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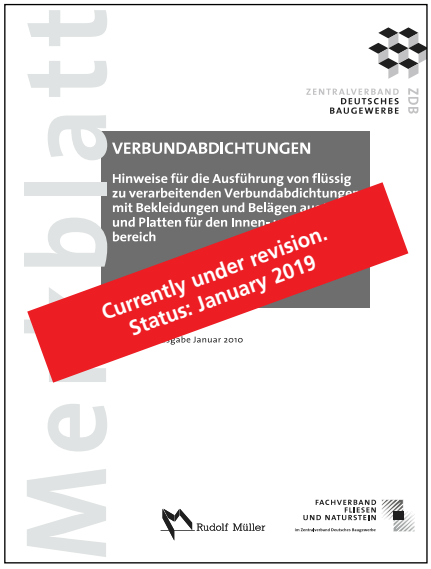
Fundamentals

The building regulations of the German federal states require structures and building elements to be designed and constructed in such a way as to prevent damage or unreasonable nuisance due to water or moisture action.

Provision should therefore be made for suitable waterproofing and damp-proofing measures to protect the building fabric.

So-called composite waterproofing systems (membrane plus ceramic finish) have proved themselves in practice over many decades. These systems have previously been described in various data sheets issued by the ZDB (Federation of the German Construction Industry), BEB (German Screed and Coverings Association) and the German stonemasons' association.



ZDB data sheet "Composite waterproofing systems".

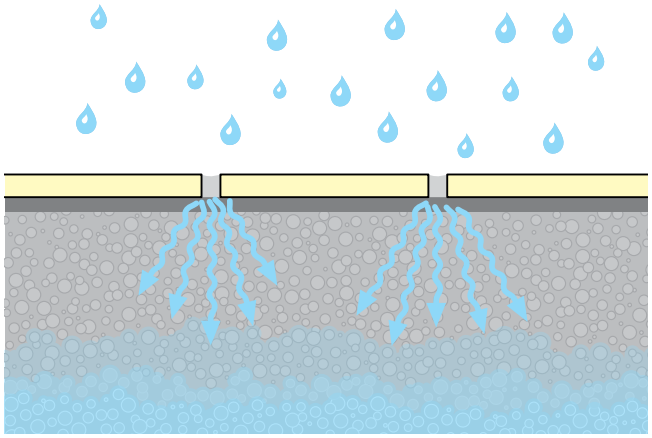
BEB data sheet "Waterproofing products applied in conjunction with floor coverings" (August 2010).

Stonemasons' association data sheet on composite waterproofing systems.

Ceramic products (tiles) remain the most robust option as a surface finish for wet spaces, wellness suites, swimming pools or food-production facilities.

Yet, ceramic coverings are no substitute for a waterproof membrane. This is due, among other things, to the fact that joints in tile finishes are classed as water-permeable.

This can, however, be deemed uncritical given that all the materials making up the composite waterproofing system (ceramic tiles, tile grout, tile adhesives and membrane) can be permanently wet or moist without this in any way impairing the performance of the overall system.



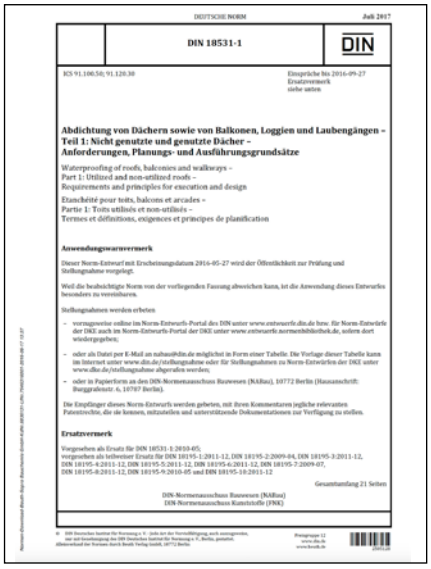
Note: All grout types are classed as water-permeable and offer no substitute for the required waterproof membrane.

Fundamentals

DIN 18534 "Waterproofing for indoor applications"

The new DIN 18534 entitled "Waterproofing for indoor applications" took effect in July 2017, thereby superseding all parts of the previous waterproofing standard DIN 18195.

DIN 18 534 "Waterproofing for indoor applications" comprises the following parts:


DEUTSCHE NORM Juli 2017

DIN 18531-1

DIN

Abdichtung von Dächern sowie von Balkonen, Loggien und Laubengängen –
Teil 1: Nicht genutzte und genutzte Dächer –
Anforderungen, Planungs- und Ausführungsgrundsätze

Waterproofing of roofs, balconies and walkways –
Part 1: Utilized and non-utilized roofs –
Requirements and principles for execution and design

Étanchéité pour toits, balcons et arcades –
Partie 1: Toits utilisés et non-utilisés –
Termes et définitions, exigences et principes de planification

Anwendungswarnvermerk

Ersatzvermerk

DIN-Normenausschuss Bauwesen (NABau)
DIN-Normenausschuss Kunststoffe (FNK)

Part 1: Requirements and principles for design and execution

Part 2: Waterproofing with waterproofing materials in sheet form

Part 3: Waterproofing with liquid-applied waterproofing materials

Part 4: Waterproofing with mastic asphalt

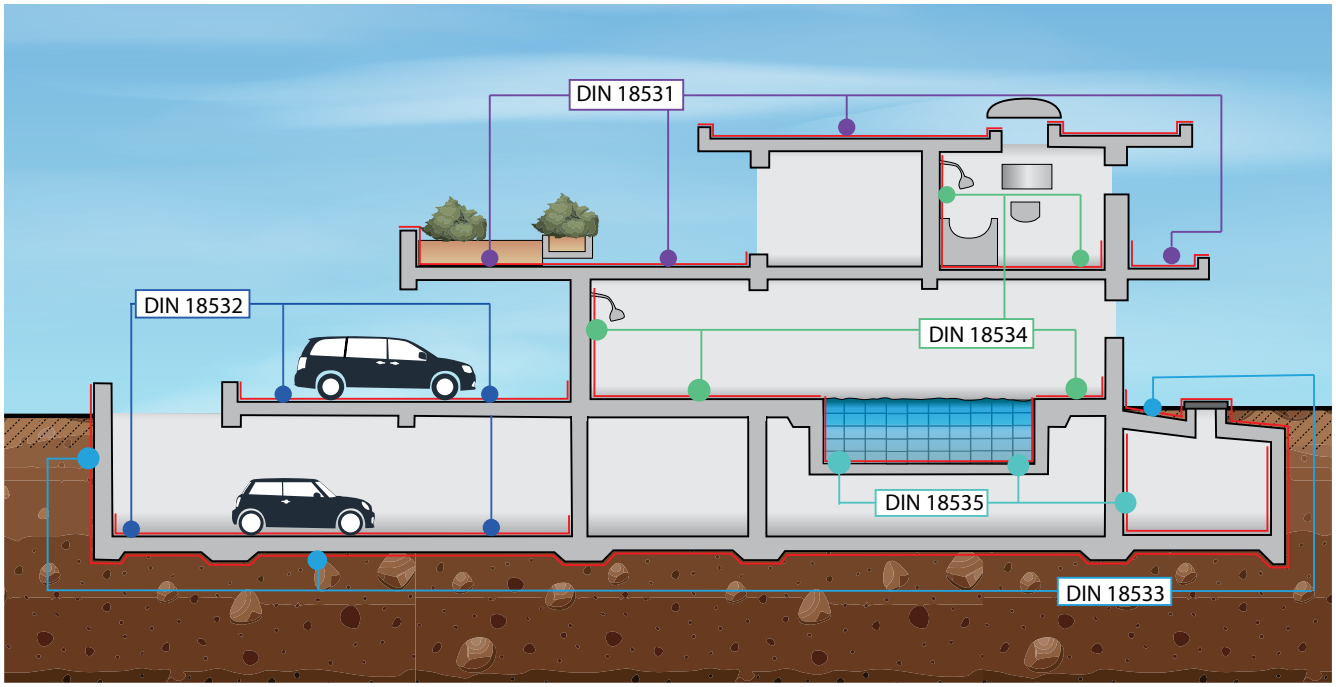
Part 5: Waterproofing with waterproofing materials in sheet form in conjunction with tiles

Part 6: Waterproofing with waterproofing materials in panel-shaped form

Of key importance for the tiling trade is the fact that composite membrane and tile assemblies – through their inclusion in the new family of standards (DIN 18534 Part 3) – have achieved the status of an officially standardized waterproofing system.

This will facilitate design and construction in future!

The reworked series of standards relating to building elements requiring waterproofing can be illustrated by a building section:



Tabular history of classification of areas for waterproofing:

ZDB up to 2004	FBK I Domestic bathrooms			FBK II Public amenities, large shower facilities		FBK III Balconies/patios	FBK IV Food-processing facilities	Swimming pools Underwater applications
DIBt since 2002				A1 Walls	A2 Floors		C	B
ZDB 01/2005	0 Domestic bathrooms with bathtub	A01 Walls	A02 Floors	A1 Wall surfaces	A2 Floor surfaces	B0 Outdoor areas exposed to water without hydrostatic pressure	C High exposure with chemical attack	B Underwater areas (hydrostatic pressure)
	Moderate exposure	Domestic bathrooms with floor drain		High exposure				
ZDB 01/2010 BEB 08/2010 ZDB 08/2012	A0 Moderate exposure to water without hydrostatic pressure, indoors e.g. domestic bathrooms, floor surfaces with floor drains			A High exposure to water without hydrostatic pressure, indoors		B0 Moderate exposure to water without hydrostatic pressure, outdoors	C High exposure to water without hydrostatic pressure with additional chemical action, indoors	B High exposure to permanent internal water pressure, indoors and outdoors
Waterproofing products ZDB 08/2012	Sopro FDF FDF 525/FDF 527 Sopro DSF 523 (1-comp.) 623 (1-comp. rapid-set) 423 (2-comp.) Sopro TDS 823 Sopro PU-FD 570 (walls) 571 (floors)			Sopro FDF (walls) FDF 525 FDF 527 Sopro DSF 523 (1-comp.) 623 (1-comp. rapid-set) 423 (2-comp.) Sopro TDS 823 Sopro PU-FD 570 (walls) 571 (floors)		Sopro DSF 523 (1-comp.) 623 (1-comp. rapid-set) 423 (2-comp.) Sopro TDS 823 Sopro PU-FD 570 (walls) 571 (floors)	Sopro PU-FD 570 (walls) 571 (floors)	Sopro DSF 523 (1-comp.) 623 (1-comp. rapid-set) 423 (2-comp.) Sopro TDS 823 Sopro PU-FD 570 (walls) 571 (floors)
BEB* 08/2010	Sopro AEB 640 Sopro AEB plus 639			Sopro AEB 640 Sopro AEB plus 639		Sopro AEB plus 639		

The former "FBK" moisture exposure classes can be allocated to the new standards as follows:

	A0	A	B0	C	B
DIN 18 534 "Waterproofing for indoor applications" July 2017	✔	✔		✔	
DIN 18 535 "Waterproofing of tanks and pools" July 2017					✔
DIN 18 531 "Waterproofing of non-utilized and utilized roofs"** July 2017			✔		

* First mention of waterproofing materials in sheet and panel form.
** Balconies

Fundamentals

DIN 18354 – Waterproofing for indoor applications

With the appearance of DIN 18534 in July 2017, the composite membrane and tile assemblies, which had already been part of standard tiling practice, achieved the status of officially standardized waterproofing systems.

Liquid-applied waterproofing materials to DIN 18534-3:

a. Polymer dispersions (DM)

b. Crack-bridging mineral sealing slurries (CM)

c. Reaction resins (RM)

Coat thicknesses:

The liquid membrane materials must be applied in at least two coats.

During the waterproofing works, a predetermined **minimum dry coat thickness (d_{min})** must be achieved.

This **minimum dry coat thickness (d_{min})** must be verifiable by on-site coat thickness measurements on the cured membrane.

To ensure that the **minimum dry coat thickness (d_{min})** is achieved, the calculations for the membrane are based on the **nominal dry coat thickness (d_s)**.

The membrane coat thickness is decisive for its quality.

Explanation:

To achieve the nominal dry coat thickness, a coat thickness supplement (d_z) must be added to the minimum dry coat thickness (d_{min}). This supplement is given as the allowance for application-related fluctuations (d_v) plus the required levelling of the substrate (d_u).

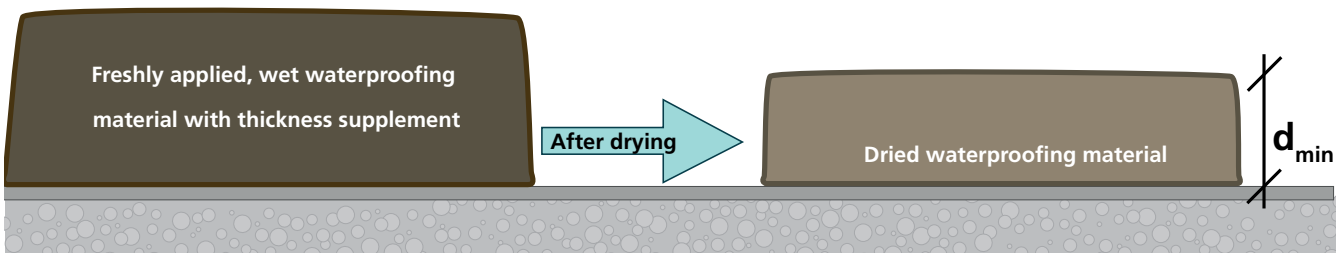
$$d_z = d_u + d_v$$

In the absence of any consumption/coverage details provided by the manufacturer, a minimum thickness supplement equal to 25 % of the minimum dry coat thickness (d_{min}) must be applied.

Definition:

Nominal dry coat thickness (d_s) = minimum dry coat thickness (d_{min}) + coat thickness supplement (d_z) in wet condition*.

Coat thicknesses:



* A minimum coat thickness supplement of 25 % must be applied. d_z = levelling of substrate (d_u) + allowance for application-related fluctuations (d_v)

Minimum dry coat thickness (d_{min}) for liquid-applied waterproofing materials

- Polymer dispersion* (DM) ≥ 0.5 mm
- Crack-bridging mineral sealing slurry (CM) ≥ 2.0 mm
- Reaction resin (RM) ≥ 1.0 mm

* Individual polymer dispersion coats to be applied in different colours during waterproofing operations.

