moisture can transport various salts into and through the concrete. This leads to efflorescence on the concrete surface.

Concrete with
a floor coating




When a floor coating is applied, it typically has a higher diffusion resistance than concrete.

Water vapor can therefore no longer flow through the concrete unhindered. As a result, the amount of water vapor in the concrete increases slowly. This can can be measured via the relative humidity in the concrete.

Many floor coverings are damaged if they are exposed to moisture for an extended period of time.

If the aggregates contained in the concrete are susceptible to alkali-silica reaction (ASR), the moisture built up in the concrete can set this reaction in motion and lead to the destruction of the concrete matrix.

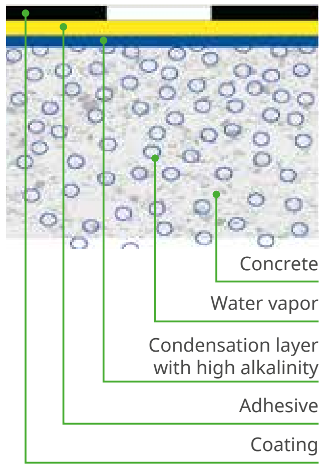
Bacteria and mold can form under floor coverings, which pose serious health risks for residents. When the moisture level is high enough, most floor coatings and adhesives will begin to peel away from the substrate.

Hardened concrete contains soluble salts including Calcium, Potassium, and Sodium. In contact with water, these salts form a highly alkaline solution with pH values of up to 14.

Adhesives, which ensure that floor coverings adhere to the concrete substrate, are attacked by a high moisture content and high alkalinity in the substrate and can fail.

The high pH value that arises on the concrete surface due to moisture can also lead to the discoloration of floor coverings.

Development of high alkalinity

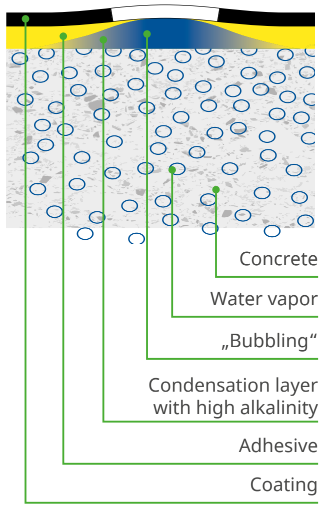



Once such a highly alkaline condensation layer has formed under a vapor-tight, firmly bonded coating, the primer and adhesive are directly exposed to this aggressive environment. Due to the moisture and the high pH value, the adhesive can degrade over time.

The exact period in which this process takes place depends on the diffusion pressure, the exact structure of the floor coating, and the exact composition of the concrete. The liquid in the blisters can have a pH of up to 14.

The damage mechanism typically takes around 3 to 6 months to delaminate coatings and floor coverings from the substrate. However, this period can vary greatly.

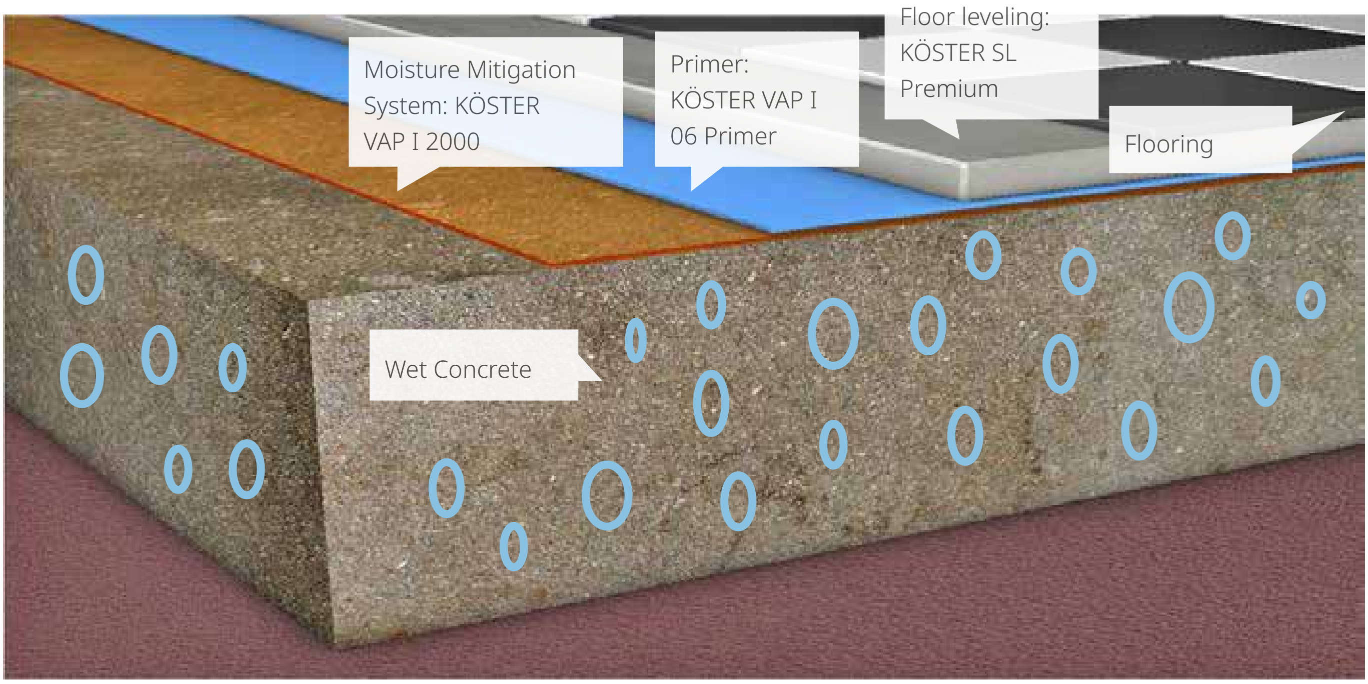
Formation of "osmotic bubbles"




