

# WATERPROOFING REPORT

2 | 2007

ON SITE | PAGE 5

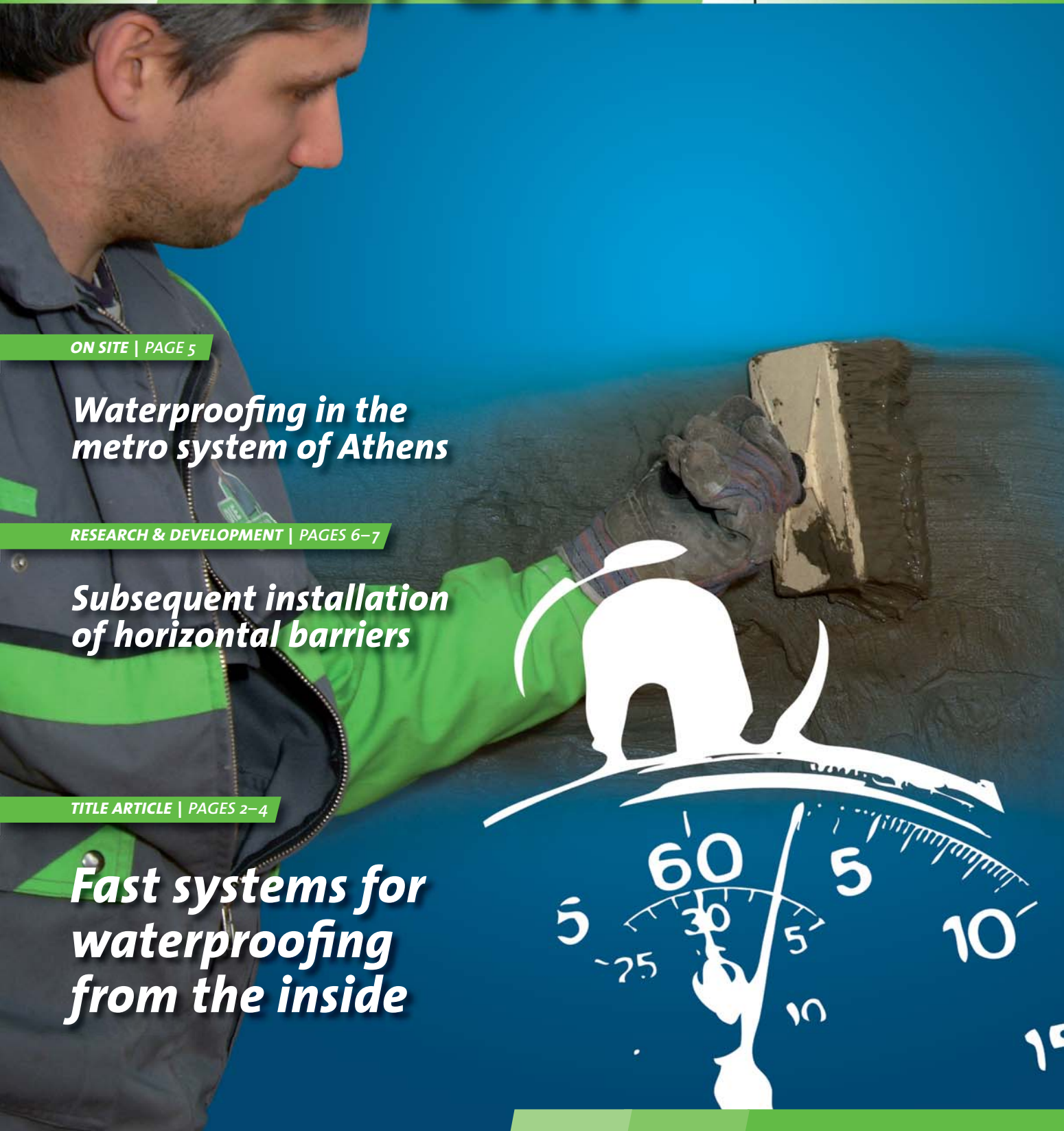
**Waterproofing in the  
metro system of Athens**

