MS W 101 22.V3

Method Statement

Negative side waterproofing with KÖSTER NB 1 Grey

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KÖSTER
Waterproofing Systems

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Waterproofing Systems

1 General information

1.1 Scope

This method statement is intended for use by developers, contractors and applicators as a general guideline for the application of the waterproofing system KÖSTER NB 1 Grey.

While this document describes the tools, equipment, materials and step by step process for preparing and installing the waterproofing system, it must be used and referred to, in combination with all other relevant technical information available for the product and its components.

1.2 Manufacturer

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KÖSTER
Waterproofing Systems

1.3 Definitions

Absorption
The process by which one substance, such as a solid or liquid, takes up another substance, such as a liquid or gas, through minute pores or spaces between its molecules. An absorption process is generally reversible.

Compressive Strength
Capacity of a material to withstand axially directed pushing forces. When the limit of compressive strength is reached, materials will collapse.

Construction Joints
Concrete structures are subjected to a variety of stresses. These stresses are the result of shrinkage and differential movement. Stresses in concrete can be controlled by the proper placement of joints in the structure.

Emulsion
A suspension of tiny droplets of one liquid in a second liquid. By making an emulsion, one can mix two liquids that ordinarily do not mix well, such as oil and water. Emulsions are chemically stabilized.

Fillet
A concave easing of an interior corner. By employing fillets on points and lines of expected high stress, stress concentrations are reduced.

Negative Side Waterproofing
Negative side waterproofing means that the waterproofing layer is applied to the side of the construction member which is opposite to the side with direct contact to the water.

2 System description

2.1 System features

KÖSTER NB 1 Grey is a cement based waterproofing system designed to waterproof mineral-based structures such as concrete and brick walls. The system contains active ingredients which will penetrate into the substrate, crystallize and thereby create an insoluble barrier which will remain in function as long as the substrate itself remains sound. Because of its penetrating and crystallizing properties, KÖSTER NB 1 Grey can successfully be used on both the inside and the outside (positive and negative side waterproofing) of a structure with equally good results.

2.1.1 Characteristics/Advantages

- Positive and negative side waterproofing against pressurized water
- Crystallizing waterproofing system
- Penetrates into the substrate and creates a chemical and mechanical bond that will last as long as the wall itself - inseparable waterproofing-substrate bond
- Open to water vapor diffusion
- Resistant against chlorides, sulphates and phosphates.
- Abrasion resistant
- Certified for drinking water environments
- Does not contain corrosion promoting ingredients
- No VOC, no emissions of environmentally harmful ingredients
- Suitable for a wide variety of substrates
- Works also on masonry and on very porous substrates like shotcrete, aerated concrete and cinderblock
- Suitable for moist surfaces
- Substrate does not have to be continually kept wet to cure
- Can seal hairline cracks caused by shrinkage and settlement of the structure (self-healing)
- Inhibits salt movement in the substrate when used as a system together with KÖSTER Polysil TG 500
- Easy to apply, fast and safe to use
- Seamless application
- Long pot life

2.2 Main products and components

KÖSTER NB 1 Grey
Mineral based, sulfate resistant, crystalizing waterproofing system for positive and negative side waterproofing against pressurized water.

See online

KÖSTER Polysil TG 500
Low viscous, substrate solidifying, salt binding, and hydrophobizing combination product on a polymer/silicate basis for the protection of mineral substrates and priming of mineral substrates before waterproofing with cementitious waterproofing slurries, PMBC, and installation of restoration plasters.

See online

KÖSTER Repair Mortar Plus
Slightly expanding, hydrophobic, fast setting repair mortar resistant to pressurized water.

