

WATERPROOFING REPORT

1 | 2007

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***Concrete repair –
stop concrete
damage in its tracks***

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***Repairing
a waste water tank***

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Concrete repair is one of the focal points of this issue. Concrete and steel reinforcement frequently suffer damage. The causes can be manifold. However, whether the damage arises from natural aging, from environmental influences, from overloading of the statics, incorrect planning and application procedures or faulty design, in order to retain the value of a building, damaged and corroded parts of the structure must be professionally repaired as soon as possible.



This requires the appropriate products. For decades, the innovative development of new systems has been our strength in the construction chemicals market. Via close association with users and planners, we work from the perspective of "What comes out of the market, goes into the market".

A development from this partnership-like collaboration is described in this Waterproofing Report: KÖSTER Betomorph[®] Multi A – a product that stands out because of its excellent technical features. It is another step towards long lasting restoration of structural members.

The quality of our products and systems is confirmed by numerous certificates from independent institutes. And now another test certificate was gained: for the product KÖSTER Crisin[®] 76. It guarantees a reliable horizontal barrier by way of unpressurized injection even in cases where the moisture content is greater than 90%.

You will see other new achievements of our daily work in the products KÖSTER Level G and KÖSTER AMS, a system for dealing with mould. We also report on them in this issue. Enjoy the reading!

Best wishes from Aurich

Günter Betten
Head of Sales, Germany

KÖSTER Betomorph[®] Multi A

Concrete repair: Quicker with an all-in-one...

The importance of the repair of structurally damaged concrete and reinforced concrete structures is increasing, because during the last twenty, thirty years the use of concrete as a construction material has increased. In order to guarantee the success of the repair works, care must be exercised during the planning and execution. Plain "concrete cosmetics", which due to the influence of time- and cost-pressure, are applied all too often, do not provide a lasting solution – usually such measures have to be repaired using more elaborate and expensive methods. KÖSTER BAUCHEMIE AG has introduced a new product to the market that makes the reliable restoration of concrete simpler and more efficient: KÖSTER Betomorph[®] Multi A.

Causes

Of the various causes of damage and damage mechanisms, carbonation and moisture are the main driving forces. One fundamental structural damage of concrete structural members arises principally from frost weathering caused by porous and open surfaces as well as from the absorption of carbon dioxide (CO₂) from the air and moisture.

Whether from moisture or carbonation – in both cases, the steel inside the concrete is attacked. It reacts with carbon dioxide and water to rust. This process, which is accelerated by poor concrete quality and cover, leads to a doub-



Clearly visible:
Concrete maintenance is due here

ling of the steel volume. This causes a blasting pressure which destroys the structure of the concrete structural member.

Repair objectives

Once damages develop, the repair of the affected concrete structural member should take place immediately. In Germany, the construction material requirements for durable and reliable repair are specified in the DafStb¹ repair guidelines and defined in the guideline "Schutz und Instandsetzung von Betonbauteilen²":

- Repair of the protection of the steel reinforcement
- Replacement of the structurally weakened concrete areas
- Sealing of the structural members
- Visual restoration to the original state.

Previous methods

On the basis of the repair guidelines, several work-steps are required in order to repair the

¹ Deutscher Ausschuss für Stahlbeton or 'German Commission for Reinforced Concrete'

² Protection and maintenance of concrete construction components

damaged concrete construction member:

1. Removal of the damaged concrete down to the sound and stable concrete-substrate-layer, including cleaning of the steel reinforcement (degree of purity SA 2 1/2) and cleaning of the surface of the damaged concrete
2. Application of a corrosion protection system
 - a) mineral-based (two-layer application of cementitious systems)
 - b) synthetic resin-based (mainly with epoxy-resin systems)
3. Application of a bonding bridge (predominantly mineral-based)
4. Filling in the missing concrete parts with a coarse repair mortar
5. Smoothing of the repaired surfaces with a finishing coat
6. Visual surface treatment, e. g. painting

Gypsum-free all-rounder: KÖSTER Betomor® Multi A

In order to optimize the required work-steps and to shorten the unavoidable waiting times between them, comprehensive series of tests were carried out in the research and development department of KÖSTER BAU-CHEMIE. Their aim was to offer concrete repair technology that is reliable in design and time-



Cleaning the steel reinforcement and concrete by sand-blasting

saving. The result is a multi-functional mortar which combines the required work-steps and sequences 2 to 5 in one single product: KÖSTER Betomor® Multi A. Its properties meet all of the stated requirements:

- high degree of admixture of synthetic materials
- cement-based
- gypsum-free
- fast curing
- chloride and carbonate-free
- compensation of the shrinkage
- high alkalinity



Mix, apply and smooth – done quickly with KÖSTER Betomor® Multi A

- Layer thickness can be up to 60mm
- ideal development of the compressive strength
- Bonding bridge, reprofiling mortar and fine filler in one product

Outlook

This new all-rounder simplifies the design and execution of concrete repair in key areas: After cleaning damaged areas, all of the required work-steps can be carried out using one single mortar. The

calculation of the materials necessary for carrying out the repair work is simplified. Construction logistics are accelerated by the use of Betomor® Multi A.