RESEARCH & DEVELOPMENT | PAGES 6-7

**Subsequent installation  
of horizontal barriers**

TITLE ARTICLE | PAGES 2-4

**Fast systems for  
waterproofing  
from the inside**



The factor time is and will remain the number one cost driver in the construction industry. On the one hand, customers always demand increasing performance from craftsmen and on the other hand, customers always increase pressure on the prices of craftsmen. KÖSTER BAUCHEMIE AG stands up to this challenge together with its customers by bringing product systems to the market which allow cost-efficient and reliable-design waterproofing.



Already, the classic – the KÖSTER Crisin® 76 suction angle injection system against rising damp – stands out because of its time-saving processing. It has also proven itself in the laboratory and in the field even in cases of high levels of moisture penetration.

The user-friendliness of the system in combination with the high level of certainty regarding the effectiveness of the system were the reasons for the development of the now already well proven system around the central product KÖSTER Restoration Plaster 2 “Fast”.

We now introduce you to the newest product of our program for fast and safe waterproofing, the product KÖSTER NB 1 “Fast” which closes the gap between our KÖSTER NB 1 Grey and the KÖSTER KD-system. This product unites the very fast curing of the KÖSTER KD-system with the very simple application of the KÖSTER NB 1 Grey / KÖSTER Polysil® TG 500 system.

You will find more about that in this edition of the Waterproofing Report, in which we would like to demonstrate to you the innovative power of the KÖSTER BAUCHEMIE AG by way of example.

With best regards from Aurich

*Dr. Uwe Warringa*

Dr. Uwe Warringa  
Head of Research and Development

## KÖSTER NB 1 “Fast”

# Fast waterproofing systems for waterproofing from the inside

With the new waterproofing product KÖSTER NB 1 “Fast”, KÖSTER BAUCHEMIE accommodates the wide-spread time pressure in the construction industry by uniting

the technical advantages of the well proven KÖSTER KD-System with the positive processing properties of KÖSTER NB 1 Grey.

### Fast waterproofing system 1: Pressurized water



### Fast waterproofing system 2: Non-pressurized water



### Fast waterproofing system 3: Damp walls



This new fast waterproofing system is the first choice for waterproofing against non-pressurized water and thereby closes the gap between fast waterproofing against pressurized water (negative side waterproofing against leakages with the KD-system) and plain plastering of moist walls with a combination of KÖSTER Polysil® TG 500 and KÖSTER

Restoration Plaster 2 “Fast”. KÖSTER NB 1 “Fast” is a fast-setting, rigid mineral sealing slurry for positive and negative side waterproofing in new building and restoration. After the product has been mixed with water, it sets within approximately 15–30 minutes under minimal heat development and can already bear light loads after 2–3 hours. KÖSTER NB 1

“Fast” is principally always combined with KÖSTER Polysil® TG 500. On one hand, the substrate to be sealed is solidified through the application of the KÖSTER Polysil® TG 500 and a uniform absorbency of the substrate is produced. On the other hand, KÖSTER Polysil® TG 500 is applied on top of the second coat of KÖSTER NB 1 “Fast” to harden the



slurry. Hardening with KÖSTER Polysil® TG 500 between the two coats, as required in the case of negative side waterproofing with KÖSTER NB 1 Grey, is not necessary.

KÖSTER NB 1 “Fast” bonds to the substrate as homogeneously as KÖSTER NB 1 Grey does and it enters a monolithic bond with the substrate.

