



BITUMINOUS SELF-ADHESIVE WATERPROOFING MEMBRANES FOR BELOW GROUND STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Positive side waterproofing with cold self-adhesive bituminous membranes for below ground structures (foundation slabs and walls).

1.2 REFERENCES

- A. CE / EN13969:2004 Cold self adhesive bitumen membrane with HDPE-top foil - Moisture barrier (Type A) and ground water barrier (Type T)
- B. Radon impermeability test – University of Saarland
- C. MPS Braunschweig PB 5077/190/92 “Testing according to DIN EN 13969”
- D. Water vapor permeability test of bituminous membranes – Fachhochschule Oldenburg, Osfriesland, Wilhelmshaven
- E. Water penetration of waterproofing materials on expanded polystyrene boards - Institute for materials Science, University of Hannover
- F. Abdichtungsreport 2-2005 (only German)
- G. Technical contribution: Abdichtung gegen Radon
- H. Product flyer KSK membranes
- I. System brochure – External basement waterproofing

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.



1.4 PERFORMANCE REQUIREMENTS

- A. The base of waterproofing system shall be a cold bitumen / rubber based self-adhesive membrane applied to all substrates (mineral based, polystyrene boards, etc.). Self-adhesive membrane should consist of a highly tear resistant, 2-layer cross-laminated polyethylene (HDPE) foil with a plastic bitumen / rubber adhesive and sealing compound. Sealing membrane should be highly flexible, immediately waterproof, resistant to driving rain, and crack bridging. The waterproofing system shall be KÖSTER KSK SY 15, manufactured by KÖSTER Bauchemie AG, Aurich, Germany. Primer shall be a thin coat of KÖSTER KBE Liquid Film applied to the substrate. Alternatively, primers should be KÖSTER KSK Primer BL, KÖSTER Bitumen Emulsion, KÖSTER Bitumen Primer (on old bituminous layers), or KÖSTER Polysil TG 500. For detail waterproofing around the pile heads waterproofing system shall be a cement based mix containing chemicals which penetrate with moisture into the capillary tracts and activate to form crystals which close the capillaries to produce the waterproofing effect. For such purpose, cementitious waterproofing system KÖSTER NB1 Grey should be used. All details, exposed edges of the waterproofing layers as well as around pipe penetrations and other junctions and endings should be waterproofed with liquid sealant KÖSTER KBE Liquid Film.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacturer shall have no less than five years experience in manufacturing polymer modified bituminous and crystallizing cementitious waterproofing systems. The system shall be specifically formulated and marketed for waterproofing. System design shall not have changed for a minimum of five consecutive years prior to start of the work.

B. Installer Qualifications:

1. Applicator shall be approved by the manufacturer, experienced in surface preparation and application of the material and shall be subject to inspection and control by the manufacturer.
2. Installer shall have no less than three years experience installing the specified waterproofing systems, or have been factory certified and trained in the KÖSTER Training Program.



1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.
- B. Store products in an approved ventilated dry area; protect from contact with soil, dampness, freezing and direct sunlight.
- C. Handle products in a manner that will prevent breakage of containers and damage to products.
- D. Liquids should not be stored in areas with temperatures over than + 30 °C or below + 5°C.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
 - 1. Do not apply bituminous and cementitious waterproofing to unprotected surfaces in wet weather or to surfaces on which ice, frost or water is visible.
 - 2. Do not apply bituminous and cementitious waterproofing when the temperature is lower than + 5 °C or expected to fall below this temperature within 24 hours from time of application.
 - 3. Do not apply bituminous and cementitious waterproofing in rain, snow, fog or mist.
- B. Protection: Protect bituminous and cementitious waterproofing to prevent damage from active rain for a minimum period of 24 hours from time of application. Protect bituminous waterproofing to prevent damages due to backfilling, all according to manufacturer's data sheet.

1.8 WARRANTY

- A. Installer of waterproofing system shall provide standard installation warranty for workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturer: KÖSTER BAUCHEMIE AG • Dieselstraße 1-10 • D-26607 Aurich • Tel. 04941/9709-0 • Fax -40 • info@koester.eu • www.koester.eu
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions section.
- D. Provide the materials of one manufacturer throughout the project as specified.