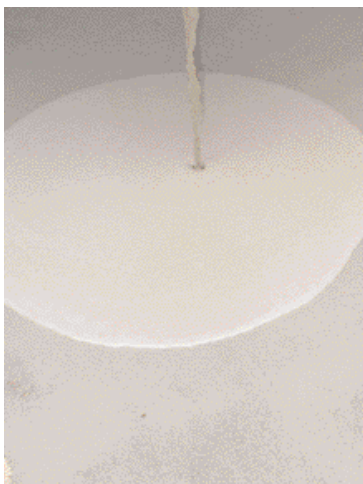
And the waiting times between the individual work-steps are reduced to a minimum.

Carbonation

The steel reinforcement in the concrete is passivated by a thin oxide layer. This layer is protected by the alkaline pH value of the surrounding concrete. As a result of the absorption of atmospheric CO₂, this pH value decreases. In a neutral or acidic environment, the oxide layer is no longer stable and the passive corrosion protection is removed. On interaction with moisture, the steel begins to rust.

KÖSTER Level G

The fast mineral floor screed for inside and outside



Time is money – especially so in the construction industry. For this reason, we developed KÖSTER Level G.

The binding agent matrix of KÖSTER Level G are mineral binding agents based on high-grade cements. Since no chloride, gypsum or calcium sulphate is added,

it can be used in almost all areas of application.

The following properties make KÖSTER Level G stand out:

- Applicable inside and outside, also suited for use in locations stressed by moisture or constant wetness
- Useable as an industrial floor screed according to EN 13813, fire resistance classification A1
- Can be walked on after only approx. 3 hours and be used after approx. 24 hours
- High wear resistance
- Highly capable of flowing
- Can be used in areas stressed by frost and de-icing salts (In Germany: exposition category XF)
- An extra bonding bridge is not necessary, since it is already integrated

- Layer thicknesses between 8 and 20 mm are possible
- Moisture content 24 hours after application is below 4%

KÖSTER Level G is mixed only with water using customary mechanical mixers. When using combined mixing- and feeding-pumps, high laying performance can be achieved.

KÖSTER Level G has already been used for many industrial applications in which a rapid recommissioning was required and in which high value was placed on a long-lasting floor coating. For example, in warehouses, water reservoirs, motor vehicle repair shops and factories. It is also applied in private housing construction, e. g. access balconies, basements, garages and balconies have been successfully renovated.

Concrete repair

Repair of a brewery wastewater tank exposed to heavy chemical stresses

The problem

The concrete of a brewery wastewater tank was showing extensive damage from chemical and mechanical stresses. In some areas, the concrete had been damaged so that the steel reinforcement was visible which had led to a significant interference of the operation. The wastewater fed into the tank consists both of acidic (pH 2.5) and of alkaline (pH 12.5) liquids. The diameter of the tank is approx. 9m and the side-walls that have to be repaired are about 3m high.

The job

The tank has to be repaired using a mineral repair- and coating-system that is durable and able to withstand the liquid media present.



Before repair: On the wall and in the fillet the damage is clearly visible.

The repair concept

After comprehensive technical laboratory testing, a durable protection system was developed that pays special attention to the strong fluctuations of the pH value.

Work-steps on the base slab

1. Substrate preparation: thorough cleaning of the surface by sandblasting and preparation of a sound and stable substrate with a minimum adhesive tensile strength of 1.5 N/mm²
2. Application of the surface-strengthening primer KÖSTER Polysil® TG 500
3. Coating of the entire surface with KÖSTER Level G with a minimum layer thickness of 10mm (depending in some places on the roughness of the surface)

Work-steps on the walls

1. Surface preparation: thorough cleaning of the surface by sandblasting and preparation of a sound and stable substrate with a minimum adhesive tensile strength of 1.5 N/mm²
2. Application of the surface-strengthening primer KÖSTER Polysil® TG 500
3. Filling in of rough areas with KÖSTER Repair Mortar with the addition of KÖSTER SB Bonding Emulsion "Concentrate"
4. Application of the mineral coating KÖSTER NB 1 Grey with the

addition of KÖSTER SB Bonding Emulsion "Concentrate" to the whole surface

5. Final sealing of the surface with KÖSTER Polysil® TG 500 by spraying the material onto the surface.



The result

The severe damages of the concrete were repaired and protected with a durable and secure mineral coating system. Shortly after completion, the tank could be used again as normal.