## How can floor systems be protected against vapor diffusion?

If preliminary tests indicate an increased level of moisture in the concrete, something must be done. Otherwise there is a risk that the floor coating or the floor covering will be damaged after a short time. Even if the concrete floor slab is not exposed to a continuous source of moisture, it can take several months to dry out to acceptable levels.

Usually this is not an acceptable time frame. In many cases, a moisture mitigation system on the concrete is the only solution. The moisture protection system reduces the water vapor diffusion to a harmless level for the subsequent floor covering and protects them from contact with the highly alkaline environment that forms in the concrete.




## KÖSTER VAP I 2000: Moisture Mitigation Systems

Successfully launched in 2001, the KÖSTER VAP I 2000 systems look back on an impressive success story of almost 20 years with thousands of satisfied customers. KÖSTER VAP I 2000 systems were specially developed to protect floor coatings against damage caused by rear-facing moisture and water vapor diffusion. The KÖSTER VAP I 2000 products were developed to provide a successful long-term solution even in difficult cases:

- KÖSTER VAP I 2000 systems permanently withstand an increased moisture level in the concrete of up to 100% relative humidity (RH*).
- KÖSTER VAP I 2000 systems are resistant to a permanently aggressive environment with pH values up to 14.
- KÖSTER VAP I 2000 systems are very user-friendly due to their single-layer application.

* see note on page 9

## Choosing the right moisture mitigation system

Every coating project is different and each has its own technical challenges. The KÖSTER BAUCHEMIE AG is a specialist in the field of moisture mitigation systems and has developed products that protect floor coverings from damage over the long term. These unique systems consist of a bonded epoxy resin system with 100% solids content and no fillers. These moisture mitigation systems can be applied to the concrete just 7 days after the concrete has been poured and in a single layer. The KÖSTER VAP I 2000 systems were developed to permanently withstand up to 100% relative humidity and a pH value of 14.

While all KÖSTER VAP I 2000 products always had low VOC emission values, another system with a VOC content of zero has been introduced: KÖSTER VAP I 2000.

The corresponding test reports demonstrate conformity in accordance with the AgBB guidelines of the DIBt (Deutsches Institut für Bautechnik) and can also be used as evidence of low-emission floor systems for a classification according to LEED (Leadership in Energy and Environmental Design) specifications.

The three available products differ mainly in the curing time:

KÖSTER VAP I 2000 12 hours,

KÖSTER VAP I 2000 UFS (Ultra fast setting 3 hours for highly expedited projects.

| **KÖSTER Moisture mitigation systems: over 20 years of success** | | |
|---|---|---|
| **Technical product information** | **KÖSTER VAP I 2000** | **KÖSTER VAP I 2000 UFS** |
| Overworking after* | 12 hours | 3 hours |
| VOC content (Volatile Organic Compounds) | Zero | Low |
| Diffusion coefficient μ** | 145000 | 135000 |
| Equivalent still air layer thickness $S_d$ (at 400 g/m²)** | 52,2 | 48,7 |
| Relative humidity of the concrete | Up to 100% | |
| Rest moisture of concrete | Can also be used on moist concrete (> 6 %) | |
| Application layers | single | |
| Resistance to high pH value | up to 14 | |
| **Fields of application** | | |
| Age of concrete after pour | KÖSTER VAP I 2000 Systems can be used on concrete that is at least 7 days old | |
| Overnight projects | No | Yes |
| LEED points (EQ Credit) 4.2 | Yes | Yes |
| Compatible floor coverings / Coatings | • Adhered floor coverings<br>• Glue<br>• Coatings / seamless systems<br>• cementitious leveling compounds<br>• medicinal floors<br>• Rubber floor coverings<br>• Sports floors<br>• Terrazzo / floating floors<br>• Linoleum / PVC | |
| Areas of application | • Industrial buildings<br>• retail trade<br>• schools<br>• Hospitals<br>• Sports facilities<br>• Storage areas<br>• Residential buildings | |
| **Additional product information** | | |
| Applicator training required | Yes | |