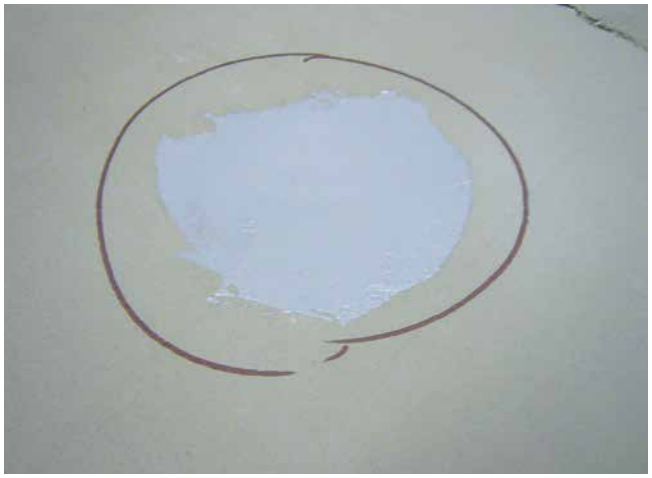
Testing for minimum dry coat thickness:

- Polymer dispersions must be applied in two different colours. An additional check is performed on basis of material consumption!*
- Monitoring of applied quantity per m^3 plus check on wet coat thickness during application.
- Control specimen for check on coat thickness.
- Documentation of checks required from class W-3 upwards.
- Five measurements must be performed for areas up to 20 m^2 and ten for areas up to 100 m^2. Measurement points must be evenly distributed over the relevant area.

Measurement points must be resealed after test.

Coat thickness of extracted sample determined using calliper rule.

Measurement point already sanded.



Measurement point repaired with overlapping application of membrane material.

* Sopro Bauchemie offers two colours for on-site operations. Also available as of now is a colour additive for blending with the material on site to produce a further colour.

Fundamentals

DIN 18534-5 – Waterproofing with waterproofing materials in sheet form in conjunction with tiles

Another now-established composite waterproofing solution alongside the liquid-applied membranes involves the use of waterproofing materials in sheet form. This is now covered by Part 5 of the new DIN 18534.

DEUTSCHE NORM Juli 2017

DIN 18534-5

DIN

ICS 91.120.30 Einsprüche bis 2016-09-13

Abdichtung von Innenräumen –
Teil 5: Abdichtung mit bahnenförmigen Abdichtungsstoffen im Verbund mit Fliesen oder Platten

Waterproofing for indoor applications –
Part 5: Waterproofing with waterproofing materials in sheet form in conjunction with tiles

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2016-05-13 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal des DIN unter www.entwuerfe.din.de bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
- oder als Datei per E-Mail an nabau@din.de möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/stellungnahme oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an den DIN-Normenausschuss Bauwesen (NABau), 10772 Berlin (Hausanschrift: Burggrafenstr. 6, 10787 Berlin).

Die Einsprüfer dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 12 Seiten

DIN-Normenausschuss Bauwesen (NABau)

Waterproofing of bathroom using composite system with sheet product (Sopro AEB 640 waterproofing and separating membrane).

Note:
The applications for which sheet membranes are suitable under the new standard are limited to water action classes W0-I to W2-I.

The manufacturer should be consulted where the relevant application involves higher water action classes and high mechanical action on the membrane.

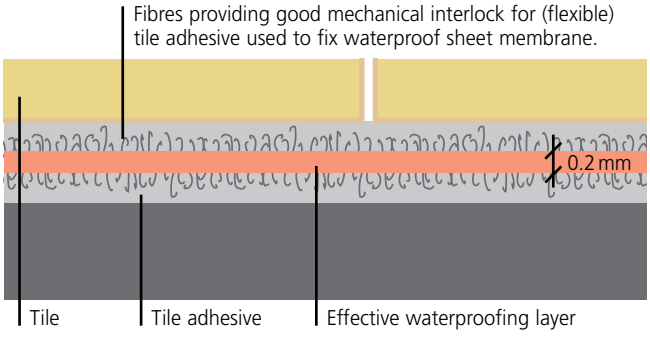
The use of sheet membranes for W3-I applications is subject to project-specific agreement with the client as a special construction.

Fully waterproofed bathroom – laps between Sopro AEB 640 sheets, watertightly sealed with Sopro RMK 818 Racofix® universal adhesive, are clearly visible.

Under the above standard, the waterproof sheet membranes for use in conjunction with tiles must be officially approved and have a European technical approval under ETAG 022 or a national test certificate (abP).

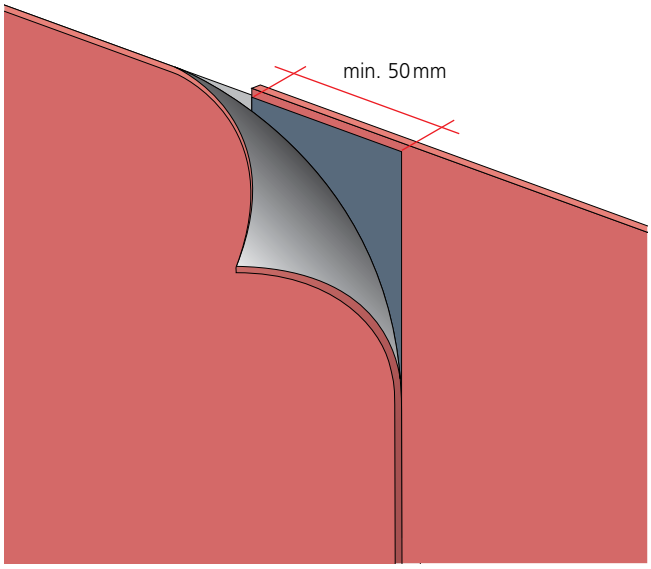
Note:

In Germany, the effective waterproofing layer (membrane) of the sheet material must have a minimum thickness of 0.2 mm.



Seams:

A suitable product must be specified for reliable bonding and watertight sealing at seams, joints and overlaps.



Product recommendation

Sopro RMK 818 Racofix® universal adhesive

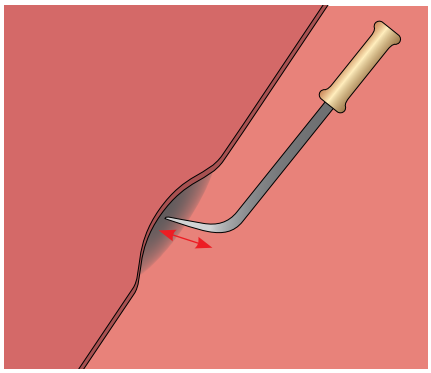
Sopro MKS 819 Racofix® universal adhesive S

Sopro TDS 823 two-component turbo sealing slurry

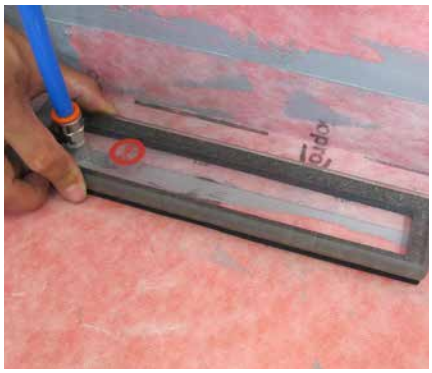
Sopro FDK 415 fixing and waterproofing adhesive*

* Sopro FDK 415 combines functions of bonding and watertight sealing at seams in a single product.

Testing of seams:



Using a special hook.



Alternatively, using vacuum pump. Test template is put in position. Achievement of negative pressure (vacuum) indicates that joint is properly sealed. Otherwise there is a leak.

Fundamentals

DIN 18534-5 – Waterproofing with waterproofing materials in sheet form in conjunction with tiles

As yet, under DIN 18534, waterproofing materials in sheet form are only approved for water action classes W0 to W2-I. One key reason why their unlimited use is not permitted for water action class W3-I is the somewhat lower tensile adhesion strengths typically exhibited by the existing waterproofing systems of this kind.

Particularly in industrial facilities (e.g. breweries or catering kitchens), the very high water exposure is likely to be compounded by high mechanical loads (e.g. from lift stackers, forklifts or crockery trolleys). To meet these requirements, waterproof sheet membranes with higher tensile adhesion strengths are therefore needed.

Sopro AEB 1160 HD membrane

Thanks to its innovative surface texture, the new Sopro AEB 1160 HD membrane is able to meet these stringent demands in terms of tensile adhesion strength. Its use in conjunction with cementitious and reaction resin thin-bed adhesives allows values of 1–2 N/mm² to be achieved.

Moreover, the sheet surface texture – which is designed without a nonwoven facing – prevents the capillary water migration typical of nonwovens. This simplifies the formation of joints and overlaps.

Although use of the Sopro AEB 1160 HD membrane for W3-I applications is still subject to project-specific agreement with the client as a special construction, it already meets DIN 18534 requirements in terms of mechanical and chemical loads.

Assembly can accommodate high mechanical loads in terms of compression and shear.

Sheet bonded with Sopro VF HF 420 VarioFlex® high-strength flexible tile adhesive.

Sealing tape and fittings can be bonded with Sopro FDK 415 fixing and waterproofing adhesive.

Tiles installed with Sopro MEG 666 megaFlex S2 turbo highly flexible tile adhesive or Sopro DBE 500 epoxy tile adhesive.

DIN 18534-6 – Waterproofing with waterproofing materials in panel-shaped form in conjunction with tiles

Experience with panel-type waterproofings has been gathered over many years through shower floor applications and the use of prefabricated shower boards. Either the surface of these products is factory-waterproofed or the rigid foam core is inherently watertight.

DEUTSCHE NORM August 2017

DIN 18534-6

DIN

ICS 91.120.30

Abdichtung von Innenräumen –
Teil 6: Abdichtung mit plattenförmigen Abdichtungsstoffen im Verbund mit Fliesen und Platten (AIV-P)

Waterproofing for indoor applications –
Part 6: Waterproofing with waterproofing materials in panel-shaped form in conjunction with tiles or paving

Etanchéité pour les espaces intérieurs –
Partie 6: Etanchéification au moyen des matériaux d'étanchéité en forme de plaque combinés avec des carreaux

Gesamtumfang 10 Seiten

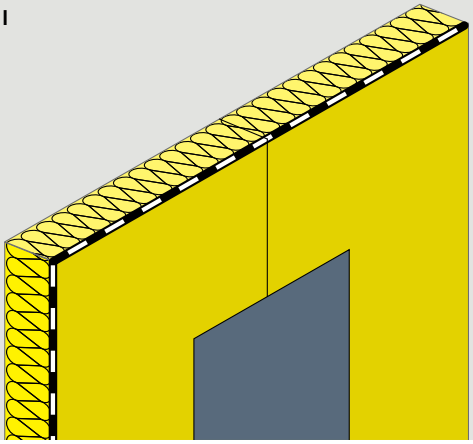
DIN-Normenausschuss Bauwesen (NABau)

Panel-type waterproofings originate from shower board applications.

Note:

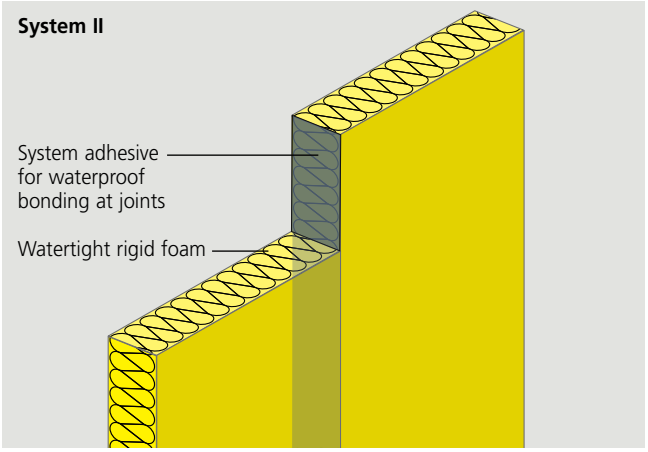
Panel type waterproofing materials perform only a waterproofing function and do not act as self-supporting building elements. Their use is limited to water action classes W0-I to W2-I. If the rigid foam core serves as the waterproof barrier, then a minimum panel thickness of 10 mm is required for W0-I to W1-I, and 25 mm for W2-I applications.

System I



Rigid foam board with surface-applied waterproof layer. Sealing tape is required at joints.

System II



Rigid foam core is inherently watertight. Waterproof bonding of panel edges with system adhesive is required during installation.

Fundamentals

Suitable waterproofing products

1. Liquid-applied waterproof membranes:

Polymer dispersions

Sopro FDF

Sopro FDF-KM 027 contrast agent

Sopro FDF

Solvent-free, one-component liquid polymer waterproof coating. Ready-to-use and suitable for composite waterproofing in conjunction with tile finish. Sopro FDF is a proven solution particularly for level, untextured substrates, such as gypsum plasterboard, gypsum fibreboard etc. The material meets crack-bridging requirements to ZDB data sheet. For indoor use, e.g. in domestic and commercial showers/bathrooms.

Available in two colours.

In future, a pigment syringe will be available to allow the colour to be changed on site.

Polymer/cement mortar composites = flexible mineral sealing slurry

Sopro DSF 523/623

Sopro TDS 823

Sopro DSF 423

Sopro DSF/Sopro TDS 823

Hydraulically setting, one-component or two-component sealing slurry for flexible waterproof/damp-proof membranes. The material is crack-bridging and displays strong adhesion to substrate. It is ideal for composite waterproofing applications below tiling on balconies and patios, in commercial/industrial spaces exposed to moisture, for internal coating of process water tanks and much more.

Reaction resins = PU and epoxy resins

Sopro PU-FD 570 (walls)
Sopro PU-FD 571 (floors)

Sopro PU-FD

White-pigmented, two-component polyurethane liquid resin. When fully cured, the material is resistant to water, sea water, wastewater/sewage, aqueous acids, alkaline solutions, salt solutions, chlorinated, lime and thermal water. Used as crack-bridging membrane in composite waterproofing systems below heavy-duty indoor and outdoor tile coverings, e.g. in swimming pools, catering kitchens, commercial and industrial facilities.

Suitable waterproofing products

2. Waterproof sheet membranes:

Sopro AEB 640

Thin-sheet, crack-bridging waterproofing and separating membrane, faced either side with special nonwoven fabric. Nonwoven fabric ensures strong bond between waterproofing/separating membrane and cementitious tile adhesive. It is ideal for trouble-free, flexible waterproofing of wall and floor surfaces below natural stone and ceramic tiling in bathrooms, showers and wet spaces. Laps and joints are bonded and watertightly sealed using Sopro RMK 818 Racofix® universal adhesive, Sopro MKS 819 Racofix® universal adhesive or Sopro TDS 823 two-component turbo sealing slurry. Particularly suitable for fast-track waterproofing on tightly scheduled construction schemes.