See online

2.3 Associated products

KÖSTER 2 IN 1

See online

KÖSTER Joint Sealant FS-H black

See online

KÖSTER Bikuthan 1C

See online

KÖSTER Joint Sealant FS-V black

See online

KÖSTER Bikuthan 2C

See online

KÖSTER Joint Tape 20

See online

KÖSTER Deuxan 2C

See online

KÖSTER KBE Liquid Film

See online

KÖSTER IN 2

See online

KÖSTER KD 2 Blitz Powder

See online

KÖSTER IN 5

See online

KÖSTER NB 1 Flex

See online

KÖSTER IN 8

See online

KÖSTER NB 2 White

See online

KÖSTER Polysil TG 500

See online

KÖSTER Restoration Plaster White/Light

See online

KÖSTER Repair Mortar

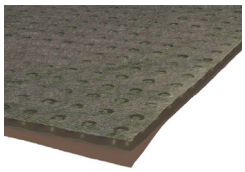
See online

KÖSTER SB Bonding Emulsion

See online

KÖSTER Repair Mortar Plus

See online



KÖSTER SD Protection and Drainage Sheet 3-400

See online

KÖSTER Restoration Plaster Grey

See online

KÖSTER Waterstop

See online

KÖSTER Restoration Plaster White

See online

KÖSTER WP Mortar

See online

KÖSTER Restoration Plaster White/Fast

See online

2.3 Associated literature

- Technical Data Sheet
- Waterproofing Report 1-2008
- System brochure: Negative Side Waterproofing Systems for Masonry and Concrete
- Abdichtungsreport 1-2009 (Only German)
- System brochure External Basement Waterproofing
- Product Declaration of Performance NB 1 Grey
- Umweltproduktdeklaration (EPD): NB 1 grau
- KÖSTER Test report NB 1 Positive Side Waterproofing
- Environmental Product Declaration (EPD): NB 1 Grey
- Specification KÖSTER NB 1 Grey (Only English)

3 Tools and Equipment

3.1 Tools

KÖSTER Brush for slurries

Rounded trowel

Trowel

Mixing vessels (30 l)

Finishing trowel

3.2 Equipment

Single paddle mixer

KÖSTER Peristaltic Pump (optional for spray application)

Pressure sprayer

3.3 Cleaning

Clean all tools and equipment immediately after use with water. Cured and hardened material can only be removed mechanically.

4 Environmental, health and safety

4.1 Personal Protection Equipment (PPE)

The following is a short overview of Personal Protective Equipment and serves only as a guideline. Contractors and Employers are responsible for meeting the occupational safety guidelines in their countries, states, and localities.

Eye protection

Employers must be sure that their employees wear appropriate eye and face protection and that the selected form of protection is appropriate to the work being performed and properly fits each worker exposed to the hazard.

Head protection

Employers must ensure that their employees wear head protection if any of the following apply: Objects might fall from above and strike them on the head; they might bump their heads against fixed objects, such as exposed pipes or beams; or there is a possibility of accidental head contact with electrical hazards.

Foot and Leg Protection

Employees who face possible foot or leg injuries from falling or rolling objects or from crushing or penetrating materials should wear protective footwear.

Hand Protection

When selecting gloves to protect against exposure hazards, always check with the manufacturer or review the manufacturer's product literature to determine the gloves' effectiveness against specific workplace chemicals and conditions. Gloves commonly used are: Coated fabric gloves and Chemical - and Liquid - Resistant Gloves

Hearing protection

Suitable hearing protection must be provided for the job environment.

4.2 Material safety & First Aid

Every KÖSTER product is labeled with specific information and symbols as to the related dangers. Please consult the respective Material Safety Data Sheet for specifics.

If inhaled:
Remove person to fresh air and keep comfortable for breathing. In all cases of doubt, or when symptoms persist, seek medical advice. Inhalation of dust may cause irritation of the respiratory system.

After ingestion:
Do NOT induce vomiting. Rinse mouth immediately and drink plenty of water. Call a physician in any case!

After contact with skin:
Wash immediately with plenty of water. Change contaminated clothing. The product develops an alkaline pH value with moisture and can cause irritation. Contains chromium (VI). May produce an allergic reaction.

In case of contact with eyes:
Rinse immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart. Subsequently consult an ophthalmologist. Following eye contact: Risk of serious damage to eyes.

In case of accident or if you feel unwell:
Seek medical advice immediately (show the label if possible). Treat symptomatically.

4.3 Waste disposal

Disposal recommendations
Dispose of waste according to applicable legislation.

List of Wastes Code -
Residues/unused products (101311)
WASTES FROM THERMAL PROCESSES; wastes from manufacture of cement, lime and plaster and articles and products made from them; wastes from cement-based composite materials other than those mentioned in 10 13 09 and 10 13 10.

Contaminated packaging
Non-contaminated packages may be recycled.

List of Wastes Code -
Used product (170107)
CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES); concrete, bricks, tiles and ceramics; mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06.