* The curing time may vary depending on the concrete and the temperature

** Calculated average values based on the test results of the CTL Group according to ASTM E96

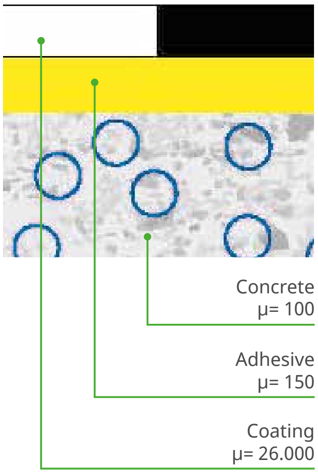
KÖSTER VAP I 2000

KÖSTER VAP I 2000 UFS

## Why is the “vapor diffusion resistance“ of a moisture protection system important?

Materials have a diffusion resistance to water vapor, which is measured using standardized methods. The diffusion resistance is expressed as a “μ value”. The μ-value is the factor by which a material has a higher diffusion resistance than air of the same layer thickness.

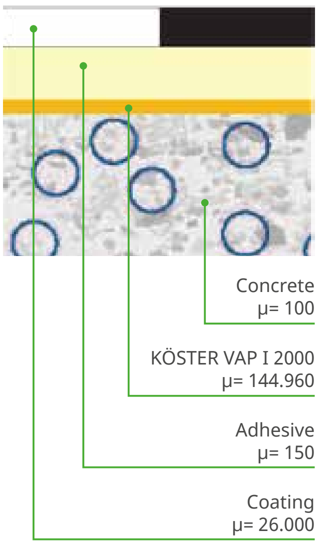
A moisture protection system has the task of reducing water vapor diffusion to a level that is acceptable specified for the floor coating.




An average concrete according to DIN 4108-4 has a diffusion resistance of μ = 100. For a 10 cm thick floor slab this means an equivalent air layer thickness of 10 m. Many floor coverings and coatings have a significantly higher diffusion resistance to water vapor. Among them, rubber floor coverings with a particularly high diffusion resistance stand out. Numerous manufacturers of rubber floor coverings specify a permissible vapor diffusion resistance value of μ = 26,000 in their technical documentation. The resting air layer thickness Sd = μ x thickness in meters. For a 1 mm thick floor covering, this means an equivalent air layer thickness of 26 m.

The following example is intended to explain the meaning for a floor coating: If a rubber floor is glued directly to the concrete floor slab with an adhesive, the concrete has a diffusion resistance of μ = 100 – so it is significantly more permeable than the rubber floor with μ = 26,000. Of the 100% water vapor that flows through the concrete during a given period, not even half will escape through the 1 mm thick rubber floor. The retained water vapor collects under the rubber floor covering. The increasing moisture content and the simultaneously increasing alkalinity loosen the adhesive and damage the floor covering.

To prevent this damage mechanism from occurring, a moisture mitigation system must be applied to the concrete before a floor coating is laid. This moisture mitigation system must have good adhesion to the concrete substrate in spite of rear-facing moisture and a high pH value. The moisture mitigation system must reduce the water vapor diffusion flow to a harmless level - namely a lower level than that of the subsequent floor coating.




KÖSTER VAP I 2000 systems do just that. They are resistant to the high moisture level and high pH values that build up in concrete. With a consumption of 450 g/m², KÖSTER VAP I 2000 develops a diffusion resistance of approx. Sd = 145 and is therefore far less permeable to diffusion than, for example, the rubber floor coverings from the previous example. The amount of water vapor that KÖSTER VAP I 2000 lets through is therefore much less than the amount that a rubber floor lets through.

Manufacturers of floor coatings indicate the maximum acceptable diffusion level for their respective products in the technical documentation. In order to effectively protect a floor coating system, the moisture protection system must reduce the diffusion flow at least to the level that the manufacturer of the floor coating specifies in its technical documentation.

## How “dry” does the concrete have to be for a floor coating?

Concrete needs a hardening time of at least 28 days in order to develop its full mechanical properties. This period of time is often mistakenly equated with the time it takes for concrete to dry sufficiently to be coated.

As a rule of thumb: If a CEM 1 Cement was used, the drying time for a concrete slab in an air-conditioned environment is approx. one month per 2.5 cm layer thickness. For a standard floor slab with a thickness of 10-15 cm, this means a drying time of approx. 4-6 months.

Regardless of this, there are also other factors that can negatively affect the drying time. In order to be able to determine the moisture content of concrete beyond doubt, the guidelines of the floor coating manufacturers, as well as the industry standard ASTM F710, recommend: „All concrete floor slabs are examined for their moisture content, regardless of whether the concrete was installed in contact with the ground or how old it is.“

There are several tests that can be used for a quantitative determination of moisture in a concrete floor slab. The calcium carbide method (CM) is a recognized standard method. The method is used to determine the moisture content of mineral building materials. For the measurement, a sample with a glass ampule and a fixed number of steel balls belonging to the device is placed in a steel bottle and sealed with a manometer. The steel balls break the glass ampule when shaken. As the moisture content of the sample increases, the pressure, which can be used to determine the moisture content, increases due to the formation of acetylene gas.