Sopro AEB plus 639

Flexible, crack-bridging, stress-relieving waterproof membrane and separating layer. Special nonwoven coating on either side ensures strong bond between membrane and cementitious tile adhesive. Particularly suitable for use as reliable, flexible waterproof membrane and stress-relieving separating layer outdoors on balconies and patios below natural stone coverings and ceramic tiling. Special sheet ensures better stress equalization in response to abrupt temperature changes. Joints are bonded and watertightly sealed using Sopro RMK 818 Racofix® universal adhesive or Sopro TDS 823 two-component turbo sealing slurry. Use of Sopro AEB plus 639 allows installation of natural stone and ceramic coverings without long waiting times.

Note:

As a rule, the membrane materials may be applied to all normal substrates that are suitable for tiling! They exhibit outstanding adhesive properties by virtue of their material composition.

Care should be taken at the design stage to ensure that water-sensitive substrate materials (e.g. gypsum-bearing materials) are not incorporated in areas with high moisture exposure.

Substrate materials suitable for the individual exposure classes are indicated in the following sections and will, in future, be covered by DIN 18 534.

Particular care is required, in all cases, in the design and construction of waterproofings.

Fundamentals

DIN 18534 "Waterproofing for indoor applications"

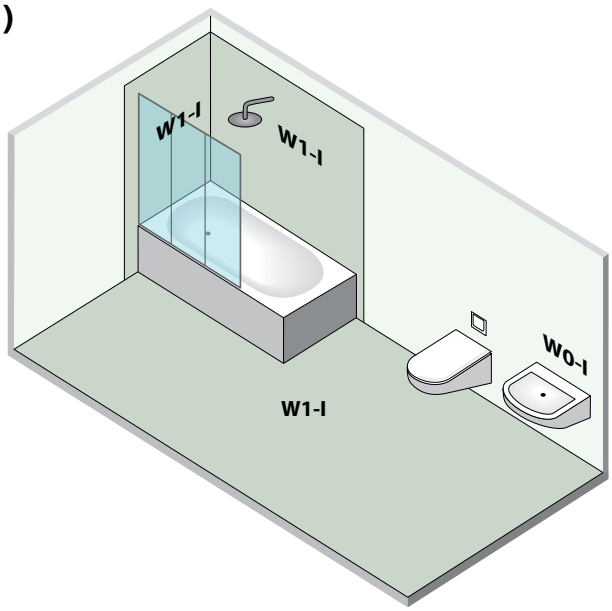
Water action, W: The potential water action on all surfaces of a space (wall–floor) must be assessed and specified by the designer. The breakdown of the new water action classes is as follows:

- **W** = Water action class
- **0-3** = Rating (low, moderate, high, very high)
- **I** = Indoor

W0-I	Low	Areas exposed to infrequent splashing
Examples		• Wall areas in bathrooms outside shower area or in kitchens, e.g. behind washbasin • Floor areas without floor drain, e.g. in utility rooms, guest toilets, kitchens
W1-I	Moderate	Areas exposed to infrequent action of process/domestic water, without higher loads due to water accumulation
Examples		• Bathroom wall areas above bathtubs and in showers • Bathroom floor areas with/without drain, without more intense water action from shower area • Floor areas in domestic spaces with drain (e.g. place for washing machine)
W2-I	High	Areas exposed to frequent action of process/domestic water, with temporarily higher loads due to water accumulation, especially on floor
Examples		• Wall areas of showers in sports/commercial facilities • Floor areas with drains and/or channels • Floor areas in spaces with walk-in showers • Floor areas in sports/commercial facilities
W3-I	Very high	Areas exposed to very frequent or long-lasting action of splash, process or domestic water, and/or water from intensive cleaning operations, with high loads due to water accumulation
Examples		• Showers in sports/commercial facilities • Poolside areas and wellness suites in swimming pools • Areas in commercial facilities (commercial kitchens, washing spaces, food-processing spaces)

Classification of areas for waterproofing by water action class

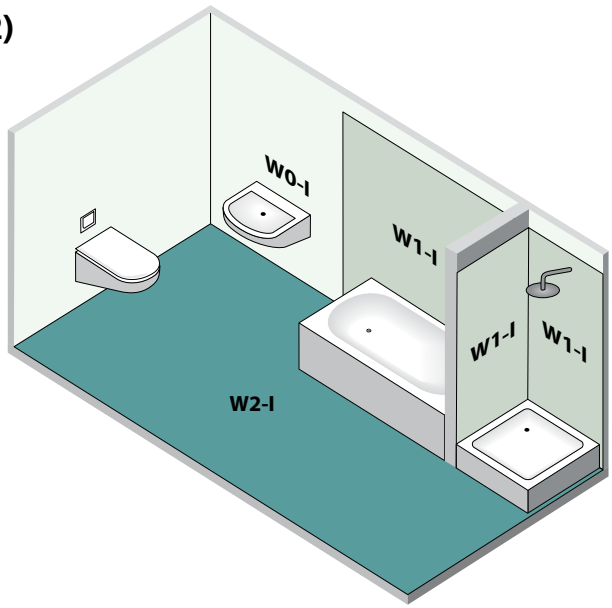
1)



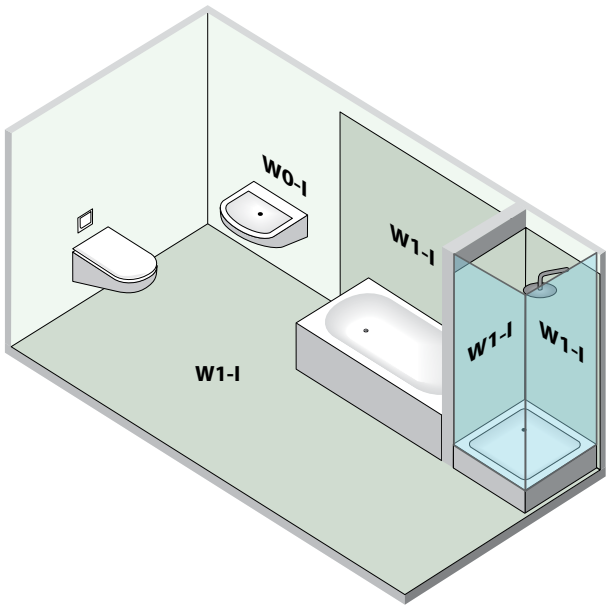
Domestic bathroom with bathtub.

Given that the protection against splashing cannot prevent water from spilling onto the floor, this must be allocated to water action class W1-I.

2)



Domestic bathroom with bathtub and shower tray.



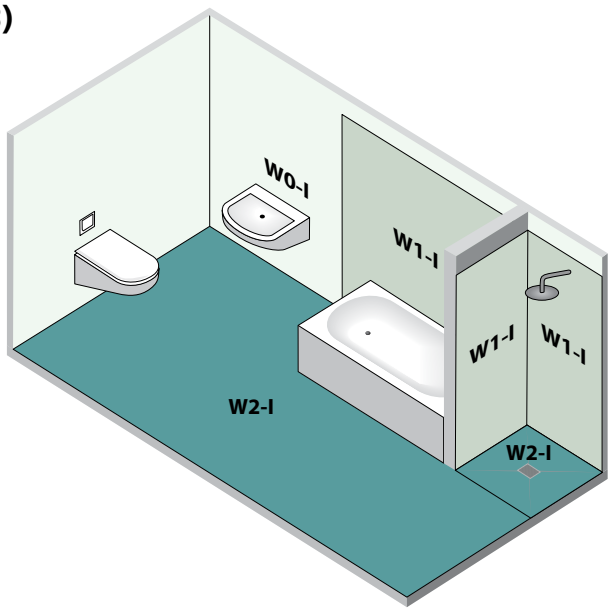
Domestic bathroom with bathtub and shower tray with shower enclosure.

Note:

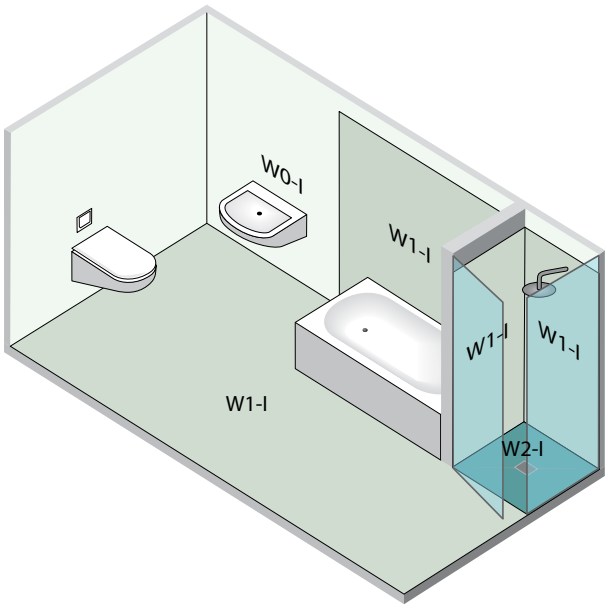
Despite the shower enclosure, it is not permissible to dispense with a waterproof membrane for the floor!

Fundamentals

3)



Domestic bathroom with bathtub and walk-in shower.

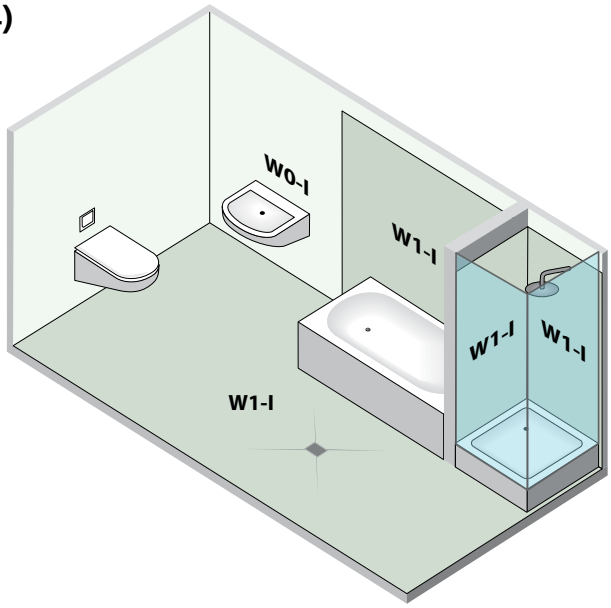


Domestic bathroom with bathtub and walk-in shower with shower enclosure.

Note:

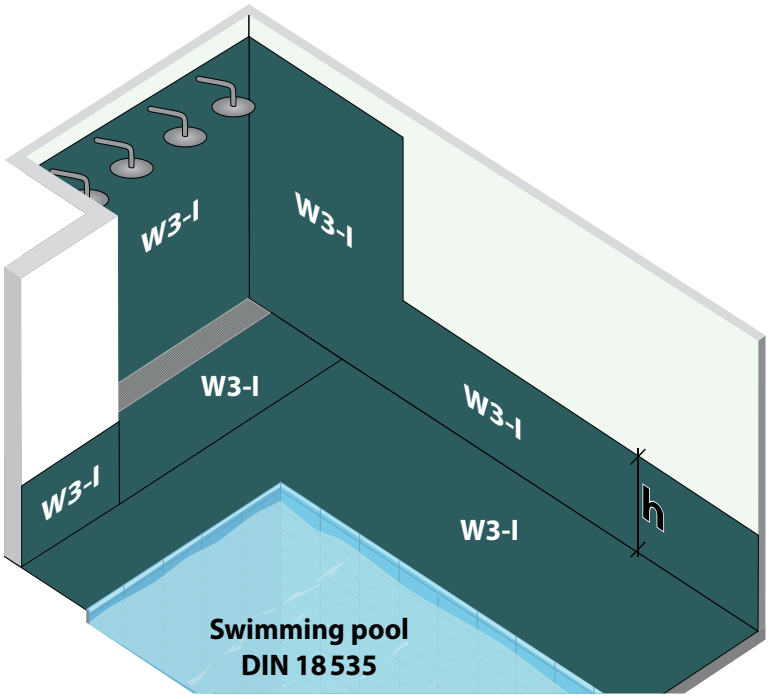
If walk-in showers are fitted with "effective protection against splash water" (for which a shower curtain is inadequate), it is possible to allocate the remaining floor area to water action class W1-I.

4)



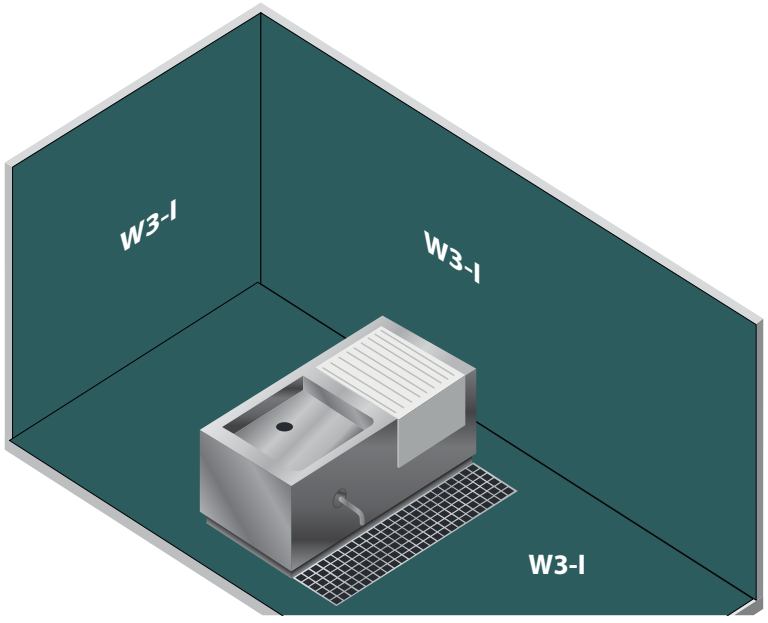
Domestic bathroom with bathtub and shower tray with shower enclosure: floor drain in room.

5)



Shower facility and swimming pool area
h = height of wall area for waterproofing, to be specified by designer.

6)



Commercial catering kitchen.

Note:

In food-processing facilities or catering kitchens, allowance must be made for additional action! This mainly constitutes chemical loads in the form of acids and alkaline solutions as well as mechanical action from use. The design must also take account of any possible thermal action.

Fundamentals

Water action classes illustrated by finished projects:

Kitchen.

Bathroom with shower tray.

Bathroom with shower enclosure.