2.2 SYSTEM - POSITIVE SIDE WATERPROOFING WITH COLD SELF-ADHESIVE BITUMINOUS MEMBRANES FOR BELOW GROUND STRUCTURES (FOUNDATION SLABS AND WALLS)

- A. Bitumen / rubber based self-adhesive membrane cold applied to all substrates (mineral based, polystyrene boards or wood), consisted of a highly tear resistant, 2-layer cross-laminated polyethylene (HDPE) foil with a plastic bitumen / rubber adhesive and sealing compound, highly flexible, immediately waterproof, resistant to driving rain, and crack bridging.
 - 1. Product: KOSTER KSK SY 15
 - 2. Physical Properties:
 - a. Thickness: 1.5 mm.
 - b. Length: 20 m.
 - c. Width: 1.05 m.
 - d. Straightness: ≤ 20 mm / 10 m
 - e. Flammability: Class E.
 - f. Tensile strength: 265 ± 5 N / 50 mm.
 - g. Elongation at break: 255 ± 60 %.
 - h. Waterproof at 60 kPa: passed.
 - i. Resistance to static loads: > 20 kg.
 - j. Resistance against artificial ageing (test pressure 60 kPa): passed.
 - k. Resistance against chemicals (10 % NaCl, lime milk and 6 % sulfuric acid - test pressure 60 kPa): passed.
 - l. Resistance to water vapor diffusion μ (MDV): 130.000.
 - m. Resistance to continued tearing lengthwise / crosswise (MDV): 175 ± 20 N.
 - n. Cold bending properties at -15 °C: free of cracks.

- o. Resistance of the joint seams to shearing: butt weld > 130 ± 30 N / 50 mm, 10 cm overlap > 200 ± 30 N / 50 mm

2.3 ADDITIONAL PRODUCTS

- A. KOSTER NB 1 Grey. Cementitious, crystallizing cement-based mix containing chemicals which penetrate with moisture into the capillary tracts and activate to form crystals which close the capillaries to produce a cementitious waterproofing system that becomes a permanent, integral part of the structure and is non-toxic, inorganic and free of added chlorides and added sodium-based compounds. Use for positive and negative side waterproofing of pile head details and wall-floor junctions before installation of fillets.
- B. KOSTER SB Bonding Emulsion. Use where recommended by manufacturer to increase elasticity, flexibility, reduce water absorption, and improve bonding to steel. Do not use in case of drinking water contact where certification is required.
- C. KOSTER Repair Mortar Plus. Watertight, fast setting, slightly expanding repair mortar with excellent adhesion. With the addition of KÖSTER SB Bonding Emulsion, it can be used as a PCC (polymer-modified cement concrete) mortar. Use for installing fillets or levelling the surface.
- D. KOSTER KBE Liquid Film. Highly elastic, solvent-free, sealing, liquid compound with a rubber / bitumen basis, for priming and for sealing the seams and edges of KOSTER KSK membranes, and for sealing details and penetrations.
- E. KOSTER KSK Primer BL. Solvent free, polymer-modified bitumen based strongly adhesive primer for KSK membranes and Polymer Modified Bitumen Coatings. It is characterized by very good adhesion to dry and moist mineral substrates.
- F. KOSTER Bitumen Emulsion. Solvent-free, low viscous bitumen emulsion which bonds excellently to both dry and moist mineral substrates. It can be used as a primer for KÖSTER KSK Membranes or KÖSTER Polymer Modified Bitumen Coatings or waterproofing.
- G. KOSTER Bitumen Primer. Cold applied, low odor, solventcontaining bitumen primer. It contains a bonding agent admixture and displays excellent penetration properties. It acts as a dust-binder and as a bonding agent for subsequent hot or cold applied liquid bitumen coatings and self-adhesive membranes.
- H. KOSTER Universal Cleaner. Solvent free cleaning agent for bituminous materials and epoxy resins.
- I. KOSTER SD Protection and Drainage Sheet 3-400. Green HD-PE based notched protection board which combines 3 functions in one product: (1) mechanical protection of the waterproofing layer (e.g. when backfilling the construction pit) according to DIN 18195, (2) decoupling of the waterproofing layer from any ground movement, (3) the



hollow core leads seepage and backwater safely to the drainage.

- J. KOSTER SD Edge Profile. Finishing profile for protection and drainage sheets.
- K. KOSTER SD Fixing Element. Steel nails and mounting heads for the fixing of protection and drainage sheets.