The so-called RH test has developed into a very popular method. It is already the industry standard in the US market. A hole with a depth of approx. 40% of the building component thickness is drilled into the slab. The measuring prism (see photo) is placed in the borehole and can be read after a calibration time of 72 hours. The RH test determines the relative humidity deep in the floor slab. 3 tests are carried out for the first 100 m² and one more for every further 100 m². According to the ASTM F2170 standard, the results should not exceed the maximum tolerable relative humidity specified by the manufacturer of the floor coatings.

Der RH-Test
(relative Betonluftfeuchte)

### **Advantages**
### of the RH Test (relative concrete humidity)

- Less influence of ambient conditions due to the measurement deep in the concrete
- The popularity of the test method increases as more coating manufacturers accept the test
- easy to use, even for non-trained personnel
- Concrete moisture profile can be created if measurements are taken at different depths
- The RH test makes gives more precise information about the moisture content deep in the concrete.
- The RH test can be repeated quickly and easily.

Moisture measurements should be carried out by expert planners. Precise measurements require training and experience so that all those involved in the project are convinced of the quality of the results. This is important insofar as high moisture values in the concrete can lead to delays in construction or additional, non-budgeted measures. Moisture measurements should therefore already be taken into account in the planning and should be part of the tender. Executing coating companies should be aware of this and, if no moisture protection system is tendered, address this as early as possible in the interests of all project participants.

## Concrete examination: What else should you watch out for besides moisture?

Reliable information about the concrete used is usually available in new construction. Information can be provided on request about the type and composition as well as the use of concrete finishing agents. In existing buildings, however, there is often no exact information about the concrete or the different usage periods of a building. A wide variety of substances that have a negative impact on the adhesion of subsequent coatings can get into the concrete during previous use. Whether or not such substances are present in an existing concrete can be determined by analyzing a drill core.

### New concrete

- The exact composition can be viewed and analyzed in order to identify problematic ingredients for the adhesion of a moisture mitigation system.
- Additives given to the concrete during production or post-treatment agents can cause adhesion problems.
- Adequate drying time for the concrete should be considered at the design stage and moisture tests should be performed before a floor coating is installed.

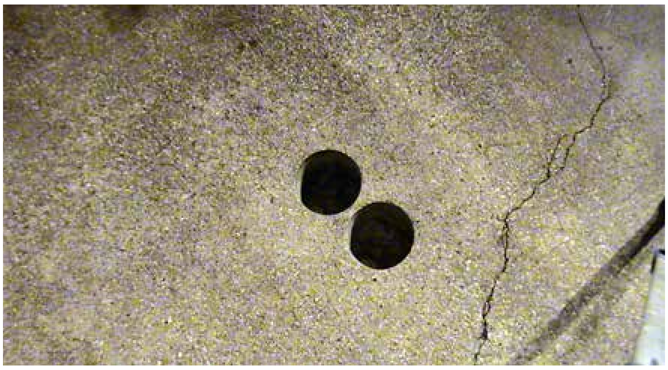
### Existing concrete

- Chemical analysis is used to determine if there are any contaminants such as sodium and / or potassium-rich metasilicate residues and by-products (usually used as surface densifiers and hardeners), sulfate-rich surface deposits or excess chlorides are present in the concrete.
- Thin-film petrography is used as standard to determine evidence of ASR and sulphate attack in concrete.
- Infrared spectroscopy is used to detect organic contaminants such as oils and fats in the concrete.

## KÖSTER helps you to find reliable solutions – even in difficult cases.

In the case of a core examination, a piece of concrete approx. 50 mm in diameter and 50 mm thick is removed from the surface of the concrete slab to be examined and made available to a suitable laboratory for examination. The core should be drilled dry, which means that no cooling water may be used during core drilling.

The results from laboratory analysis can be used by KÖSTER to recommend a specific system for each project. In addition, KÖSTER regularly offers seminars on the subject of concrete and moisture protection systems for applicators, engineers, architects, construction companies, and other interested parties.



The decades of experience from numerous international projects and the reliability in processing are the main success factors of the KÖSTER VAP I 2000 systems. It is specifically the difficult cases in which a lot of technical know-how is required in addition to the product, to which KÖSTER can bring its 40 years of experience to bear.

The technical team around our engineers supports you with detailed checklists for preparation, helps to identify possible problems during the planning phase and can suggest appropriate measures.