5 Substrate preparation

5.1 Project site conditions

5.1.1 Application temperature

The waterproofing system should be applied at temperatures between +5° C and + 30° C. Do not apply cementitious waterproofing materials when the temperature is lower than +5 °C or expected to fall below this temperature within 24 hours from time of application. Do not apply the material in direct sunlight with temperatures over +30 °C.

5.1.2 Substrate temperature - Dew point

At the dew point, water condenses on the surface to be coated, therefore, coating must take place when the surface temperature is at least +3 °C above the dew point.

5.1.3 Moisture content in substrate

The substrate must be prepared in such a way that it does not absorb water from the fresh coating. This can be achieved either by pre-wetting the substrate or by applying a primer to it. When pre-wetting, the surface must be wet enough so that it will remain damp and cold for at least 10 minutes directly before being coated.

5.1.4 Relative humidity

Relative humidity should not exceed 95 % as it may affect the final results and curing process. Low levels of relative humidity increase the risk of water evaporation from the material, consequently increasing the risk of premature drying and shrinkage cracking.

5.1.5 Rain and frost

The waterproofing coating must not be exposed to mist, rain, intense heat, snow, frost and strong wind during the application and for at least 24 hours afterwards.

5.2 Requirements

The mineral substrate has to be sound and solid as well as free of bonding inhibiting agents such as grease or oil. Remove all bond breaking substances such as old coats, laitance, loose particles, dust, formwork, release oil, etc. The substrate must be open pored so that the KÖSTER NB1 Grey can penetrate.

The substrate must also be free of silicate sealer, waxes, and silicate curing compounds as well as all forms of gypsum. Do not apply cementitious waterproofing to unprotected surfaces in wet weather or to surfaces on which ice, frost or water is visible.

5.3 Substrate quality testing

5.3.1 Scratch test

Scratch the substrate with a nail or something similar. If particles come off the surface or if the fingernail can penetrate the substrate, remove the entire weak or sinter layer.

5.3.2 Wipe test

Wipe with your hand over the substrate. If no particles become detached and if the hand remains clean, then the substrate is acceptable.

5.3.3 Water test

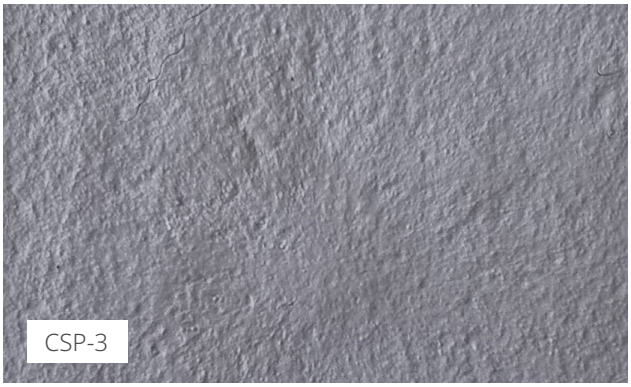
To evaluate the absorptiveness of the substrate, wet the substrate. Water which is applied to the substrate must not roll off the surface but it must distribute within a short period of time.