Bathroom with glass pane for splash protection.

Bathroom with floor drain by bathtub.

Shower facility.

Fundamentals

Swimming pool/poolside area.

Catering kitchen.

The water action classes must be specified by the designer in function of the projected loads and exposure. The specified **water action class** will then dictate the permissible **substrate** and **waterproofing materials**!

The same type of space (with regard to use) may be allocated to different water action classes on different projects.

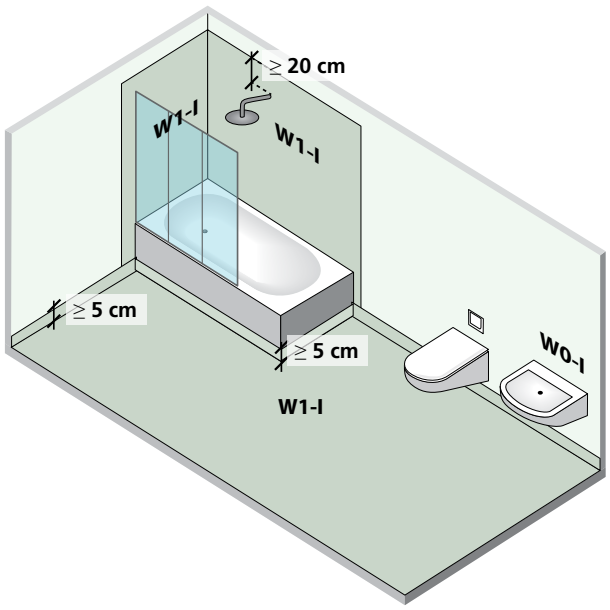
Example: The guest toilet in a domestic environment is typically classed between W0-I and W1-I. However, a toilet in a stadium, for example, will be classed at least between W2-I and W3-I.

Guest toilets in residential facilities can be classed between W0-I and W1-I.

Toilet facilities in a ski hut or stadium, on the other hand, must be classed between W2-I and W3-I due to the extremely high loads.

Fundamentals

Specifications regarding areas for waterproofing:

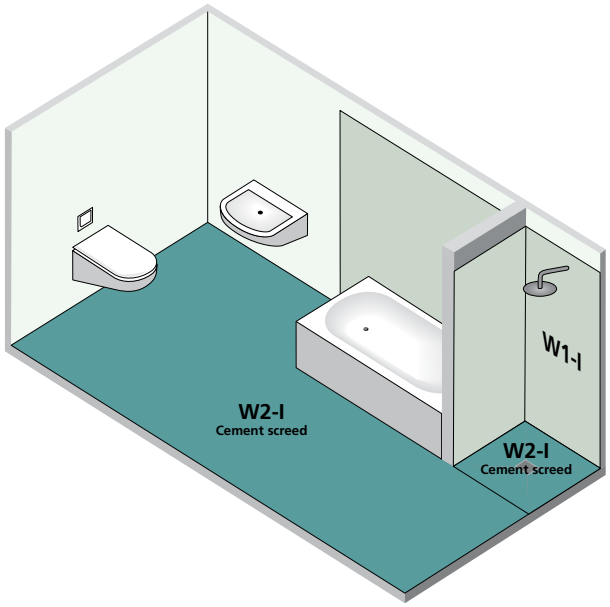


- If only the floor area requires waterproofing (e.g. W1-I/ W2-I), then the membrane must be carried up adjoining vertical elements to a **minimum height of 5 cm** (to be subsequently covered over by the bonded skirting).
- The membrane must be carried at least 20 cm above the highest draw-off point.
- W1-I floor areas require waterproofing!
- W1-I wall areas require waterproofing where moisture-sensitive substrates are present or where water can reach other areas via non-moisture-sensitive substrates.
- W0-I areas do not require waterproofing provided water-repellent finishes are specified.
- If necessary, the waterproofing systems must be able to withstand water accumulation up to a maximum height of 10 cm.

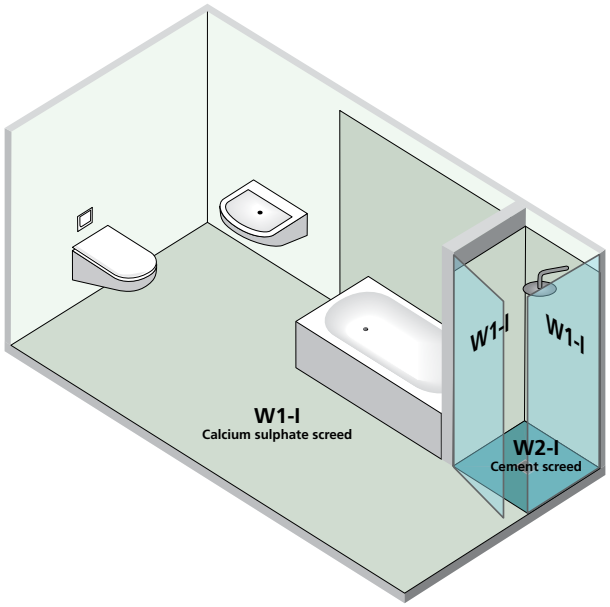
Substrates

Moisture-sensitive substrates, e.g. gypsum plasters, gypsum-bearing drylining materials, calcium sulphate screeds, are permissible in conjunction with water action classes W0-I and W1-I.

Moisture-sensitive substrates are not permissible in conjunction with water action classes W2-I and W3-I. In other words, cementitious substrates, e.g. concrete, cement render or cement screeds, are generally required here.

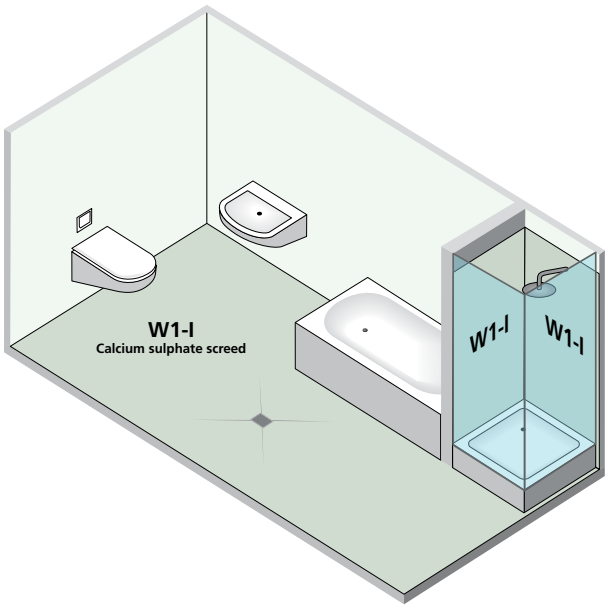


Bathroom without effective protection against splash water in barrier-free shower area.



Bathroom with effective protection against splash water in barrier-free shower area.

Substrates



Bathroom with floor drain, not within shower area.

Falls

The levels of the floor construction that carry water (membrane and finished floor surface) should be provided with adequate falls to ensure that water runs off properly.

Falls in shower.

Falls in catering kitchens complicate daily operations.

Water removal by rubber squeegee.

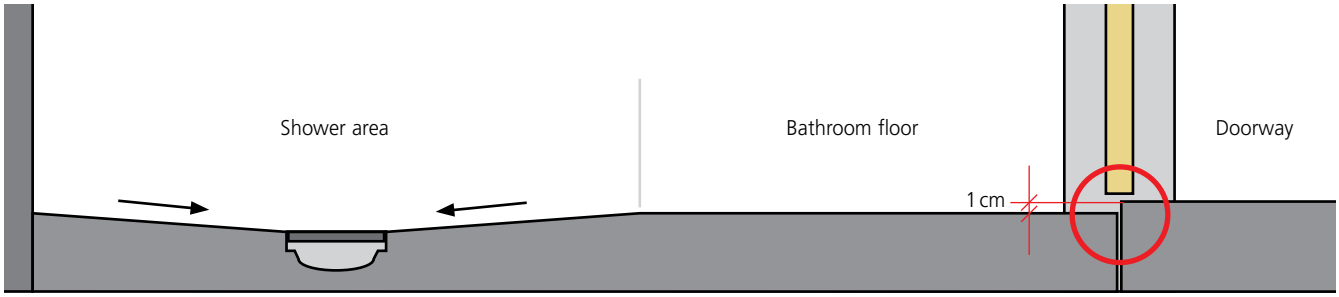
Exceptions are permissible where alternative provision is made for the removal of water. (This is often relevant in the context of food-processing facilities, e.g. catering kitchens, where the built-in falls frequently obstruct production processes.)

Fundamentals

Thresholds

Designers must take suitable measures to prevent any water that spills on floor surfaces from entering non-waterproofed areas via doors or other entrances.

This is particularly important in bathrooms with (walk-in) shower areas that are finished flush with the rest of the bathroom flooring. At the very least, a 1 cm high threshold must be provided at the doorway to prevent the unobstructed escape of water into other spaces.



An inevitable concomitant of barrier-free design is that water too can spread freely over surfaces. A typical feature of older tiled showers was the use of special tiles to create a 1 cm difference in levels at the shower perimeter – which shows that the requirement for a 1 cm difference in levels is nothing new. Ultimately, in this regard, designers have a certain degree of freedom in developing a suitable solution.

Shower area with specially shaped perimeter tiles to provide a 1 cm difference in levels.

Close-up showing inclination of special tiles.

Threshold examples

Doorway with threshold strip (Schlüter).

Covering with natural stone threshold.

Threshold strip.

Natural stone threshold.

Threshold formed by strip section and mosaic tiles.

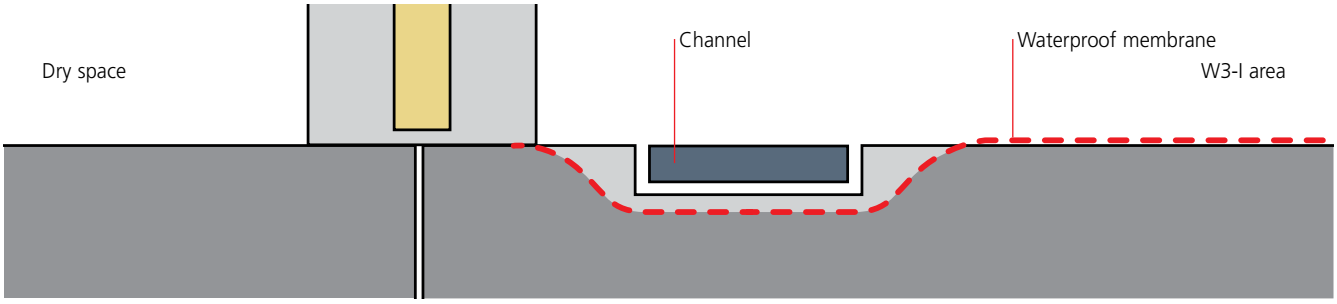
Threshold formed with mosaic.

Fundamentals

Thresholds

Threshold examples

Areas with higher exposure (water action class W3-I), e.g. in catering kitchens and food-processing facilities, or subject to intensive cleaning regimes, require the incorporation of channels directly in front of the doorway.



Channel incorporated at doorway.

Channel at entrance point.

Slot channel incorporated in front of doorway in catering kitchen.

Crack formation in substrate

The formation of cracks in elements forming the membrane substrate cannot be completely prevented. Any cracks discovered prior to installing the membrane should be properly repaired.

If further cracking or changes in crack width are anticipated, then a waterproofing system must be specified that is able to accommodate such changes without failure.

Crack classes for typical membrane substrates

Crack class	Maximum change in crack width	Substrates
R1-I	Up to approx. 0.2 mm	Reinforced concrete, masonry, screed, plaster/render, structurally continuous and sealed joints in gypsum board/gypsum fibreboard linings
R2-I	Up to approx. 0.5 mm	Joints in large-format blockwork masonry, structurally continuous joints in panel claddings/linings
R3-I	Up to approx. 1.0 mm, plus offset between crack faces up to approx. 0.5 mm	Wall base joints

Composite waterproofing membranes (whether liquid-applied or in sheet form) may only be used on substrates of crack class R1-I.

Allocation of waterproofing materials to water action classes

Waterproofing product	Approved water action class
Polymer dispersions (to be applied in two colours)	W0-I Walls and floors W1-I Walls and floors W2-I Wall areas only
Crack-bridging mineral sealing slurries	W0-I W1-I W2-I W3-I
Reaction resins	W0-I W1-I W2-I W3-I with additional action (chemical, mechanical, technical action)
Waterproofing materials in sheet form in conjunction with tiles (areas without high mechanical action)	W0-I W1-I W2-I
Waterproofing materials in panel-shaped form in conjunction with tiles	W0-I W1-I W2-I

Note:
Liquid-, sheet- and panel-type waterproofing materials must be applied as part of a fully co-ordinated system solution in conjunction with the ancillary sealing tapes, fittings, collars etc.

Sealing tapes and preformed angles must be lapped by at least 50 mm at their ends and bonded with a waterproof material (e.g. Sopro RMK 818 Racofix® universal adhesive or Sopro TDS 823 two-component turbo sealing slurry).

Fundamentals

All membrane substrates (renders etc.) must be air-dry and meet various criteria. Floating or unbonded screeds for subsequent tiling are subject to the following residual moisture requirements:

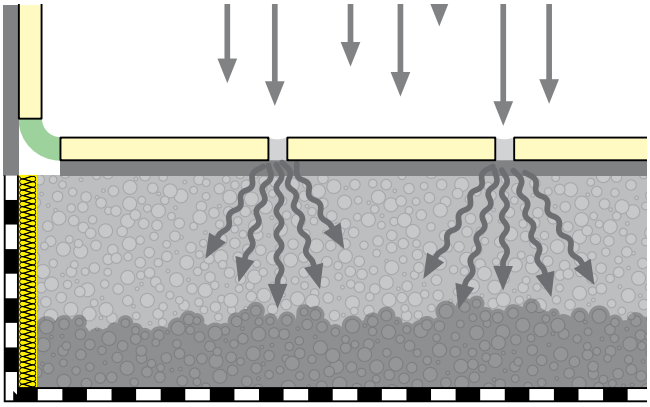
- **Cementitious screeds ≤ 2.0 %**
- **Calcium sulphate screeds ≤ 0.5 %, in conjunction with heating systems ≤ 0.3 %**

These values should be determined using a (standard) **CM tester** and documented.
Any incorporated floor heating systems should normally undergo the commissioning procedure to DIN 4725 "Hot-water floor heating systems", with a record taken of the results prior to waterproofing and flooring installation.
In addition, the **"Building trades co-ordination committee procedures for heated floor constructions"** and the **ZDB (Federation of the German Construction Industry) data sheet** "Ceramic tiling, natural and cast stone coverings to calcium sulphate and cementitious screeds" must be observed (see Section 7 "Screeds and floor constructions").