## Reference: New Meadowlands Stadium, New Jersey

- The New Meadowlands Stadium is now called the Met Life Stadium. Located in East Rutherford, New Jersey, it is home to both the New York Giants and the New York Jets. It is the only NFL stadium that is used by two teams at the same time and has a capacity of 82,566 seats.
- The stadium was built from 2007 to 2010 as the successor to the original Giants Stadium. The total construction cost was approximately US $ 1.6 billion.
- The closely timed construction phase required a moisture mitigation system that was quick and easy to apply and that was able to reliably protect the subsequent floor coverings (see right picture).
- The specialist contractor decided on a high-quality solution: KÖSTER VAP I 2000. The ground slabs and lightweight concrete slabs on the upper floors were coated in this way.
- In 2011, KÖSTER received the Starnet Preferred Vendor Award for this project.

# Processing of the KÖSTER VAP I 2000 moisture protection systems

KÖSTER recommends extensive tests to determine the moisture level in the concrete. The determination of the relative humidity with the help of the RH test or the humidity determination with the CM method provide usable results.

KÖSTER also recommends existing concrete for contamination such as different salts, AKR (alkali-silica reaction) susceptible aggregates, unreacted water-soluble silicates and other adhesion-reducing substances to be examined. For repair work on damaged floor coatings, it is recommended to take drill cores in order to identify the causes of the damage as clearly as possible.

## Substrate preparation:

Concrete substrates that are coated with KÖSTER VAP I 2000 systems must be clean, dust-free, stable, absorbent, oil and grease-free and meet the industry standard, ACI Committee 201 Report "Guide to Durable Concrete". Substrates must be free of adhesives, coatings, concrete finishing agents, efflorescence or any other adhesion-reducing substances. The temperature of the concrete surface must be at least +3 °C above the dew point. Processing in environments with a humidity above 95% should be avoided.


The substrate must be prepared mechanically by shotblasting, based on the specifications of the ICRI (International Concrete Repair Institute) with a Concrete Surface Profile (CSP) of 3 to 4. Grinding is only allowed in areas that cannot be reached with a shotblasting device, such as in corner areas. After finishing shotblasting and grinding and before installing KÖSTER VAP I 2000 systems, the concrete surfaces must be freed from dust, dirt, and other residues with an industrial vacuum cleaner. Do not use sweeping aids as they may contain oils.


Mixing: The A component is first mixed briefly. Then it is repotted into a clean container.


The B-component is added to the A-component and mixed intensively with a slowly rotating mixer (<400 RPM) until a homogeneous consistency is achieved.

Processing: The material is poured onto the floor surface immediately after mixing. The container must be completely emptied.

KÖSTER VAP I 2000 systems are applied in one step and distributed with a notched rubber squeegee so that aminimum unbroken layer thickness of approx. 0.4 mm is achieved.

Immediately afterwards, this layer must be rolled over with a short-pile epoxy resin-compatible roller in a cross-pattern (at a 90° angle to the working direction of the squeegee). This ensures that the vapor barrier is evenly distributed on the substrate without any pinholes.

**Consumption (CSP 3 substrate): 450 g / m²**

If a standard concrete substrate is prepared with a CSP value of 3 and coated with KÖSTER VAP I 2000 at a consumption of 450 g / m², the vapor barrier has a layer thickness of about 0.4 mm. On a rougher and / or a more porous surface or more absorbent concrete, the material consumption must be increased accordingly or a second layer must be applied in order to achieve an equivalent vapor barrier effect. Tests show the following relationship between consumption, layer thickness, and vapor diffusion resistance:

| Consumption (CSP 3 Profil) | Layer thickness (in mm) | KÖSTER VAP I 2000 Equivalent air layer thickness* | KÖSTER VAP I 2000 UFS Equivalent air layer thickness* |
|---|---|---|---|
| 400 g / m² | 0,36 | $S_d$ = 52,2 m | $S_d$ = 48,7 m |
| 500 g / m² | 0,45 | $S_d$ = 65,2 m | $S_d$ = 60,9 m |
| | | μ = 145000 | μ = 135000 |

* Calculated average values based on the test results of the CTL Group according to ASTM E96

**Following coating work:**

Before overworking with a subsequent floor coating, the KÖSTER VAP I 2000 vapor barrier must be clean, free of dust, dirt, and any other residue. Grinding is not allowed. The maximum waiting time for revisional work is 24 hours. KÖSTER VAP I 2000 products do not form an amine haze on the surface and can be coated over even after a long period of time as long as the coating surface is clean. KÖSTER VAP I 2000 coatings must not be exposed to direct sunlight for longer than 48 hours. For PMMA coatings, the maximum waiting time before reworking is 48 hours after the KÖSTER VAP I 2000 system has fully cured.

KÖSTER VAP I 2000 systems should only be used by specialist companies and only after having completed a training course at the KÖSTER BAUCHEMIE AG.

## Structure of a typical floor coating

The further build-up of cementitious leveling compounds on epoxy resin floors is a major challenge in terms of the adhesive bond and its strength. For these reasons, KÖSTER has developed the KÖSTER VAP I 06 Primer. The material is a one-component primer that was specially developed to ensure maximum adhesion between non-absorbent / non-porous substrates, such as KÖSTER VAP I 2000 moisture mitigation systems, and subsequent cementitious leveling compounds such as KÖSTER SL Premium and KÖSTER SL Protect.