PART 3. EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until concrete substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Concrete surface should be:
 - sound and solid
 - level, free of large breakouts, nests and ridges
 - absorptive
 - dry
 - clean, free of adhesion inhibiting soiling like dust, oil, grease etc.
 - free of gaping cracks
 - corners have to be broken
 - wall floor junctions have to be rounded out by the installation of fillets
 - protrusions and recesses have to be kept to a minimum

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation. All concrete surfaces must be solid, sound, and free of all laitance, oils, grease, curing agents, or other foreign materials which might affect the bonding adversely.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces to receive bituminous or cementitious waterproofing, chip or abrasive blast to a CSP-3 (ICRI Guideline 3102R13) profile to remove defective materials and foreign matter such as paint, dirt, grease, curing agents, form release agents, and mineral salts. Suitable surface cleaning method is cleaning with water jet (300 to 500 bar). In case there is form work release oil on the surface, apply a suitable detergent to the surface before cleaning with the water jet.
- D. If concrete surface has been previously treated with other agents, notify manufacturer before proceeding.
- E. Repair cracks, expansion joints, control joints, and open surface honeycombs.
 - 1. Use KOSTER SB Bonding Emulsion with manufacturer approved concrete repair materials. (Such as the KOSTER Repair Mortar Plus). Comply with requirements listed in manufacturer's technical data information. No exceptions.
 - 2. Moving joints and cracks are treated and detailed as expansion joints. Install an elastic sealant and corresponding primer in accordance with sealant manufacturer's instructions.
- F. Honeycombed areas, cavities, recesses and chipped out areas where form ties have

- been cut or removed must be routed/bush hammered to sound base and repaired according to manufacturer's instructions and patched flush with KÖSTER Repair Mortar Plus with 20 % KÖSTER SB Bonding Emulsion added to the mixing water.
- G. Uneven surfaces must be first rendered flush with KÖSTER Repair Mortar Plus with 20 % KÖSTER SB Bonding Emulsion added to the mixing water.
 - H. Fillets and Coves between Horizontal and Vertical Areas: In order to reduce the tensions on the waterproofing layer, 90° angles at wall-floor junction must be rounded out by the installation of fillets. Mortar fillets should be made out of KÖSTER Repair Mortar Plus with 20 % KÖSTER SB Bonding Emulsion added to the mixing water. Rounded mortar fillets should have a leg length of 4 to 6 cm.
 - I. Where fillets or coves are specified it is desirable that the cementitious waterproofing be applied behind the cove strip (such as KÖSTER NB 1 Grey).
 - J. Breaking the corners: To prevent damage to the membrane due to mechanical stresses, all corners need to be broken at a 45° angle with a grinding tool. In new construction it is recommended to install a triangular wooden molding onto the top edge of the form work for the foundation slab.

3.3 INSTALLATION - POSITIVE SIDE WATERPROOFING WITH COLD SELF-ADHESIVE BITUMINOUS MEMBRANES FOR BELOW GROUND STRUCTURES (FOUNDATION SLABS AND WALLS)

- A. Install in accordance with manufacturer's instructions.
- B. Application – Priming the surface:
 - 1. Cementitious fillets must have dried completely before primers are applied.
 - 2. Priming the substrate: As a primer a thin coat of KÖSTER KBE Liquid Foil is applied to the substrate (Consumption: approx. 250 – 500 g / m²). Alternatively, KÖSTER Primer BL, KÖSTER Bitumen Emulsion, KÖSTER Bitumen Primer (on old bituminous layers), or KÖSTER Polysil TG 500 can be used for priming. The priming layer must be allowed to dry completely. Apply the membrane on the same day.
 - 3. When bonding the membranes onto the substrate on the same day on which the primer was applied, check and make sure that no condensate has formed on the surface.
 - 4. Bonding the membranes too early onto a surface which was primed with a solvent-containing primer which has not fully dried can lead to damages of the waterproofing.
 - 5. Metal substrates e.g. not corroded zinc, copper etc. as well as plastics do not need to be primed.



C. Application - General:

1. Do not apply KOSTER KSK SY 15 and / or cementitious products at temperatures below + 5 °C.
2. When applying, firmly press the applied membranes onto the substrate, avoiding trapping air and creating creases. All air bubbles should be repaired by puncturing air filled bubble, squeezing out the air through the hole, patching the puncture with a piece of membrane and sealing the patch with KOSTER KBE Liquid Film.
3. When applying KOSTER KSK membranes to the area, make sure to overlap the previously applied membrane by a minimum of 5 cm.
4. All overlappings of membranes must be pressed together using a roller (such as KOSTER Rubber Hand Roller).
5. Touch-up, repair or replace damaged products before Substantial Completion.