KÖSTER Level G is applied as the final coating to the base slab. The wall surface has already been sealed finally with KÖSTER Polysil® TG 500. Done!

Credits

Object:	Brewery wastewater tank
Implementation:	Henkenötter Fußbodentechnik GmbH, Paderborn System partner "Die Abdichter"

KÖSTER Anti-Mould-System

Mould – a threat to health



After removing the visible mould...

Every day, five to ten litres of water evaporate in an average apartment due to cooking, bathing, washing and breathing. This leads to an excess of air moisture in the rooms. Suddenly, dark dots appear on the walls which slowly develop into bigger spots: mould has developed!

Now prompt action has to be taken because besides the unsightly optical appearance and the creeping deterioration of the building substance, the endangering of the room climate should not be underestimated.

Mould seeds, referred to as spores or conidia, are classified as a cause of the most diverse respiratory illnesses including asthma. If the decision to fight the mould is made, it becomes evident that, due to their poisonous content, many anti-fungus-media are not much more beneficial to human health than the fungus itself.

- **KÖSTER AMS 2 Liquid Film:** Solvent-free air – but not water – permeable coating. Application is also done using a paintbrush.
- **KÖSTER AMS 3 Special Plaster:** Capillarily inactive, highly alkaline special plaster which is extremely absorbent due to its large pores. Application is done using a finishing trowel.

Due to the thin layer composition of in total only 2.5mm, the KÖSTER Anti-Mould-System can also be applied in small areas. In combination, these layers act like a huge buffer which absorbs the moisture accumulating in the room and thus prevents the masonry from absorbing moisture. Because of this, the moisture is released more quickly than it would be in the case of a conventional plaster.

The application of the KÖSTER Anti-Mould-System guarantees, proper heating and ventilation provided, dry surfaces without impairment of the room climate. Thus, mould finally is – once and for all – a problem of the past.

The KÖSTER Anti-Mould-System functions without biocides and fungus-killing poisons. It consists of three components which build on each other and are simple and inexpensive to apply:

AMS 1 Primer, AMS 2 Liquid Film and AMS 3 Special Plaster.

The secret of the KÖSTER Anti-Mould-System lies in the layer composition:

- **KÖSTER AMS 1 Primer:** Solvent-free moisture barrier with very good adhesion improving properties for all mineral substrates. The material is applied using a wide brush.



...the KÖSTER AMS 1 Primer and at least 15 minutes later ...



... the KÖSTER AMS 2 Liquid Film is applied. After 1 hour curing time...



...the KÖSTER AMS 3 Special Plaster is applied uniformly thin...



... and – once it has just started to set – leveled with a trowel

KÖSTER Crisin® 76

New test certificate confirms the reliability of the horizontal barrier again

KÖSTER Crisin® 76 is extremely effective as a horizontal barrier. Following comprehensive tests, the independent Dahlberg-Institute for Diagnostic Investigation and Maintenance of Historic Structures e.V., Wismar has confirmed, that the product guarantees a secure horizontal barrier –

installed using unpressurized injection – even in cases where moisture penetration levels are above 90%. While the untreated test pieces had to be considered “permeable to water” or “water absorbent”, they can be considered “water-repellent” after the treatment.



New: The Green Pages of Construction Chemicals

All KÖSTER systems, all KÖSTER products– and a whole lot more: Our new, completely revised sales catalogue has become a practical reference book for waterproofing. On 85 pages, all areas of application are presented extensively. Summarizing tables with the specifications for tenders lead quickly to the needed product for every waterproofing situation.



Order your copy!

You can order “The Green Pages of Construction Chemicals” directly from us using the fax-sheet on the back page of this Waterproofing Report or by e-mail to: info@koester.eu



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If you would like to know more about the topics discussed in this issue, please copy this sheet and send it to us by fax or send us an e-mail to: info@koester.eu.

Yes, I am interested in these topics:

Concrete repair with KÖSTER Betomor® Multi A

Application technology Sales

Mineral floor screed with KÖSTER Level G

Application technology Sales

Treatment against mould with the KÖSTER Anti-Mould-System

Application technology Sales

New Test Certificate for KÖSTER Crisin® 76

Application technology Sales

Please send me "The Green Pages of Construction Chemicals"

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What you always wanted to know about waterproofing...

... you can, of course, also ask us. If you prefer to quickly and specifically find and read up on a certain topic, our three "standard works of waterproofing" will help you:

- our website at www.koester.eu



- the planning folder, with all of the master work-schedules and technical guidelines for tradesmen, architects and civil engineers
- "The Green Pages of Construction Chemicals" – our sales catalogue, with its extensive information part



You can order the planning folder from us by writing to us to:

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