KÖSTER VAP I 06 Primer is a water-based, solvent-free primer for KÖSTER VAP I 2000 moisture mitigation systems. It is used on terrazzo, marble, metal, ceramic or quarry stone substrates before overworking with a cementitious leveling compound. The combination of a quality, ready-to-use product and the fast drying time of the material have set a new standard in the industry for primers on non-absorbent / non-porous substrates.

KÖSTER VAP I 06 Primer:

Primer for cementitious leveling compounds

## Key features
### of KÖSTER VAP I 06 Primer

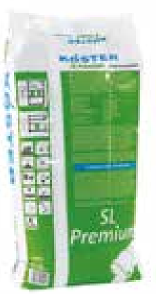
- no mixing, one-component
- fast curing / drying
- excellent adhesion
- moisture and alkali resistant
- VOC compliant
- water-based
- solvent-free

## Technical specifications

| | |
|---|---|
| • Packaging: | 9.5 kg canister |
| • Consumption: | 50 - 100 g / m² |
| • Pot life after opening: | approx. 3 hours (at + 21 °C) |
| • Drying time: | 1 - 2 hours (at + 23 °C) |

KÖSTER SL Premium:

cementitious self-leveling underlayment




KÖSTER SL Premium can now be applied to the primed and prepared substrate. KÖSTER SL Premium is a high-quality, fast-setting, highly pressure-resistant cementitious self-leveling underlayment. The material evens out uneven surfaces and prepares them for finishing with a decorative floor coating. KÖSTER SL Premium can be used with all common floor coating materials and is compatible with all common adhesives. It is resistant to abrasion and wear. If the leveling compound is placed on a smooth, non-absorbent / non-porous surface such as KÖSTER VAP I 2000, it must be primed with KÖSTER VAP I 06 Primer.

## Key features
### of KÖSTER SL Premium

- self-leveling
- rapid initial strength
- for all common floor coatings
- very good adhesion to the substrate
- can also be processed by pump
- one-component

## Technical specifications

| | |
|---|---|
| • Packaging: | 25 kg bag |
| • Compressive strength: | 45 N / mm² after 28 days |
| • Processing time: | approx. 20 min (at + 20 °C) |
| • Can be walked on: | after approx. 3–4 hours. |
| • Tile laying: | after approx. 4 - 6 hours. |

# System for concrete contaminated with water-soluble silicates

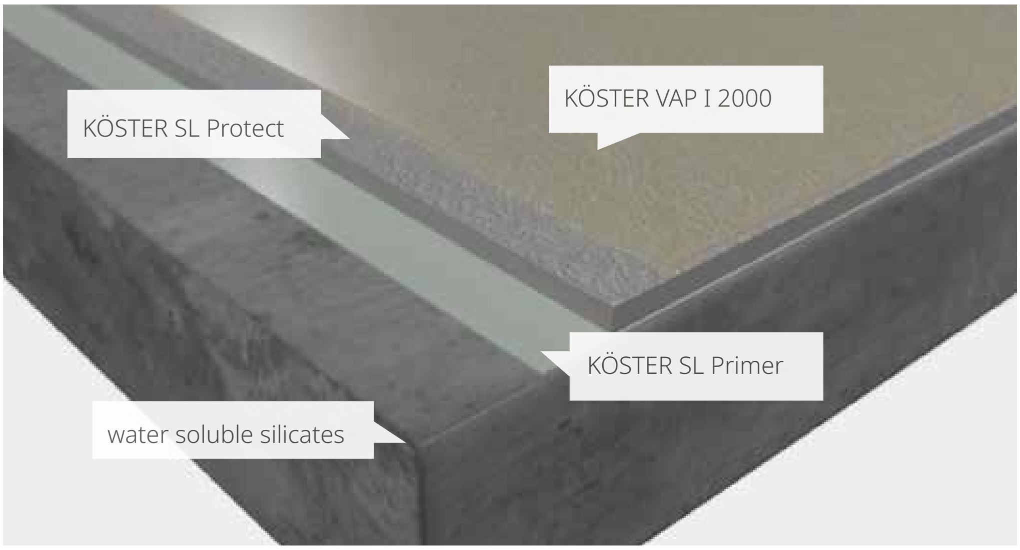
Silicates are widely used as concrete finishing agents.

If water-soluble silicates are present in the concrete at a certain concentration, this concrete can only be repaired by mechanical measures such as milling or heavy shotblasting. Often times even this is not enough. In such cases a separation layer, such as with KÖSTER SL Protect, can be applied to the concrete before a subsequent vapor barrier or floor coating can be installed. In this case, KÖSTER SL Protect can also be used to avoid very time-consuming concrete removal. KÖSTER SL Protect is applied directly to the shot-peened concrete. KÖSTER SL Protect is permanently resistant to high humidity and an alkaline environment. This creates an buffer layer between the silicate-contaminated substrate and the vapor barrier. KÖSTER SL Protect is self-leveling and therefore easy to use.