### *Start in the morning, be finished by noon.*

Principally, the application sequence of KÖSTER Polysil® TG 500 and KÖSTER NB 1 “Fast” is done fresh in fresh, waiting time is only approx. 15 minutes between the priming of the substrate with KÖSTER Polysil® TG 500 and the application of the

first coat of sealing slurry. After the slurry has been hardened with KÖSTER Polysil® TG 500,

a further waiting time of 15 minutes must be observed until plastering can be started with the application of a plaster key made of KÖSTER Restoration Plaster 2 “Fast” and KÖSTER SB-Bonding Emulsion “Concentrate”. After a very short curing time (30–60 minutes), plastering can be carried out in one layer using KÖSTER Restoration Plaster 2 “Fast”.

Due to the extremely short curing times of both, the waterproofing made from KÖSTER NB 1 “Fast” and KÖSTER Restoration Plaster 2 “Fast”, restorations of small areas can be carried out within one day. Waiting times between the individual layers / work steps have been reduced to a minimum.

### *Fast waterproofing systems for all applications*

Three applications – three times a high level of security at a fast work pace. All three systems for the restoration of damp or respectively wet substrates are shown in the pictures sequences 1–3. The time sequences are oriented on the average job performance of an employee and an area of 5 m<sup>2</sup> of wall to be restored.

It becomes evident that, depending on the waterproofing load case, a significant area coverage is made possible, which up to now could not be reached using traditional waterproofing and restoration plaster systems.

## *The new standard regulating restoration plasters: EN 998-1*



Quite a while ago now, the characteristics of restoration plasters were outlined by the WTA-guideline 2-2-91 “Restoration plasters” and since manifested through the certification of restoration plas-

ters by a WTA expert committee. Available now since September 2003 and in effect in Germany since January 2005, DIN EN 998 “Requirements on mortar for masonry”, part 1: plastering mortars closes the regulatory gap to the requirements on restoration plasters and puts them in line with the plastering mortar groups also regulated by DIN EN 998-1: normal plastering mortar, lightweight plastering mortar, patent plastering mortar, one layer plastering

mortar for outside use and heat-insulating mortar.

With the publication of EN 998-1, the concept of restoration plaster has been raised to a European standard level and thus the facts – that moist and salt-contaminated substrates necessitate special coating concepts – have been recognized and accommodated. On closer inspection though, it remains doubtful whether the established definition of restoration plasters is sufficient to achieve the crucial long-term damage-free condition of restorations with these products. The new EN 998-1 regulates the materials to be used but the standard regulating the application is at present still in revision.

KÖSTER KB-Pur® 2 IN 1

## Waterproofing in the metro system of Athens

*Athens has a metro system since 1869. Until 2000, there was only one line. With regard to the Olympic Games in 2004, two more lines were built. Monastiraki station was, due to the dense building development, the traffic and ground conditions and most of all due to the archaeological demands – situated in the heart of Athens at the foot of the Acropolis – an exceptional technical challenge.*

High requirements were placed on the water-tightness of station concourses. Despite the technically good construction, it was not possible to exclude construction joints and leakages on cable feed-throughs which were subsequently concreted. In various places, water seepages were found which have repeatedly been injected during the last months with injection foam. Yet, very shortly afterwards it became apparent in the same places that the applied foam had disintegrated or shrunk and thus provided new channels for the water.

In the end of 2005 it was decided that the waterproofing would be done using the new KÖSTER KB-Pur® 2 IN 1 which would be injected during the night from 1 a.m. on – after metro operations ended for the day – using a low pressure system.

### Why KÖSTER KB-Pur® 2 IN 1?

This product combines the features of an injection foam and an injection resin. The material

acts as water stopper and solid resin in one product. Thus, on site only one material is needed now which provides a lasting solution for water bearing as well as for dry cracks.

### Construction joints – water-tight at last

The foam, which had already been injected repeatedly into the construction joints, was worn down by movements of the building structure and thus let water pass through after a relatively short time. After installation of the injection packers, KÖSTER KB-Pur® 2 IN 1 was injected in the first work step until the material began to discharge from the substrate.