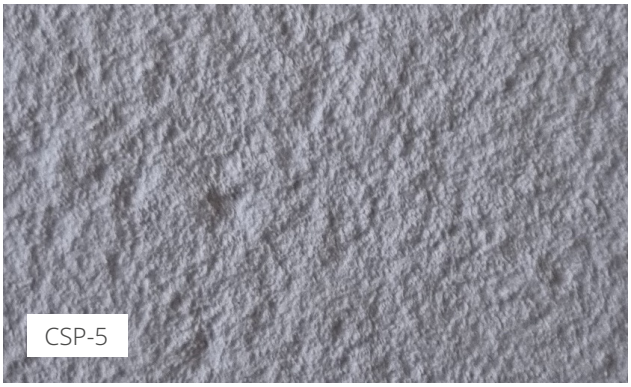
5.4 Preparation

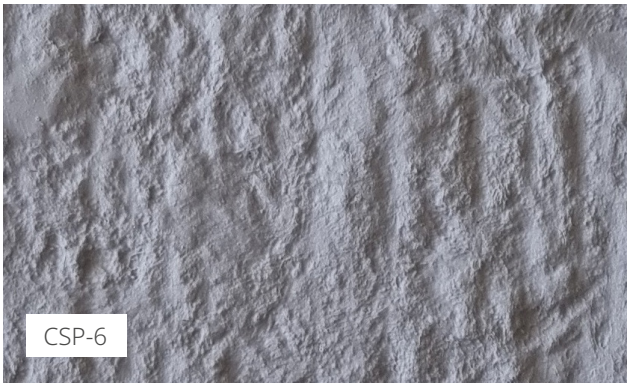
5.4.1 Concrete surfaces

Concrete surfaces must be prepared to have an open pore surface free of laitance. The surface roughness must present a structure corresponding to a Concrete Surface Profile CSP-3, CSP-4, CSP-5 or CSP-6; according to the guidelines by the International Concrete Repair Institute (ICRI). The surface must then be intensively cleaned prior to the installation.

Suitable surface preparation methods are grinding, high-pressure water blasting (at least 350 bar) and sand-blasting/shotblasting.







Grinding
Suitable for creating a CSP-1 to CSP-3.

High-pressure water blasting
(at least 350 bar)
Suitable for creating a CSP-3 to CSP-10. In case there is formwork release oil on the surface, apply a suited detergent to the surface before cleaning with the water jet.

Sandblasting or **shotblasting**
Suitable for creating a CSP-2 to CSP-8.

5.4.2 Masonry

Masonry walls must be mechanically cleaned and freed from efflorescence prior to the application of the waterproofing system. Uneven brick or block work must be first rendered flush with KÖSTER Repair Mortar Plus enhanced with KÖSTER SB Bonding Emulsion.

5.4.3 Levelling & repairing the surface

In the case of surface roughness of less than 5 mm, use KÖSTER NB 1 Grey with the addition of KÖSTER NB 1 Flex in the mixing water to smooth the surface. Apply with KÖSTER Brush for slurries and/or trowel.

Honeycombed areas, cavities, recesses and chipped out areas, as well as all holes or irregularities wider or deeper that 5 mm have to be filled with KÖSTER Repair Mortar Plus enhanced with KÖSTER SB Bonding Emulsion before applying KÖSTER NB 1 Grey.

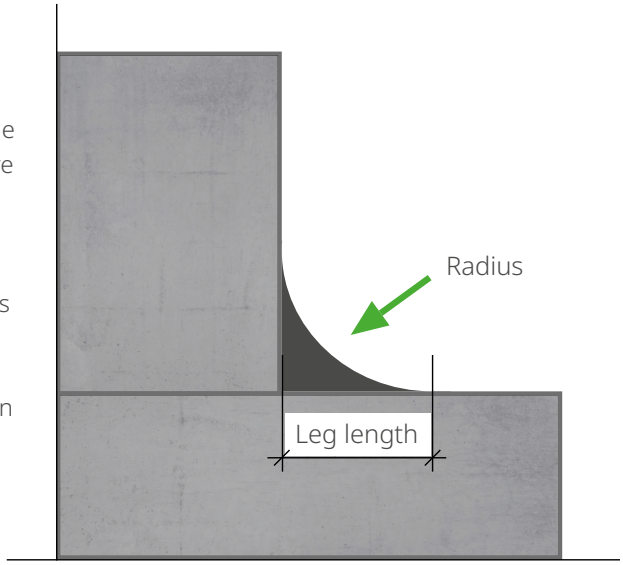
5.4.4 Rounding edges

All sharp corners and edges are to be rounded to a radius of approximately 4 cm.

5.4.5 Installation of fillets

On interior corners a fillet must be installed to reduce stress concentrations in the walls, and therefore, in the coating. Install fillets (leg length of approx. 4–6 cm) made from KÖSTER Repair Mortar Plus at least 12 hours before treating the surfaces with the waterproofing coat on all wall-floor and wall-wall junctions.

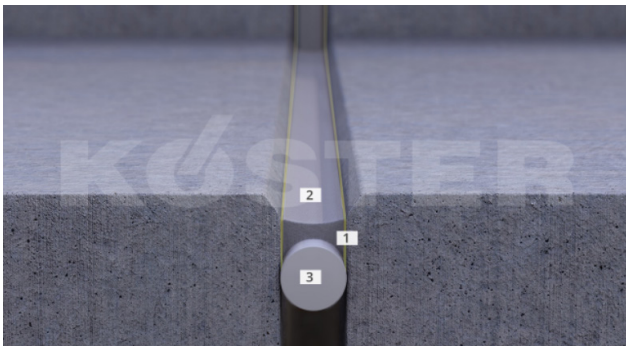
In areas exposed to pressurized water, the substrate has to be primed with KÖSTER NB 1 Grey (consumption: approx. 4 kg/m²) prior to the installation of the fillet. Allow the KÖSTER NB 1 Grey to cure for at least 24 hours. Then the fillet can be installed (leg length of approx. 4–6 cm) using KÖSTER Repair Mortar Plus (mix 25 kg of KÖSTER Repair Mortar Plus with 2.5 – 3.0 l of water + 800 ml of KÖSTER SB Bonding Emulsion).