The substrate levels required for installation of the wall or floor covering must be achieved prior to waterproofing, i.e. the relevant wall and floor surfaces must be provided with all necessary levelling and filler coats, falls etc. (see Section 11 "Levelling of substrates") necessary for the thin-bed laying of tiles after waterproofing.

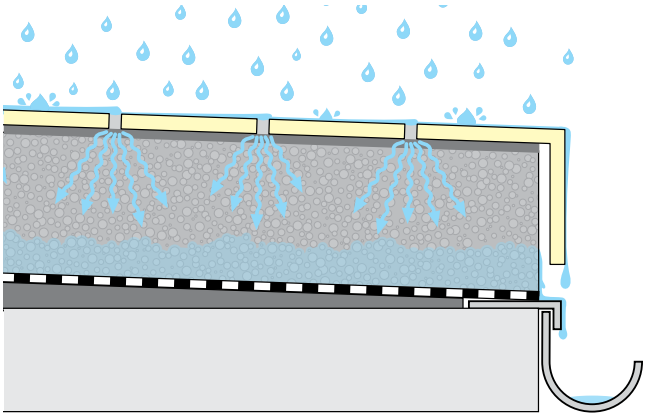
Failures resulting from past installation of sheet membranes in conjunction with screeds

Saturation of screed due to lack of waterproof barrier – a hygiene hazard e.g. in catering kitchens.



Dirt accumulation in screed.

Calcareous deposits at gutters and drips resulting from unprotected screed.



Soluble lime constituents leached from mortar matrix, l eading to efflorescence.

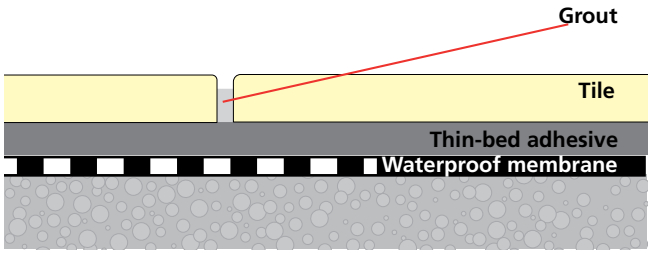
Tile covering and grouting

Ceramic tiles have, for many centuries, been an established choice in the design of wall and floor finishes for domestic environments.

As robust and inert materials – capable of withstanding the action of water at different temperatures, mixed with acids, alkaline solutions and a host of other aggressive media – they represent an indispensable solution, particularly in wet spaces.

In tandem with tile grouts, they form a compact, continuous surface. At the same time, the ceramic products in conjunction with their grouted joints are still no substitute for a waterproof membrane given that grouts are not classed as waterproof. Consequently, tile coverings must always be regarded as water-permeable.

The incorporated waterproof membranes, applied to the surface of the screed, for example, form an integral system with the overlying thin-bed tile covering.



Composite waterproofing system with membrane and tile finish.

Tiles laid on waterproof membrane with system-compatible thin-bed adhesive.

Movement joints/sealing tape – Protection of membrane during maintenance of movement joints

A system-compatible sealing tape is incorporated in the membranes at movement joints.

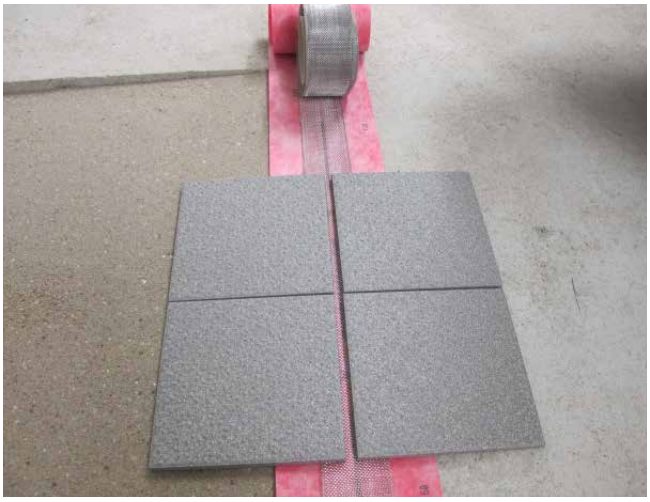
Incorporation of sealing tape at movementjoints, fixed in place with Sopro TDS 823 two-component turbo sealing slurry.

Fundamentals

Application of sealing tape

During subsequent installation of the tile covering, these joints are not rigidly grouted, but normally sealed with a silicone product. Being vulnerable to debonding and failure due to structural movement and wear, silicone joints require periodic replacement. To prevent damage to the underlying sealing tape layer during replacement of the old silicone joint, it is possible to insert strips of stainless-steel fabric to guard against cutting or piercing. These protective strips are built into the construction at the appropriate positions during the tiling operations.

Sopro SB 113 cut protection tape can be cut to length as required for particular application.



Sealing tape and protective strip (Sopro SB 113 cut protection tape) to prevent damage to tape when replacing silicone joints.

Cut protection tape incorporated during tile laying.

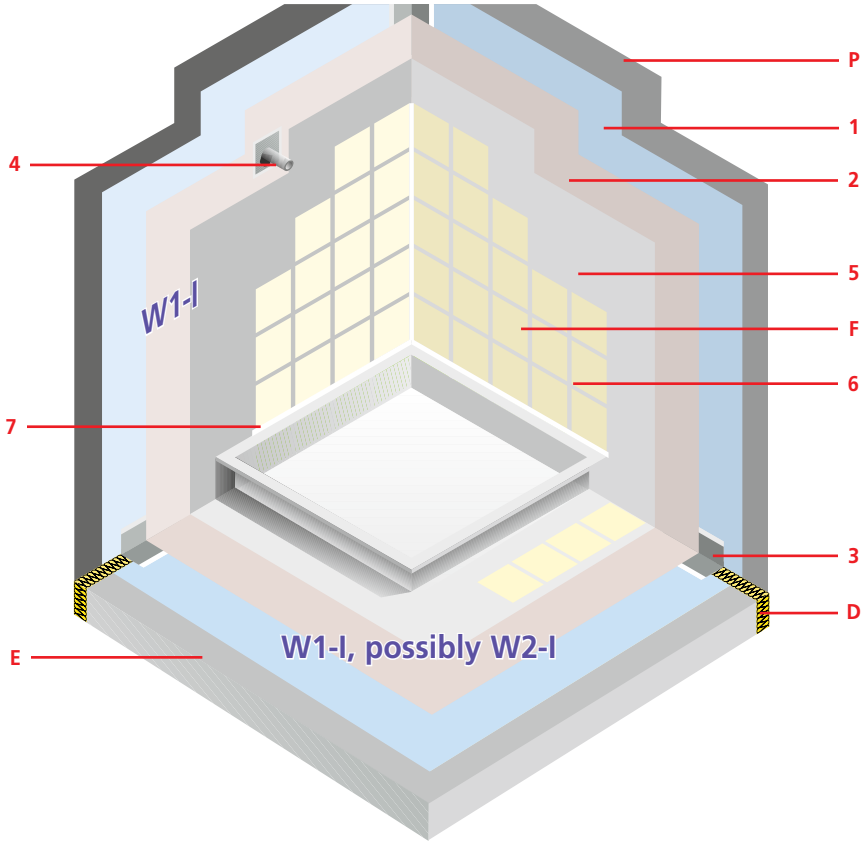
Cut protection tape is easy to form into required shape.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

Definition W1-I

Directly and indirectly exposed surfaces in spaces which do not come into contact with process, domestic or cleaning water very frequently, e.g. in household bathrooms.

In areas of moderate exposure, incorporation of a waterproof membrane is required behind tile coverings and below bathtubs or shower trays – particularly where moisture-sensitive substrates are present. The structure must be protected against moisture penetration.



1 Sopro GD 749 primer
2 Two-coat waterproof membrane
3 Sopro DB 438 sealing tape
4 Sopro DMW 090 sealing collar for walls
5 Flexible thin-bed adhesive
6 Cementitious tile grout
7 Elastic joint sealant
D Insulation
E Screed
F Tile
P Plaster/render
PE Circular-section PE back-up strip
U Concrete substrate

Suitable substrates

- Concrete, lightweight/aerated concrete
- Cement screed/mastic asphalt screed
- Masonry (calcium-silicate)
- Calcium sulphate screed*
- Paperless gypsum panels* (walls)
- Cement and lime/cement render
- Gypsum plaster*
- Strong existing tile covering
- Cementitious drylining
- Extruded polystyrene (XPS)
- Gypsum plasterboard*

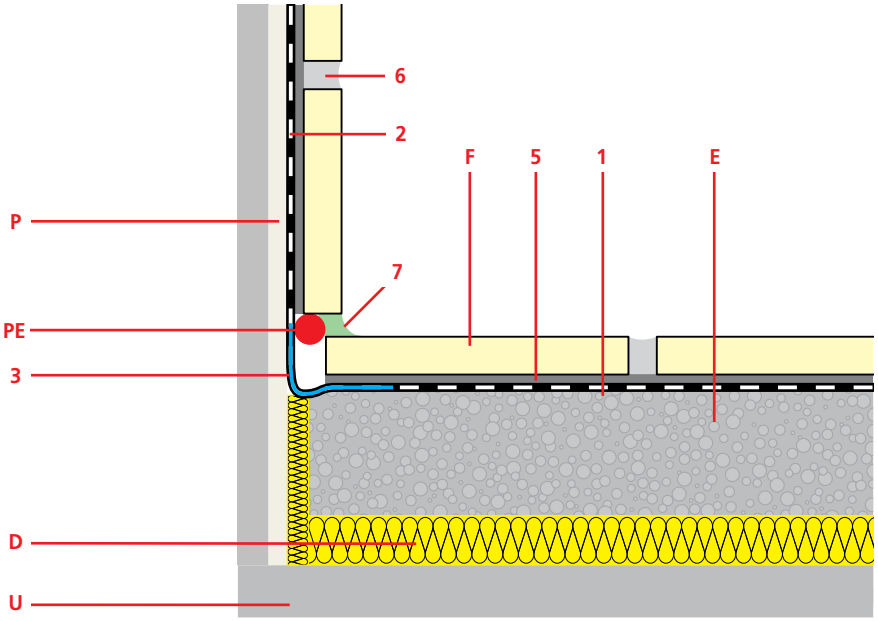
Unsuitable substrates

- Wood-based products

Exception: see Section 5.

Note:

System designs also exist to enable waterproofing and tile installation on timber substrates.



Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

The installation of waterproof membranes below bathtubs and shower trays is a perennial source of debate on building sites due to the difficulty, in some cases, of co-ordinating the works of the various trades in order to meet this requirement. This demand is already formulated in the BEB (German Screed and Coverings Association) data sheet "Waterproofing products applied in conjunction with floor coverings", August 2010:

"The application of a sealant between the bathtub/shower tray and the wall does not constitute a waterproof barrier."

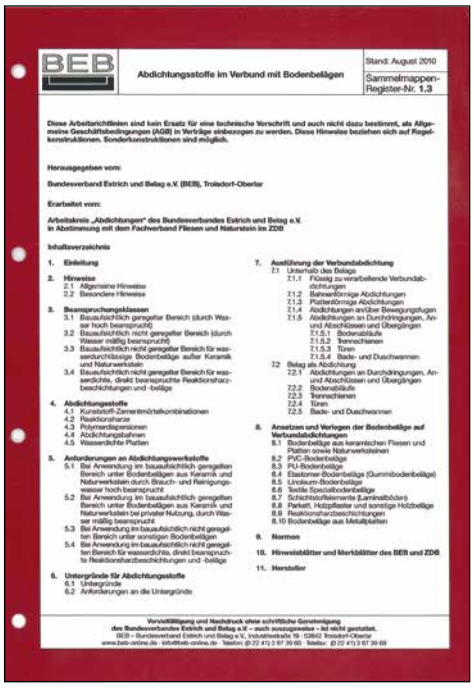
"The screed and waterproof membrane shall be installed prior to the bathtub or shower tray and carried below this element."

DIN 18534

Areas below and behind bathtubs and shower trays shall be protected against water action!

Solution 1: Connection of bathtub/shower tray edge to membrane, e.g. with bathtub sealing tape.

Solution 2: Continuation of membrane below and behind bathtub/shower tray.


BEB

Abdichtungsstoffe im Verbund mit Bodenbelägen

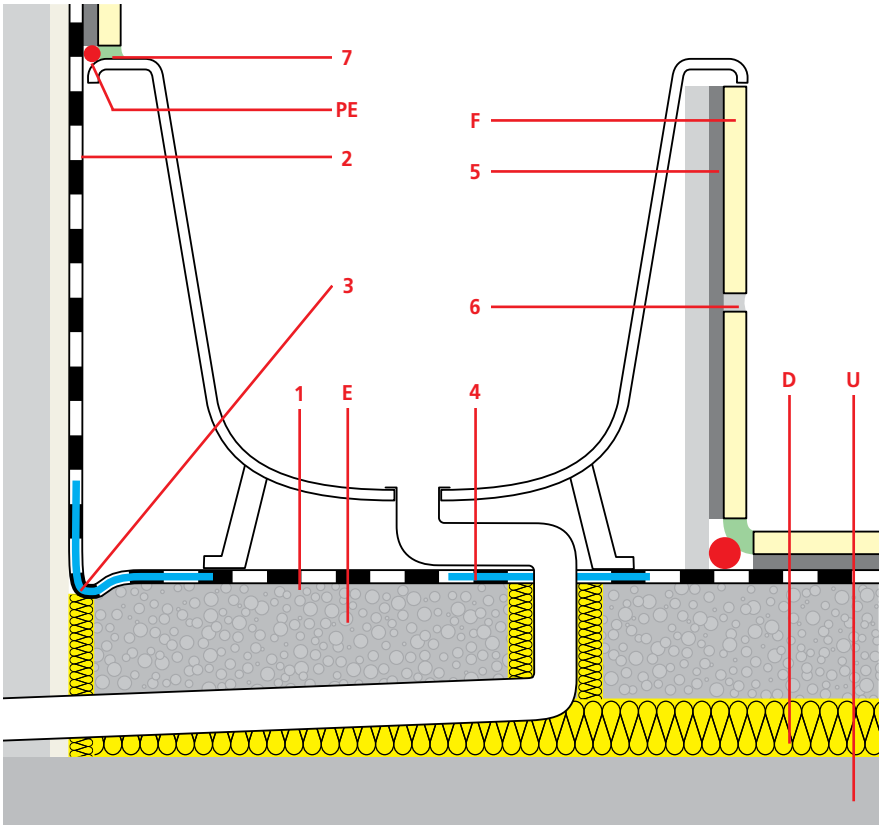
Stand: August 2010

Sammelmappen-Register-Nr. 1.3

BEB data sheet "Waterproofing products applied in conjunction with floor coverings" (August 2010).