#### Injection using a low pressure system

Since there was still water in the crack area, the injected material reacted immediately to form a water stopping foam. Within the pot-life of the material, the crack was injected again in a second work-step. This way, the crack area could be permanently sealed with



an elastic resin. Incidentally, all construction joints were located below the ground water level and thus had to be waterproofed against flowing water.

**At night, when metro operations were suspended...**

### Profile

Object:	Monastiraki metro station
Technical data:	Length: approx. 150 m Width: approx. 15 m Depth: approx. 30 m
Passenger volume at peak times	up to 40,000 people per hour
Developer:	Attiko-Metro metro-company, Athens
Technical advice:	GEO INVEST – Real Estate Construction & Trading Company SA, sole agency of KÖSTER BAUCHEMIE AG in Greece
Products used:	KÖSTER KB-Pur® 2 IN 1 injection resin

## Subsequent installation of horizontal barriers – reliable in design and applicator-friendly down to the details

*The subsequent waterproofing against rising damp in restoration and maintenance of buildings gains more and more importance. Via the porous network of capillary system within a certain building material, damp can rise in the masonry. Thus, considerable damage can develop on buildings.*

Once such damages and the infiltration of damp are diagnosed, building owners, planners and applicators are faced with question of choosing a restoration method. Crucial for the right waterproofing system are two characteristics:

1. the degree of moisture penetration

2. the extent of salt contamination (quantitative and qualitative),

which are determined by measuring tests. The appropriate waterproofing system can be chosen only after this building diagnosis was evaluated.

### **Do test certificates provide a design and execution guarantee?**

Unfortunately not – since one is theory and the other is practice. To provide a certain security, WTA [Scientific & Technological study group for the restoration of buildings and preservation of monu-

ments] developed the guideline 4-4-04/D, “Injections in masonry against capillary moisture”. It is supposed to give planners and applicators the opportunity to assess the customary injection materials with regard to their features and fields of application. Proof of suitability for masonry with various degrees of damp loads (degree of moisture penetration: 60% – 95%) can be supplied.

We, the KÖSTER BAUCHEMIE AG, contracted the material testing institute in Leipzig, Germany in the beginning of 2004 to carry out testing of our product KÖSTER Crisin® 76 according to WTA

Description	KÖSTER Crisin® 76	Competitor Product 1	Competitor Product 2	Comments
Size of test sample l: 740, h: 570, w: 240 [mm]	fulfilled	fulfilled	fulfilled	
Alkalisiation of masonry required after injection	no	yes	not specified	1
Alkalisiation of masonry required before injection	no	no	not specified	2
Drying of masonry required (before injection)	no	no	not specified	3
Degree of moisture penetration	89 %	not specified	not specified	4
Material consumption (Projection of consumption per m²)	1.2 – 1.5 litre (6.7 – 8.3 litre)	8 – 12 litre (45 – 67.5 litre)	not specified	5
Completely airtight packaging of test pieces	yes	no	no	6
Injection system	unpressurised	pressurized	pressurized	7
Water-soluble	no	yes	yes	8

guidelines. In comparison to other injection materials, the following was observed:

**Comments:**

**To 1)** With some injection materials, an additional after-injection with an alkaliser (e.g. alkali silicate) is necessary. This is not the case with KÖSTER Crisin® 76.

**To 2)** This is necessary if an injection material is applied which requires alkalinity of the building material. E. g., alkali silicates can only penetrate the building material optimally if the building material is alkaline. KÖSTER Crisin® 76 contains no alkali silicates.

**To 3)** Certain systems require that the degree of moisture penetration is strongly reduced prior to the application by heating up the brickwork. This way, the degree of moisture penetration is reduced e. g. from 95% to almost 0% so that the substance can be injected. With KÖSTER Crisin® 76 this difficult and time consuming task is not necessary.