5.4.6 Cracks & joints

Cracks and joints must be treated accordingly with the respective resin or sealant. Cracks, construction joints and other areas which are susceptible to leaking or poor bonding must be opened at least 2 cm wide and 2 cm deep and filled with KÖSTER Betomor Multi A or KÖSTER Repair Mortar Plus. Dilation joints can be treated with KÖSTER Joint Tape 20/30 (according to the size of the joint) adhered with KÖSTER KB-Pox Adhesive. Make an Omega Profile in the joints to allow further movements of the joint. Alternatively, KÖSTER FS-Joint Sealant or KÖSTER PU-Flex 25 can be used.

1. Primer: KÖSTER KB-Pox Adhesive
2. Joint sealing: KÖSTER Joint Tape 20
   KÖSTER Joint Tape 30

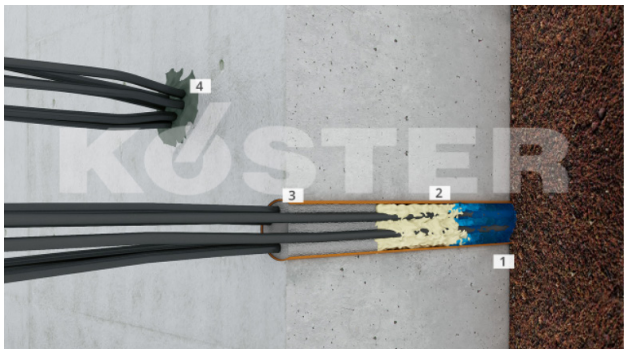


1. Primer: KÖSTER FS Primer 2C
2. Joint sealing: KÖSTER Joint Sealing FS-H black
   KÖSTER Joint Sealing FS-H grey
   KÖSTER Joint Sealing FS-V black
   KÖSTER Joint Sealing FS-V grey
3. Backing rod

5.4.7 Pipe penetrations

Pipe and cable penetrations can be waterproofed with KÖSTER KB Flex 200. As an additional safeguard and to hold the pipe/cable centered, the exposed material is covered with KÖSTER KB-Fix 5.

1. Penetration
2. Backing
3. Waterproofing: KÖSTER KB-Flex 200
4. Protection Layer: KÖSTER KB-Fix 5



5.4.8 Priming

Substrates have to be wetted (avoid standing water) or treated with KÖSTER Polysil TG 500 prior to the application of KÖSTER NB 1 Grey. Dusty or salt-damaged substrates have to be brushed off and primed with KÖSTER Polysil TG 500, approx. 30 - 60 minutes prior to the application of KÖSTER NB 1 Grey.

KÖSTER Polysil TG 500 should be applied in 1 single application with a pressure sprayer, roller or a brush, at a consumption of approx. 0.1 - 0.25 kg/m² depending on substrate; strongly absorbent substrates may require more.

6 Application/Installation instructions

6.1 Mixing

The material must be mixed using a slow speed mixer whereby the powder should be added to the mixing water or respectively to the polymer liquid.

Generally, each 25 kg bag of KÖSTER NB 1 Grey is mixed with:

- 8 l of water or
- 6 l of water plus 1-2 kg KÖSTER SB Bonding Emulsion
- 1 jerry can (9 kg) of KÖSTER NB 1 Flex

After mixing, up to 1.0 liter of additional water can be added to the material to achieve a consistency suitable for processing.

Use a clean mixing vessel for each batch or respectively clean the mixing vessel every time before mixing a new batch.

- Put 8 l of liquid into a large, clean mixing vessel.
- Add one 25 kg bag of KÖSTER NB 1 Grey in portions to the liquid while stirring continuously using an electric mixer with approx. 400 rpm (e. g. KÖSTER Single Paddle Mixer with Mortar Stirrer or Disk Stirrer).
- Mixing time after all powder has been added to the liquid is 3 minutes.