Guideline solutions:

1 The load-spreading layer is installed over the entire space. The bathtub or shower tray is subsequently mounted on the waterproofed screed surface.



1 Sopro GD 749 primer
2 Two-coat waterproof membrane
3 Sopro DB 438 sealing tape
4 Sealing collar
5 Flexible thin-bed adhesive
6 Cementitious tile grout
7 Elastic joint sealant
D Insulation
E Screed
F Tile
PE Circular-section PE back-up strip
U Concrete substrate

Rubber-sleeved collar for DN 50-DN70 waste pipe penetration (Dallmer system).

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

Provision of sinking in floor for shower tray is not feasible due to slab construction. In this situation, membrane (e.g. Sopro DSF 423 two-component flexible sealing slurry) can be simply applied to waterproof wall and floor surfaces.

Shower base unit (Kaldewei system) positioned in corner on waterproofed substrate.

Sopro AEB 130 wall collar is used to provide reliable seal around shower tray waste pipes.

Sopro AEB 130 wall collar is embedded in liquid-applied waterproof membrane. Rubber lip seal fits tightly to outer wall of pipe.

Sopro AEB wall collars are available for a wide range of pipe diameters.

Pipes serving heat emitters, e.g. carried through floors, can also be reliably integrated in floor membrane with Sopro AEB 131 collar.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

2 The installation of waterproof membranes is often complicated by sinkings formed in the screed to receive the base of bathtubs or shower trays. These sinkings may be provided due to spatial constraints or as a means of lowering the top edge of the bathtub/shower tray.

Waterproofing works obstructed by supply pipe runs in sinkings. Under DIN 18534, this must be avoided in future.

Highly effective, easy-to-install solutions can be achieved through the use of liquid-applied waterproof membranes in conjunction with the waterproof sheet membranes approved under DIN 18534 Part 5.

DIN 18534

If the installation of a waterproof membrane is planned below/behind bathtubs and shower trays, then only the pipes serving the relevant bathtubs/trays may be carried through this space. The penetrations for these pipes must be designed such as to ensure reliable connection of the membrane.

Waterproof sheet membranes

Sopro AEB 640

Sopro AEB 640:

Thin-sheet, crack-bridging waterproofing and separating membrane, faced either side with special nonwoven fabric. Nonwoven fabric ensures strong bond between waterproofing/separating membrane and cementitious tile adhesive. Ideal for trouble-free, flexible waterproofing of wall and floor surfaces below natural stone and ceramic tiling in bathrooms, showers and wet spaces. Laps and joints are bonded and watertightly sealed using Sopro RMK 818 Racofix® universal adhesive, Sopro MKS 819 Racofix® universal adhesive or Sopro TDS 823 two-component turbo sealing slurry. Particularly suitable for fast-track waterproofing on tightly scheduled construction schemes.

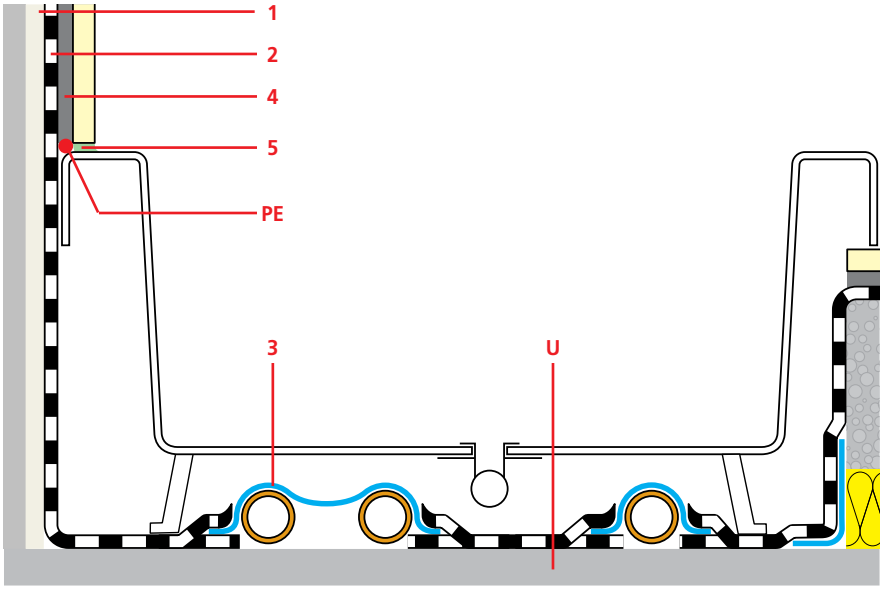
Sopro AEB plus 639

Sopro AEB plus 639:

Flexible, crack-bridging, stress-relieving waterproof membrane and separating layer. Special nonwoven coating on either side ensures strong bond between membrane and cementitious tile adhesive. Particularly suitable for use as reliable, flexible waterproof membrane and stress-relieving separating layer outdoors on balconies and patios below natural stone coverings and ceramic tiling. Special sheet ensures better stress equalization in response to abrupt temperature changes. Joints are bonded and watertightly sealed using Sopro RMK 818 Racofix® universal adhesive, Sopro MKS 819 Racofix® universal adhesive or Sopro TDS 823 two-component turbo sealing slurry. Use of Sopro AEB plus 639 allows installation of natural stone and ceramic coverings without long waiting times.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

Liquid-applied waterproof membranes used in conjunction with waterproof sheet membranes



Waterproof (trowel-applied) membrane combinable with Sopro AEB 640 waterproofing and separating membrane at service runs (pipes etc.).

Sopro AEB 640

1 Sopro GD 749 primer
2 Two-coat waterproof membrane
3 Sopro AEB 640 waterproofing and separating membrane
4 Flexible thin-bed adhesive
5 Elastic joint sealant
PE Circular-section PE back-up strip
U Concrete substrate

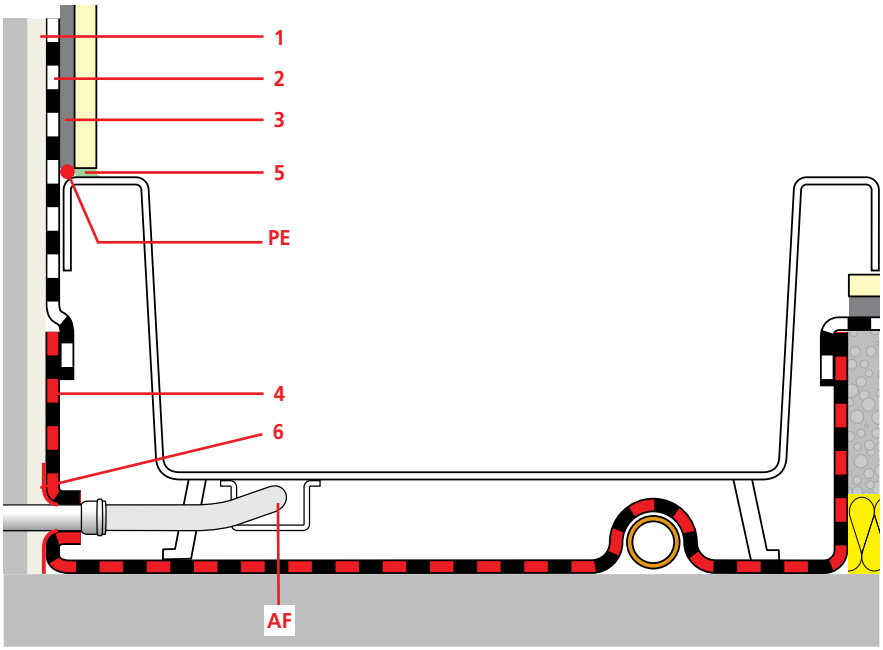
Strips of Sopro AEB 640 worked into membrane for added protection at pipe and other service runs. The ends of the strips are fully embedded in and overcoated by the liquid membrane.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

Waterproof sheet membranes

Waterproof sheet membranes are commonly encountered on construction sites and also offer an ideal solution for waterproofing below bathtubs and shower trays.

Detail:



1 Sopro GD 749 primer
2 Two-coat waterproof membrane
3 Flexible thin-bed adhesive
4 Sopro AEB 640 waterproofing and separating membrane
5 Elastic joint sealant
6 Sopro AEB 644 wall collar
AF Waste pipe
PE Circular-section PE back-up strip

Sopro AEB 640

Sopro AEB 642 (internal angle)

Sopro AEB 643 (external angle)

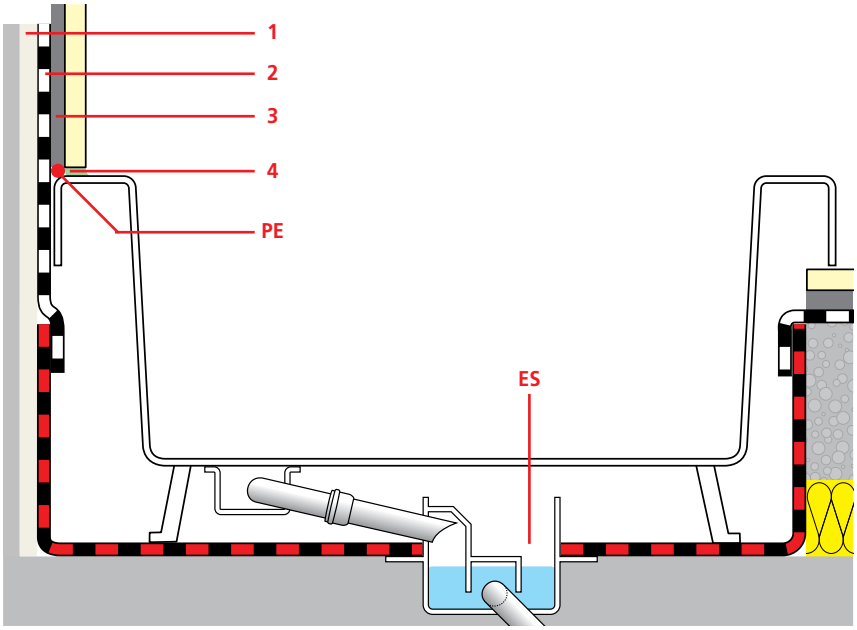
Sopro AEB 644 (wall collar)

Waterproofed surface as base for shower tray.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

Waterproof sheet membranes

Detail:
With intermediate drainage level



1 Sopro GD 749 primer
2 Two-coat waterproof membrane
3 Flexible thin-bed adhesive
4 Elastic joint sealant
PE Circular-section PE back-up strip
ES Drain pan (ACO system with trap)

Drain pan for intermediate drainage at one level of waterproofing system in industrial facility.

Drain pan for intermediate drainage below bathtub.

Waterproofing of bathtub base area with intermediate drainage level

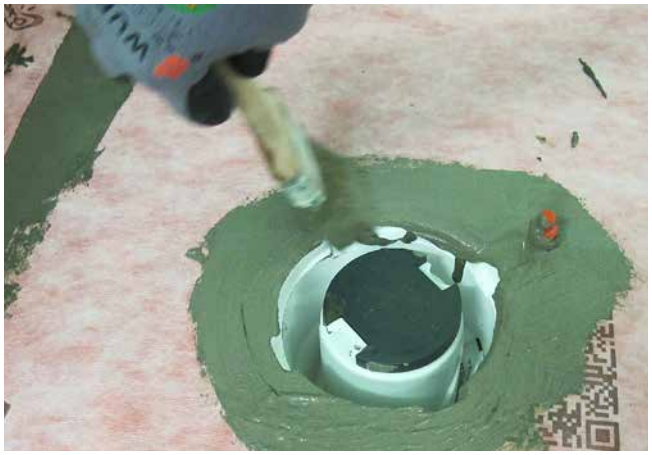
1 Spread Sopro FDK 415 fixing and waterproofing adhesive over screed and flange of drainage component.

2 Lay Sopro AEB 640 sheet membrane in freshly applied adhesive.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

3 Pressing down firmly, work Sopro AEB 640 sheet membrane into Sopro FDK 415 adhesive.

4 Incorporate fittings (angles and tape) with adhesive.



5 Carefully embed and seal at penetration (intermediate drainage).

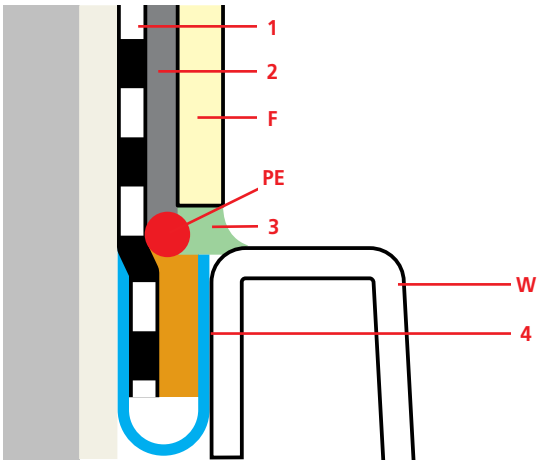
6 Fit upper part of intermediate drainage component.

7 Normal discharge of bathtub wastewater via intermediate drainage component. Any water that may run onto membrane due to leakage will also drain off.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

Where circumstances on site are such as to prevent the installation of a waterproof membrane below a bathtub or shower tray, **the use of a bathtub sealing tape is also possible under DIN 18534**. This can be installed in conjunction with liquid-applied waterproof membranes (Sopro FDF flexible sealing compound, Sopro DSF flexible sealing slurries etc.). Sopro boasts many years' experience in the use of self-adhesive sealing tape for the connection of bathtub/tray edges to waterproof membranes. In an official test performed over ten years ago, this solution was successfully subjected to 1,500 hot/cold water cycles.