**To 4)** The degree of the moisture penetration of the test piece can only be set with a tolerance of 5 – 10 %, during testing it can be determined exactly though. In the test report for KÖSTER Crisin® 76, this value was determined to exactly 89 % while in the reports of others no values are specified.

**To 5)** Very big differences can be observed regarding the consumption of material. Material consumption of KÖSTER Crisin® 76 is up to 7 times lower than that of our competitors products.

**To 6)** While the KÖSTER Crisin® 76

test piece was packaged completely airtight, it can be noted in other test reports that the front sides of the injection pieces were not sealed air-tight. Just through this, the degree of moisture penetration is reduced. Obviously, a correct test result can only be achieved with a test piece which was sealed airtight. Furthermore, it can be recognized by this that the applied water-mixable products only develop their actual hydrophobicity once they have fallen dry. KÖSTER Crisin® 76 passed this test even without this possibility to dry up! This is important since in real-life applications building very often stay damp. Thus, KÖSTER Crisin® 76 will stop rising damp in these cases whereas other materials will not.

**To 7)** In my opinion, pressurized injection always bears the risk of uncontrolled outflow of the material. Normally masonry is heterogeneous and can contain cracks and cavities. Under pressure, the injection material will vanish in the cracks and cavities without sealing the area which was intended to be sealed. In contrast, KÖSTER Crisin® 76 applied pressureless with the KÖSTER Suction Angel System, ensures homogeneous penetration of the material, using the capillarity of the pores which caused the rising of moisture to begin with.

**To 8)** Some products can be pre-set to the degree of moisture penetration of the wall by diluting them with water. But due to the varying degrees of moisture penetration in one building, the exact required degree of dilution is very difficult for the worker to adhere to. KÖSTER Crisin® 76 can not be diluted with water. When KÖSTER

Crisin® 76 is applied, no further water is added into the building structure.

**Conclusion:** In praxis, planners and applicators demand easy to apply products which offer the most security possible. Please judge for yourself on the basis of the characteristics described – you know our recommendation:



When making your choice, please consider the following: in buildings which are to be restored often salts such as sulphate, chloride, nitrate etc. are present which are harmful to the building substance. Many of the products which can be used to install subsequent horizontal barriers react to high salt contents or can not be applied in these situations. In certain cases, this already begins at 1 % (by mass) of salt content. A product such as KÖSTER Crisin® 76 reacts fully independent of these salt contents.

**Non-pressurised injection system – safe and applicator-friendly: KÖSTER Crisin® 76**

KÖSTER BAUCHEMIE AG  
Dieselstrasse 3 – 10

26607 Aurich  
Germany

**Fax number +49 49 41 97 09 40**



**Everything  
is in there:  
the big folder of  
waterproofing...**

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](mailto:info@koester.eu).

Yes, I am interested in these topics:

***Fast systems for waterproofing from the inside***

Application technology     Sales

***Restoration plasters and EN 998-1***

Application technology     Sales

***Waterproofing in the metro system of Athens***

Application technology     Sales

***Subsequent horizontal barriers***

Application technology     Sales

Mr/Ms \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

Telephone/Fax \_\_\_\_\_

Order the practical work aid for planners, applicators and trade by writing to us to:

KÖSTER BAUCHEMIE AG,  
Dieselstrasse 3 – 10,  
26607 Aurich, Germany.  
[info@koester.eu](mailto:info@koester.eu)

**... and in the internet under  
[www.koester.eu](http://www.koester.eu)**



Our website contains lots of information for building owners, planners and applicators. Take a look.

***About us***

***Publisher***

KÖSTER BAUCHEMIE AG  
Dieselstrasse 3 – 10, 26607 Aurich  
Telephone +49 49 41 97 09-0  
[info@koester.eu](mailto:info@koester.eu), [www.koester.eu](http://www.koester.eu)

***Production***

Meinders+Winter Werbeagentur GmbH  
Meindersstrasse 1, 33615 Bielefeld