KÖSTER VAP I 2000 is applied to slightly „brushblasted" surface after the KÖSTER SL Protect has cured.

KÖSTER SL Protect

(Isolation layer)


## Key features
of KÖSTER SL Protect

- isolated from contaminated concrete
- resistant to high alkalinity
- self-leveling
- specially developed for KÖSTER VAP I 2000 systems
- Can be used in areas with increased mechanical requirements

## Technical specifications

| | |
|---|---|
| • Packaging: | 25 kg bag |
| • Compressive strength: | > 45 N/mm² after 28 days |
| • Processing time: | approx. 30 min (at + 20 °C) |
| • Can be walked on: | after approx. 3 hours (at + 20 °C) |

# Treatment of cracks and expansion joints

KÖSTER Joint Sealant FS-H


Cracks and expansion joints must be filled with a material that can elastically absorb the movements of the subsurface. Expansion joints must be sealed so that they are durable, dimensionally stable and UV-resistant. A joint sealant must allow movements in the component without causing damage to the structure. Movement joints of up to 35 mm can be sealed with KÖSTER Joint Sealant FS-H (or KÖSTER Joint Sealant FS-V). KÖSTER Joint Sealant FS-H is a self-leveling, rubber-elastic sealing compound with a high chemical resistance. For this reason it is the ideal material for sealing horizontal joints in buildings, foundations, sewage systems, garages, tunnels, and many other structures.

## **Key features**
## of KÖSTER Joint Sealant FS-H

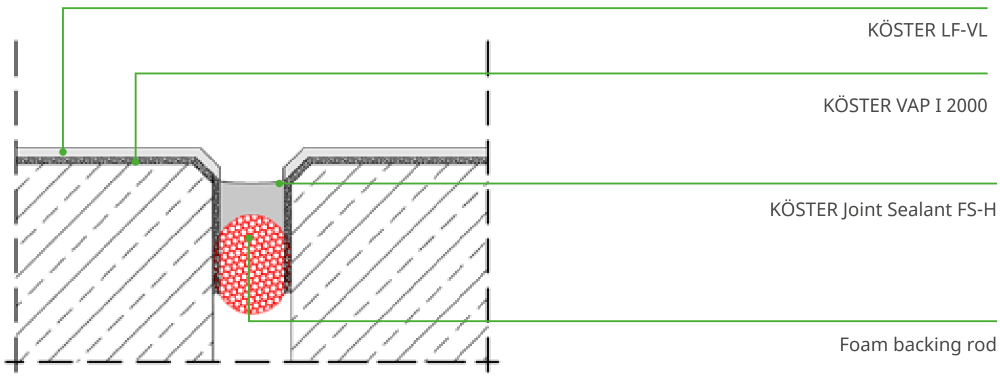
- high mechanical resistance
- good chemical resistance

## Technical specifications

| | |
|---|---|
| • Max. total working elasticity: | approx. 35% |
| • Shore A hardness: | approx. 15 |
| • Consistency: | pourable, self-leveling |
| • Pot life: | approx. 2 hours |
| • Hardening: | approx. 24 hours. |
| • Colors: | gray and black |

The expansion joint must be designed in such a way that the joint runs through the entire floor build-up, including all coatings for example the floor coating KÖSTER LF-VL. The prepared joint flanks are coated with KÖSTER VAP I 2000. After the hardening time of 4-12 hours (depending on the product), a round foam backing rod and the joint filler can be installed. KÖSTER FS Primer 2C is not used if the joint filler is applied directly to the KÖSTER VAP I 2000 products.

You can find further information on this in the KÖSTER system brochure “Waterproofing Construction Joints”.

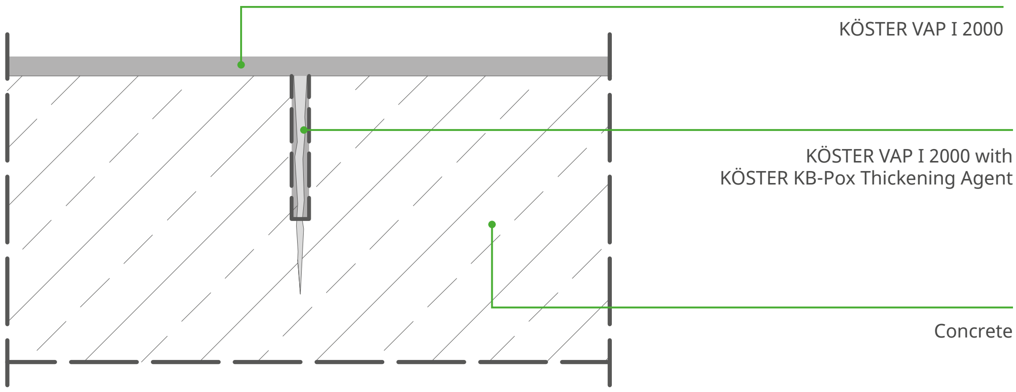



Cracks and dilation joints

## Static cracks and voids

Static cracks and voids are completely cleaned and then filled with KÖSTER VAP I 2000 thickened with KÖSTER KB-Pox Thickening Agent.