Solution for membrane junction with bathtub edge



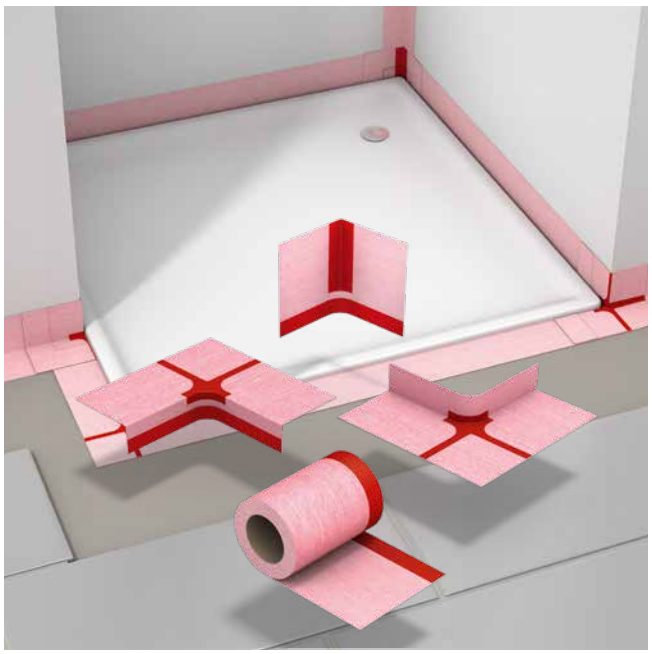
1 Waterproof membrane (Sopro FDF or Sopro DSF 523)
2 Sopro's No.1 flexible tile adhesive
3 Sopro Sanitary Silicone sealant

Sopro FDB 524 flexible sealing tape.

4 Sopro FDB 524 flexible (self-adhesive) sealing tape
F Tile
PE Circular-section PE back-up strip
W Bathtub

In response to the new waterproofing standards, the steadily growing demands on site practice and the various bathtub/shower tray installation options, the original sealing tape solution was further refined. The **Sopro bath/shower sealing system** comprises three components – sealing tape, internal angle seal and multi-angle seal – which can cater for virtually all on-site configurations.

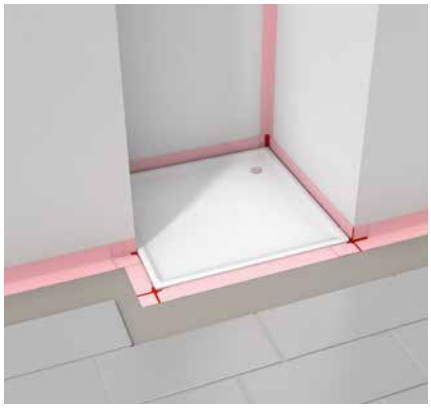
Sopro's Technical Service team will be glad to provide support in this connection.



Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

Installation options for bathtubs and shower trays, waterproofed with Sopro bath/shower sealing system

Bathtub installation.



Shower tray installed flush with bathroom floor.

Shower tray raised above tile covering.

Installation of Sopro bath/shower sealing system

1 Clean bathtub edge to remove any adhesion-impairing substances.

2 Fix self-adhesive Sopro WDE 812 bath/shower angle seal, which adapts to bathtub radius at bottom while forming 90° angle at wall connection.

3 Fix self-adhesive Sopro WDB 811 bath/shower sealing tape with min. 50 mm overlap over angle fitting.

4 Press down tape firmly onto bathtub edge with roller or spatula.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

5 Once tape and fittings are in place, fix self-adhesive Sopro WDS 814 bath/shower soundproofing tape.

6 Prepared bathtub, ready for installation.

7 Bond tape to wall with liquid-applied waterproof membrane (Sopro FDF or Sopro DSF).

8 Watertightly bond fittings at joints and overlaps, e.g. with Sopro RMK 818 Racofix® universal adhesive.

9 Bathtub waterproofed with Sopro bath/shower sealing system. Tape can now be overcoated with wall membrane.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray*

Detail solutions using Sopro bath/shower sealing system

1 Sopro WDM 813 bath/shower multi-angle seal used to connect bathtub to ledge.

2 Sopro WDM 813 bath/shower multi-angle seal and Sopro AEB angle to connect raised shower tray to aligned wall section.

3 Sopro WDM 813 bath/shower multi-angle seal used to connect shower tray to wall angle in niche.

4 Two interlocking WDM 813 bath/shower multi-angle seals used to install shower tray flush with tile covering at wall angle.

* Depending on nature of wet space, water action class W2-I may also apply.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

Formation of waterproof junction between wall and bathtub edge

Other bathtub sealing tape systems available on the market have been tried out in practice to determine their compatibility with Sopro's waterproofing products.

Franz Kaldewei GmbH & Co. KG system
Bathtub

1 Bathtub already positioned against wall, with adhesive-fixed sealing tape (Franz Kaldewei GmbH & Co. KG system).

2 Franz Kaldewei GmbH & Co. KG system tape embedded and sealed using Sopro FDF flexible sealing compound.

Shower tray

1 Waterproofing fittings are available for each (Kaldewei) shower tray type.

2 Fittings bonded to pre-cleaned bathtub edges.

3 Minimum 50 mm lap required at tape and fitting connections, which are then watertightly bonded.

Water action class W1-I, moderate exposure, bathrooms with bathtub or shower tray

MEPA (Pauli und Menden GmbH) system

1 Bathtub sealing tape (MEPA/Pauli und Menden GmbH system) adhesive-fixed to bathtub edge.

2 Foam strip adhesive-fixed during bathtub installation to eliminate sound transmission path.

3 Vertical perforation must be widened at angles to achieve proper connection.

4 Bathtub sealing tape (MEPA/Pauli und Menden GmbH system) embedded and sealed at wall using Sopro FDF flexible sealing compound.

Poresta systems GmbH system

1 Radius of angle seal readily adapts to bathtub/tray geometry while top part forms sharp 90° angle with wall.

2 Angle seal is easy to embed and overcoat ,e.g. using Sopro DSF 523 one-component flexible sealing slurry.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Definition W2-I

The floor areas in showers are subject to high exposure through the frequent action of temporarily accumulating domestic water (W2-I).

Contemporary bathrooms are frequently designed and constructed as barrier-free spaces. Shower areas are finished flush with the bathroom flooring.
The wastewater from these areas runs off into floor drains or channels. A further option involves the use of shower trays that are installed flush with the surface of the floor tiling.

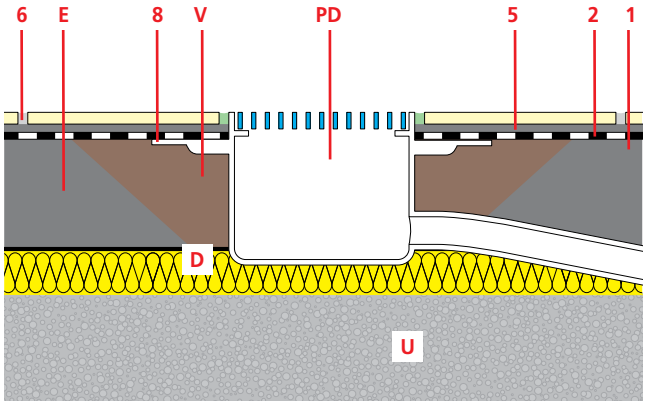
Regardless of which solution is adopted – whether tiling or shower tray – the finished surface must be waterproof and capable of catching the shower water. The waterproof membrane must be installed with the utmost care!

Note:

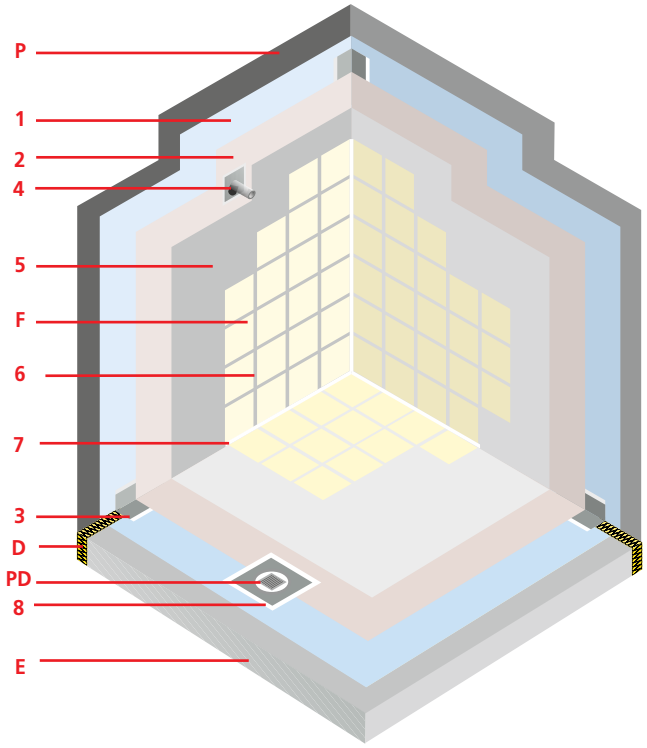
If no effective protection against splashing is provided (e.g. only a single glass pane), then the entire bathroom floor is classed as a high-exposure area (W2-I). This means that no moisture-sensitive (gypsum-bearing) materials can be incorporated in the floor and that flexible, cementitious sealing slurries are the minimum requirement for the membrane.

If effective protection against splashing is provided, then a calcium sulphate screed may be laid outside the shower area. The area can then be allocated to water action class W1-I.

The same applies where provision is made for an additional floor drain (e.g. below the washbasin) that is not strictly intended for regular use (W1-I).



Floor drain.



1 Sopro GD 749 primer
2 Two-coat waterproof membrane
3 Sopro DB 438 sealing tape
4 Sopro DMW 090 sealing collar for walls
5 Flexible thin-bed adhesive
6 Cementitious tile grout
7 Elastic joint sealant
8 Sopro DMB 091 sealing collar for floors/Sopro AR 562 scrim
V Special grout
PD Floor drain
D Insulation
E Screed
F Tile
P Plaster/render
U Concrete substrate

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Permissible substrates depending on potential water action

Moisture-sensitive substrates may be used for exposure class W0-I and W1-I applications!

Examples:
- Gypsum and gypsum/lime plasters made from gypsum/dry mortar
- Paperless gypsum wall board
- Gypsum board with nonwoven scrim
- Gypsum fibreboard
- Gypsum board
- Calcium sulphate screeds

Drylining with gypsum board products.

Moisture-resistant substrates must be specified for exposure classes W2-I and W3-I.

Examples:
- Concrete
- Lime/cement render
- Cement render
- Lightweight-concrete hollow panels
- Cement-bound mineral building board
- Composite units comprising expanded or extruded polystyrene with mortar coating and fabric reinforcement
- Lightweight-concrete building board
- Cement screeds

Cement-bound drylining board (Fermacell system).

Wall surface rendered/coated with cement mortar (Sopro RAM 3 454 renovation and levelling mortar).

Shower area produced with cement mortar (Sopro Rapidur® M5 rapid-set screed mortar).

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Floor drains and channels for drainage of water-exposed areas (e.g. showers)

To guarantee a reliable connection to the waterproof membrane, the drainage component must be provided with an adequately wide flange.

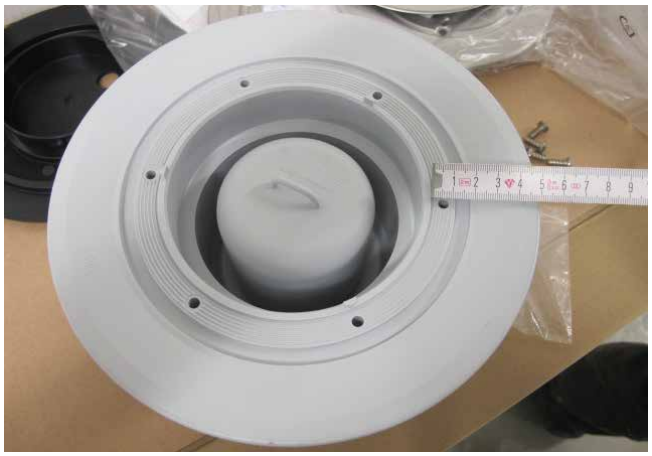
The flange must be made from a material (e.g. PVC, stainless steel) that ensures good adhesion to the waterproofing material.

A minimum flange width of 50 mm is required as standard for floor drains and drainage channels.

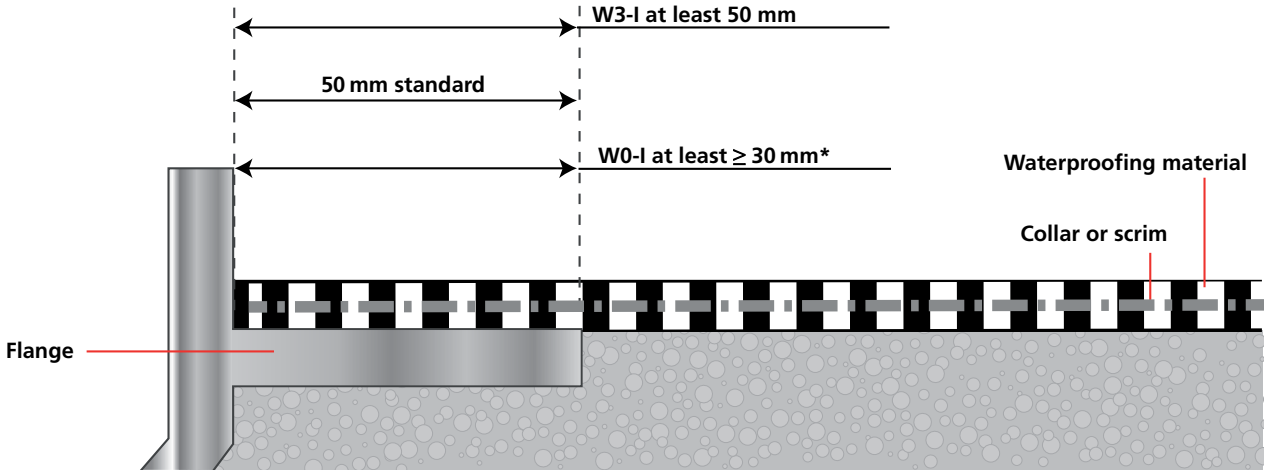
For water action classes W0-I to W2-I, flanges with a minimum width of 30 mm are permissible where suitable sealing adhesives, two-component cementitious sealing slurries or reaction resins are used to bond any collars.

A minimum flange width of 50 mm is required for water action class W3-I.

Floor drain or channel with 30 mm wide flange.



50 mm wide flange.