The addition of KÖSTER SB Bonding Emulsion or KÖSTER NB 1 Flex to the mixing water raises the ability of the material to retain water and prevents a premature drying of the coating in cases of unfavorable weather conditions, (warm, dry, windy).

When used in drinking water reservoirs only mixing with water is permitted. The addition of KÖSTER NB 1 Flex or KÖSTER SB Bonding Emulsion will negate the Drinking Water Certification.

6.2 Installation/Application

KÖSTER NB 1 Grey is applied in at least two layers. The total consumption must be at least 2.0 kg/m² and not more than 4.0 kg/m². When the first coat of KÖSTER NB 1 Grey has set sufficiently so that it is not damaged by the application of a second coat, a second coat of KÖSTER NB 1 Grey is applied. The finished coating must be uniform, even in thickness, free of pinholes or other defects.

General consumption guidelines:

Under KÖSTER NB Elastic Grey for swimming pools	approx. 1.5 kg/m²	**1 coat**
In cases of ground moisture	min. 2 kg/m²	**2 coats**
In cases of non-pressurized water	min. 3 kg/m²	**2 coats**
In cases of pressurized water	min. 4 kg/m²	**2-3 coats**
In cases of negative side waterproofing	min. 3 kg/m²	**2 coats**
Under bituminous thick film sealants	approx. 1.5 kg/m²	**1 coat**

6.2.1 Brush application

Use the KÖSTER Brush for slurries to brush the material evenly onto the surface. Make sure to brush thoroughly first up and down and then left and right, or vice versa, in order to close all pinholes.

6.2.2 Spray application

Mix additionally approx. 250 ml of water per bag to reach a thin material suitable to be sprayed over the surface with KÖSTER Peristaltic Pump. After spraying the first layer, this should be brushed with the KÖSTER Brush for slurries to promote deeper penetration of the material in the pores and enhance the bonding characteristics.

Due to varying degrees of cement hydration and the latent-hydraulic active ingredients, KÖSTER NB 1 Grey can cure in various shades and tones.

In addition to the KÖSTER Peristaltic Pump, the „BMP 7“ screw pump from b&m can also also be used. Operation with 230 V; Hose 10 m, 3/4“ ; slot nozzle; 1st gear speed, 20% speed; do not add too much air.

6.3 Aftertreatment

On highly absorbent substrates, in strong wind or direct sunlight, the material may tend to prematurely dry. If premature drying is observed (early lightening of the surface), spray with water using a bottle mister or pressure sprayer until the surface is dark.

6.4 Quality control

Recommended suitable methods for testing the quality of the mixing:

- Use a scale to weigh the mixed batch. Verify that the total weight corresponds to the added components. Verify that the mixture is free of lumps by feeling with a gloved hand.

- Collect mix samples and make test cubes for every 1000 m^2. Document time, location where the material is to be used and batch no. Testing should be done either in an official concrete laboratory or by KÖSTER BAUCHEMIE AG. Properties to be tested are:
  a) Compressive Strength
  b) Tensile Strength
  c) Specific gravity and
  d) air pore content.

  Testing should be done after min. 7 days of curing.

Recommended suitable methods for quality control of the final layer:

- Pull-off strength: Pull-off strength must be >1.5 N/mm^2 tested with an Elcometer surface adhesion tester or similar precision instrument. Test the coating at least once for every thousand square meters. Only results with failure in the concrete substrate (min. 3 mm deep) are accepted. Failures in the adhesive or coating must show that at least 50 % of the failure was in the substrate and obtain values >2.0 N/mm^2 to be acccepted. Document where and when testing was carried out and document the results obtained. Use a solvent free adhesive to bond the test dollies.

- Layer thickness: Take drill cores with 5 cm diameter and 4 cm depth. Measure the thickness of the cured layer of KÖSTER NB 1 Grey e. g. with a crack ruler. The layer thickness should be 1 mm. Test the coating at least once for every thousand square meters. Document where and when testing was carried out and document the results obtained.

7 General notes

7.1 Material and system considerations

KÖSTER NB 1 Grey is a mineral-based material with a high content on cementitious special binders and additives which require water to cure. Discoloration or dark spots after the application of the waterproofing system, are a result of the hydration process of the binding materials. Dark spots are common in applications against negative water pressure and are by no means signs of failure of the systems. On the contrary, it is proof of the reaction and functionality of the material.