The crack is prepared by grinding and not cut further or deeper than necessary. Contaminated cracks in existing concrete are trimmed with an angle grinder to remove any residues that reduce flank adhesion.




Rigid cracks and voids

## KÖSTER VAP I 2000 systems: Professional processing equipment

### Toothed rubber squeegee and replacement blades:

In addition to moisture protection systems, KÖSTER also offers the appropriate accessories for application. It is important that a suitable toothed rubber squeegee (width approx. 60 cm) with suitable, slotted transfer sheets are used, which enable a continuous layer thickness of 0.4 mm.

## KÖSTER VAP I 06


Ideal and necessary for priming cured KÖSTER VAP I Systems for the subsequent installation of all cementitious self-leveling underlayments. KÖSTER VAP I 06 Primer is a unique, water based, single component material for priming absorbent and non-absorbent substrates. Suitable as a primer under terrazzo, marble, and ceramic tiles.

| | |
|---|---|
| Pot life: | Approx. 3 hours |
| Drying time: | Approx. 1 – 2 hours |
| Flash point: | None. Non-flammable, nonexplosive |
| Color: | Dries transparent, greenish |

| Article No. | packaging | Consumption |
|---|---|---|
| SL 131 009 | 9.5 kg jerrycan | Approx. 50 – 100 g / $m^2$ |

## KÖSTER VAP I 2000


Vapor barrier for priming unsealed interior concrete floors, e.g. against osmotic action under vapor tight flooring. Fields of application: under epoxy, polyurethane or vapor tight flooring e.g. in gyms, industrial halls or sales rooms.

| | |
|---|---|
| Pot life: | Approx. 12 Min. (at +23 °C) |
| Curing time: | Approx. 12 hours (at +23 °C) |
| Final strength: | After 7 days |
| Compressive strength: | Approx. 65 N / $mm^2$ |

| Article No. | packaging | Consumption |
|---|---|---|
| CT 230 | 2,95 kg combipackage<br>10,13 kg combipackage<br>25,32 kg combipackage | Approx. 450 g / $m^2$ |

## KÖSTER VAP I 2000 UFS


Fast setting vapor barrier for priming unsealed interior concrete floors under vapor tight flooring. Curing time 2-3 hours. The material reduces Moisture Vapor Emission Rates (MVER) and alkalinity to levels acceptable for most resilient or epoxy flooring systems as well as other vapor tight floorings.

| | |
|---|---|
| Pot life: | Approx. 12 Min. (at +23 °C) |
| Curing time: | Approx. 2 hours (at +23 °C) |
| Final strength: | After 7 days |

| Article No. | packaging | Consumption |
|---|---|---|
| CT 234 | 2,95 kg combipackage<br>10 kg combipackage | Approx. 500 g / $m^2$ |

## KÖSTER SL Protect


KÖSTER SL Protect is a mineral based self-leveling underlayment with high resistance to chemical and mechanical stresses. It is an early loadable, directly useable leveling layer over uneven or coarse concrete and cementitious screeds. Due to its high chemical resistance it is used to protect against light and medium corrosion and serves as a slowly reacting sacrificial layer in areas of high chemical stress. KÖSTER SL Protect is further used for fast repairs and protection in agricultural, industrial, business, workshop, production facilities, and private use buildings.

| | |
|---|---|
| Layer thickness: | 2 to 30 mm |
| Pot life: | Approx. 30 Min. (at +20 °C) |
| Curing time: | Approx. 3 hours (at +20 °C) |
| Compressive strength (28 days) | > 45 N/mm$^2$ |

| Article No. | packaging | Consumption |
|---|---|---|
| SL 286 025 | 25 kg bag | Approx. 1,9 kg / m$^2$ / mm layer thickness |

## KÖSTER SL Premium


KÖSTER SL Premium is a high quality, fast setting underlayment that hardens tension free and provides a smooth, level surface ready to receive subsequent flooring systems. It hardens within hours to a smooth, strong, and multifunctional leveling layer. It may be applied onto a variety of substrates. KÖSTER SL Premium can be applied in layer thicknesses between 5 and 15 mm, can be feathered out to 2 mm, and installed in depressions up to 30 mm.

| | |
|---|---|
| Layer thickness: | 2 to 15 mm, in depressions up to 30 mm |
| Pot life: | Approx. 20 Min. (at +20 °C) |
| Curing time: | Approx. 3 – 4 hours |
| Can be tiled over: | After approx. 4 – 6 hours |
| Compressive strength (28 days) | > 45 N/mm$^2$ |

| Article No. | packaging | Consumption |
|---|---|---|
| SL 280 025 | 25 kg bag | Approx. 1,5 kg / m$^2$ / mm layer thickness |

We are there for you – worldwide.

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Always adhere to the specifications in the respective Technical Data Sheets.