D. Application – New construction – horizontal waterproofing:

1. Onto the excavated construction pit a geotextile layer is installed to separate the soil from the gravel.
2. A compacted layer of gravel is installed and covered with PE foil before starting the concrete work to prevent concrete from filling the compacted gravel.
3. Install a triangular wooden molding onto the inside top edge of the one-sided formwork, this will save time because the edges of the foundation plate will not have to be broken when installing the area waterproofing.
4. A 30 cm wide strip of KÖSTER KSK SY 15 membrane is attached to the formwork as corner reinforcement. When using wooden formwork it is stapled along its top edge onto the form. The adhesive side of the KSK must face inwards. Remove the protection foil before pouring the blinding layer of concrete.
5. The blinding layer of 10 cm unreinforced concrete is then poured.
6. After drying of blinding concrete layer, all the pile head details and reinforcement penetrations details should be waterproofed against ground moisture, and non-pressurized and pressurized water using cementitious mineral waterproofing with subsequently crystallizing agents (such as KOSTER NB 1 Grey). After removing of all protrusions and cleaning the pile head, surface between reinforcement is smoothed with KOSTER Repair Mortar Plus and fillets are installed between pile-head and blinding concrete layer with the same mortar. Complete surface of pile head together with an additional position of future overlap with KSK membrane on blinding layer (minimum of 10-15 cm) is than waterproofed with KOSTER NB 1 Grey, in 2-3 layers by brush.
7. Complete surface should be primed with an adequate primer before installing membrane.

8. Fold the rest of the strip down and attach it to the blinding layer.
 9. The membrane is rolled out, cut to the desired size and rolled up again. Cutting the membrane to size is facilitated by placing a piece of wood or a metal straight edge on the membrane as a back brace to cut against. Roll out membranes or pre-cut pieces in a length of approx. 50 – 80 cm, remove approx. 30 – 50 cm of the backing paper at the beginning of the membrane and press the exposed adhesive layer onto the substrate beginning from the middle. Avoid trapping air and creating creases. Pull the backing paper through from under the roll and pull it off while unrolling the membrane. Firmly press the applied membranes onto the substrate.
 10. After the whole area is waterproofed with KÖSTER KSK SY 15 membrane, cover the area waterproofing with two layers of PE-foil to act as a gliding layer and then a 5 cm protective screed of unreinforced concrete is installed. On such prepared protection layer, the foundation slab and the rising walls can now be built.
- E. Application – New construction – vertical waterproofing:
1. When the rising walls are installed the fillet area can be waterproofed. Waterproof the wall-floor junction first with KÖSTER NB 1 Grey.
 2. Then install a rounded fillet made of KÖSTER Repair Mortar Plus. Use a trowel to place the mortar in the fillet area, then use a fillet trowel or a piece of pipe to round out the fillet.
 3. Perform any necessary concrete repair. Apply an appropriate primer to all surfaces which are to receive KÖSTER KSK SY 15 membrane. The applied primer must be fully cured. The adhesion is sufficient if the membrane can only be removed from the substrate by use of force. A preliminary test is recommended. Do not apply the membrane when condensate has formed on the surface of the primer, e. g. in the morning hours. After priming the substrate the vertical area waterproofing can be installed.
 4. Attach the vertical area waterproofing layer to the rest of the membrane strip at the bottom.
 5. All interior and exterior corners are reinforced by applying pre-cut membrane pieces approximately 30 cm wide. Remove the backing paper just before applying the membrane to the surface.
 6. For waterproofing of the especially demanding internal and external corners use specially cut pieces of membrane. Refer to the manufacturer's application guidelines on the packaging for details.
 7. Waterproof wall surfaces beginning approx. 30 cm above ground level, proceeding downwards to the wall floor junction and on to the side of the foundation. Pre-cut the membrane to the required length. Apply the membrane by removing the protective paper and pressing the membrane onto the substrate. Overlap the edge of the

previously applied membrane by a minimum of 5 cm. All overlapping areas of the membranes must be firmly pressed together using a KÖSTER Rubber Hand Roller. Remove the backing paper from the self-adhesive edge before applying the next membrane.

8. In order to avoid water infiltration behind the membrane, seal all exposed edges of the waterproofing layers as well as around pipe penetrations and other junctions and endings with KÖSTER KBE Liquid Film. In case of rough substrates or porous concrete, a second coat may be needed after the first coat has fully dried. Embed KÖSTER Glass Fiber Mesh into the KÖSTER KBE Liquid Film around pipe penetrations.
9. Mechanically fix the upper edges of the membranes e.g. with large headed zinc coated nails (5 pieces/m) or with a fixing profile. In all cases the edges of the membranes are waterproofed with KÖSTER KBE Liquid Film to secure against water leaking behind the waterproofing.
10. Protect the KÖSTER KSK SY 15 with KÖSTER Protection and Drainage Sheet 3-400 against damage due to backfilling. Optionally, a layer of XPS Insulation (minimum 30 mm) also provides protection against backfill. This system provides the advantage of an insulated basement. The construction pit should be backfilled immediately after full cure of the KÖSTER KBE Liquid Film.
11. In case of soils with low permeability as well as in case of retained seepage, a drainage has to be installed.