It is a normal and positive behavior for the crystalizing slurry to show discolorations where more hydration is present and the chemical reaction is active, creating crystal and stopping the water ingress. In some cases, even a glossy surface can be observed. The discolorations or dark spots do not affect the subsequent installation of mineral systems like flexible waterproofing systems, restoration plasters, underlayment or the installation of tiling systems.

7.2 Important considerations

- This method statement is intended for use as a general guideline for the application of the referred system and must be adapted to suit the local conditions, standards and specifications, as well as special requirements.
- Testing the suitability of the material and equipment for the intended use is strongly recommended before commencing work.
- Application at high temperatures: If very warm water is used for mixing and/or the ambient temperature is high, the KÖSTER NB 1 Grey might show an increased viscosity and reduced pot life. Under these conditions, moisture loss of the material speeds up, and therefore, the risk of cracking is increased.

7.3 Limitations

Special conditions may require alterations to these recommendations; therefore, warranty can only be given for the quality of the products but not for the correct usage or the workmanship of the materials.

8 Certifications

- **National Technical Approval P-5101/838/14 MPA BS by the MPA Braunschweig**:
  Mineral Waterproofing Slurry for Waterproofing of Constructions according to Building Regulation List (Bauregelliste) A, Part 2, No. 2.49
- **Official test certificate, Institute for Hygiene, Gelsenkirchen:**
  Tank and tank-lining, according to the regulations of the DVGW, Tech. regulations for potable water
- **Official test certificate, Institute for Hygiene, Gelsenkirchen**:
  Tank and tank-lining, according recommendation of the „Drinking Water Affairs" working group of the Plastics Commission of the Federal Health Office.
- **Worksheet W 270, December 1990**:
  About the reproduction of micro-organisms on materials for use in drinking water environments
- **European technical assessment, ETA-17/0025 of August 18, 2017:**
  „Set of a mineral, non-flexible waterproofing slurry based on cement."
- **BBA Agrément Certificate 19/5619 for KÖSTER NB 1 Grey System**, issued 31 January 2019.
- **BBA Approval Inspection Testing Certification**, including parameters Resistance to water penetration, Sulfate resistance, Durability
- **Building Research Institute Warsaw, technical approval, mineral concrete protection**, ITB-KOT-2020/1303, edition 1
- **Building Research Institute Warsaw, Technical Approval, Sealing Mortar**, ITB-KOT-2019/1303, Edition 1
- **Cracow Institute of Ceramics and Building Materials, Manufacturer Production Control**
  Certificate No. 008-0834UWB-123

9 Appendix

Technical Data	**Product Name: KÖSTER NB 1 Grey**
Material Class	Cementitious Crystallizing Slurry
Temp. range for application	+ 5 °C to + 30 °C
Consumption approx.	2 - 4 kg / m²
Layers	2 / no primer (W)
Color	Grey
Solvent free	Yes
Certified for potable water	Yes
Can be plastered over	+++ (Plaster must be open to vapor diffusion)
Crystallizing properties, penetrates into substrate	Yes
Mode of Application	Brushable, sprayable
Suitable for negative side waterproofing	Yes
Waiting time until backfilling	> 48 hours
Simplicity of application	+++
Substrate	
Masonry	+++
Cementitious plaster	+++
Concrete	+++
Brick	+++
Screeds	+++
Gypsum	Must be removed
Moisture condition of surface	Pre-wetted or already moist
Performance	
Waterproofing max. load conditions	13 Bar (Positive and negative)
Time until rainproof	Approx. 8 hours
Chemical resistance	Good
Vapor permeability	High
UV Resistance	Long term resistant
Abrasion resistance	+++

Lower+ Medium++ High+++

W wetting is sufficient (substrates should be moist). In case of highly absorbent substrates prime with KÖSTER Polysil TG 500

10 Legal disclaimer

This method statement reflects general cases with standard parameters. It is not suitable as a step-by-step guide for all and each waterproofing projects as the conditions on site at the moment of the application cannot be foreseen. It is solely the applicator's responsibility to decide on the actual procedure considering the specific situation on the construction site. In any case, KÖSTER's Terms of business are valid and can be viewed under www.koester.eu