* The use of suitable sealing adhesives, two-component cementitious sealing slurries or reaction resins is mandatory for bonding sealing collars.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

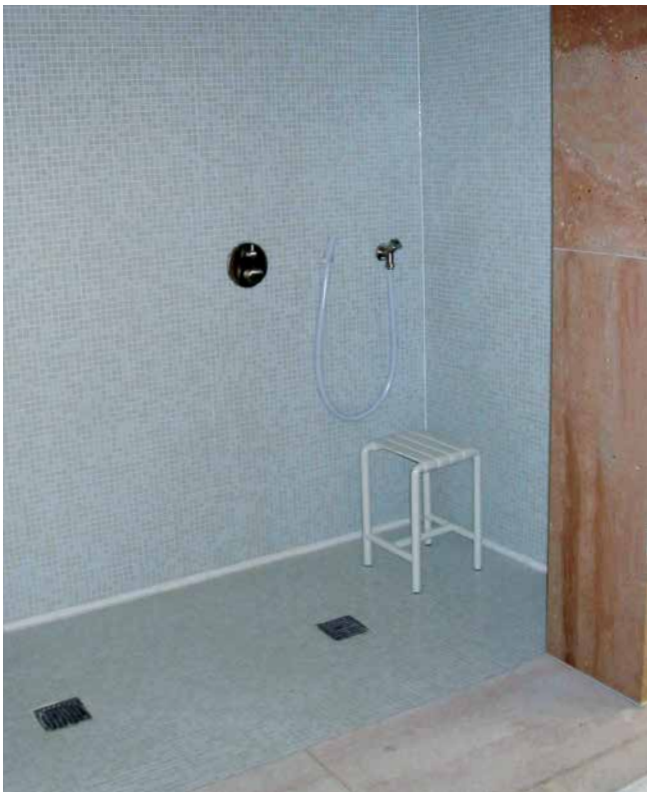
In respect of shower installations, bathroom design has undergone somewhat of a revolution in recent years, with barrier-free and walk-in solutions opening up unimagined possibilities.

At a technical level, the options are practically unlimited. Yet, when assessing the wide range of floor drains and channels offered by services installations manufacturers, the client is often more interested in their aesthetic appeal than in the technical maturity of the system for incorporating the penetration. Technical suitability and design compatibility are, however, essential for the development and on-site implementation of these solutions in order to ensure that shower areas offer long-term performance and form an integral unit with the waterproof membrane. Particularly critical is the interface between floor drain/channel and the waterproof membrane. Suitable flanges should be provided to allow reliable connection to the waterproof membrane. The same applies to the now "flat" shower trays that are installed flush with the finished ceramic covering. Here too, provision is required for a reliable junction or connection with the waterproof membrane.

The following pages give an impression of various drainage components offered by big-name manufacturers and show the work stages required for the successful application of Sopro products.

Hotel bathroom with channel in shower area.

Private bathroom with floor drain.



Barrier-free shower area in old people's home.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

ACO system

1 ACO drainage channel on insulation in shower area.

2 ACO channel, with rear face coated with (Sopro's No.1 flexible) tile adhesive as bonding layer, is embedded in freshly laid screed mortar (Sopro Rapidur® M1/Sopro Rapidur® M5).

3 ACO channel installed in screed mortar (Sopro Rapidur® M1/Sopro Rapidur® M5).

4 Channel component embedded and sealed with Sopro DSF 523 one-component flexible sealing slurry, with scrim strip incorporated as reinforcement at junction.

5 Wall and floor surfaces waterproofed with Sopro DSF 523.

6 Corner shower fully waterproofed with two coats of Sopro DSF 523 (wall and floor surfaces), ready for tiling.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

ACO system energy-efficient channel

1 ACO energy-efficient channel incorporating copper pipes for heat exchange/recovery.

2 Channel installed in cement screed made from Sopro Rapidur® M1/Sopro Rapidur® M5.

3 External face of channel precoated with thin-bed adhesive to improve bond with screed.

4 ACO energy-efficient channel quickly and easily installed with Sopro Rapidur® M1/Sopro Rapidur® M5 rapid-set screed mortar.

5 Heat-exchange pipes fitted within body of drainage channel.

6 Channel perimeter and whole surface waterproofed using sealing tape, scrim etc. in conjunction with e.g. Sopro DSF 423 two-component flexible sealing slurry.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

ACO system energy-efficient channel

7 Waterproofed shower area with ACO energy-efficient channel.

8 Visually appealing combination of ACO energy-efficient channel with cover and adjacent tile covering.

ACO shower unit

1 Channel fitted into pre-installed ACO drylining unit.

2 Preparation of components for membrane application, including fitting of Sopro AEB 176/177 vertical make-up pieces.

3 Scrim is embedded in Sopro TDS 823 two-component turbo sealing slurry around channel. Sopro AEB vertical make-up piece is also fitted.

4 Shower area waterproofed in two coats, ready for tiling.

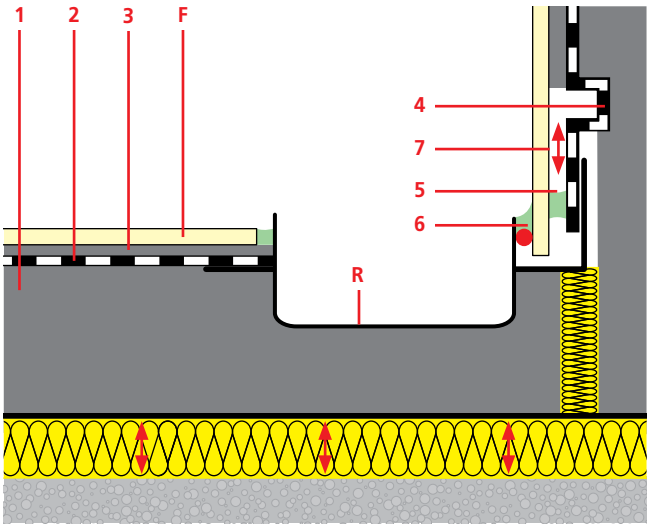
Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

ACO system

Channel with upstand for fixing to wall

1 Channel unit with angle upstand, which may require cutting-out of recess in drywall.



1 Floating screed (Sopro Rapidur® M1/ Sopro Rapidur® M5)
2 Waterproof membrane with Sopro DSF flexible sealing slurry
3 Thin-bed adhesive (Sopro's No.1)
4 Flexible sealing tape
5 Tile elastically bonded with silicone
6 Silicone sealant
7 Movement zone
R Channel
F Tile

Note:

Where floating screeds are laid, channels with upstands for wall mounting should not be fastened to the wall. Where the shower tray is supported by a floating assembly, the channel must be able to accommodate movement. The channel should be monolithically connected to the floating screed such that the two elements form a single unit capable of moving in tandem.

2 Channel placed in freshly laid cement screed mortar (Sopro Rapidur® M1/Sopro Rapidur® M5).

3 Sopro FDB 524 flexible sealing tape with fold, adhesive-fixed at junction between metal flange of channel and adjoining materials.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

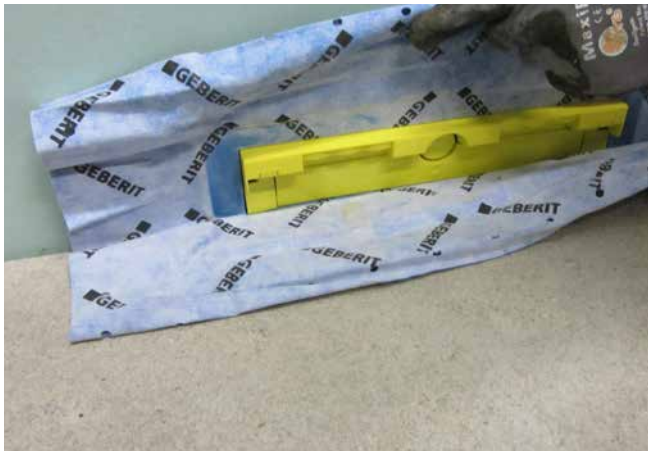
Guideline solutions for barrier-free and walk-in showers in bathrooms

Geberit system (wall inlet)

1 Wall inlet unit for drylining and masonry constructions (Geberit system) in conjunction with floating screed.

2 Installed cementitious screed made from Sopro Rapidur® M1/Sopro Rapidur® M5. Protective cover serves as aid in screeding operation.

3 Finished shower surface after laying Sopro Rapidur® M1/Sopro Rapidur® M5, ready for following works after short setting time.



4 Ready-welded collar on Geberit inlet unit is unfolded for bonding with liquid-applied waterproof membrane (Sopro TDS 823 two-component turbo sealing slurry).

5 Geberit collar fixed in place and sealed with Sopro TDS 823.

6 Waterproofed wall and floor surfaces, ready for tiling after drying. This forms an ideal base for laying natural stone and ceramic coverings (no upstand) as described below.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Geberit system (wall inlet)

7 In front of wall inlet unit, water collection channel is bonded to waterproof membrane and fully embedded with (Sopro's No.1) tile adhesive.

8 Large-format tiles are laid using buttering/floating method.

9 Tiles are laid up to edge of water collection channel.

10 Joints are finished with Sopro DF 10 flexible designer tile grout.

11 Provision is made for approx. 5 mm gap between water collection channel and wall (due to floating screed). Joint with wall tile is elastically sealed with silicone product (Sopro Sanitary Silicone).

12 Finished drainage assembly combines easy cleaning with visual appeal.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

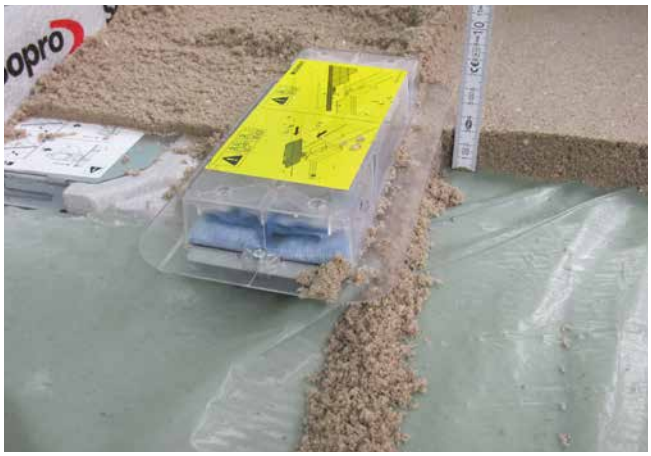
Guideline solutions for barrier-free and walk-in showers in bathrooms

Geberit system (thin-coat construction with resin-bound screed)

1 Floor drain positioned in shower area.

2 In places, screed cover is very thin.

3+4 Mixing of resin-bound mortar for laying of thin-coat screed (Sopro BH 869 construction resin and Sopro EEK 871 epoxy screed aggregate).



5 Isolated areas with low cover are possible with resin-bound mortar.

6 Shower area installed with resin-bound screed mortar, ready for subsequent waterproofing and tiling.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Viega system

1 Preparation of corner drain and laying of Sopro Rapidur® M1/Sopro Rapidur® M5 rapid-set screed mortar.

2 Rear face of corner drain unit coated with Sopro's No.1 flexible tile adhesive to ensure good bond with screed mortar.

3 Provision should be made for recess in wall to allow installation of corner drain unit flush with wall and free to accommodate movement.

4 Shower surface produced with Sopro Rapidur® M1/Sopro Rapidur® M5 rapid-set screed mortar.

5 Careful waterproofing around drain unit with self-adhesive sealing tape (Sopro FDB 524).

6 Shower corner waterproofed with Sopro DSF 523 one-component flexible sealing slurry or, alternatively, with Sopro TDS 823 two-component turbo sealing slurry.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Viega system

1 Preparation of Sopro Rapidur® M1/Sopro Rapidur® M5 screed and drain pan for channel with wall upstand.

2 Rear face of channel coated with tile adhesive (Sopro's No.1) to ensure good bond with screed.

3 Channel installed flush with wall, such as to allow free movement.

4 Channel installed in (Sopro Rapidur® M1/Sopro Rapidur® M5) screed.

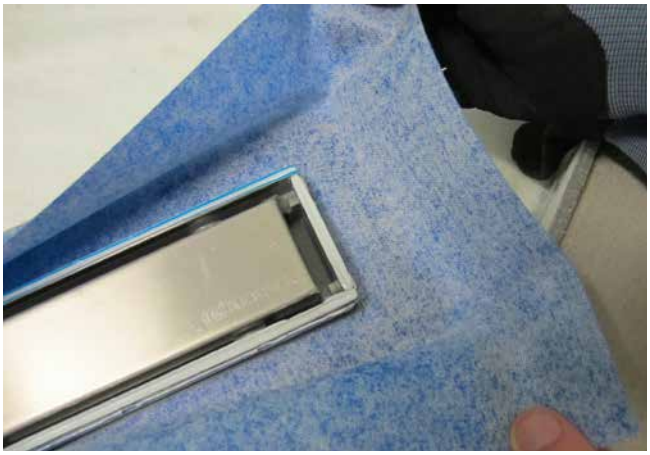
5 Waterproofing around channel using sealing tape/scrim and Sopro TDS 823 two-component turbo sealing slurry.

6 Waterproofed shower surface (two coats), ready for tiling.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Kessel system



1 Fixtures (floor drains or channels) manufactured by Kessel are provided with collar-type flanges that are pre-welded onto drainage component. Packaged "soft" collars are only folded out after installation of component in screed.

2 Low construction height of components allows very thin-coat assemblies.

3 Rear face of housing is coated with tile adhesive (e.g. Sopro's No 1) to ensure good bond with fresh screed mortar.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Kessel system

4 For very thin constructions, use resin-bound mortar (Sopro BH 869 construction resin and Sopro EEK 871 epoxy screed aggregate) as screed mix.

5 Floor drain incorporated in resin-bound screed (Sopro BH 869 and Sopro EEK 871), ready for waterproofing.

6 Factory-welded collar is folded out.

7 Floor drain sealed in place and shower area waterproofed with Sopro TDS 823 two-component turbo sealing slurry, applied in two coats.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Heiler system

1 Channel system with upstand and attached rail for secure, water-tight fitting of glass pane.

2 Channel installed with Sopro Rapidur® M1/Sopro Rapidur® M5 rapid-set screed mortar. Next step is to fix sealing tape.

3 Neat channel end solution with glass pane surrounds.

4 Glass pane held securely in bottom rail of shower channel system.

5 Wall surface waterproofed with Sopro AEB 640 waterproofing and separating membrane, bonded with Sopro's No.1 flexible tile adhesive.

6 Floor surface waterproofed with Sopro TDS 823 two-component turbo sealing slurry. Several tiles have already been positioned in shower area to help determine tile layout.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

MEPA system

1 Prepared shower corner with recess in wall to accommodate wall drainage channel.

2 Rear face of channel coated with tile adhesive (Sopro's No.1) to ensure good bond with screed mortar.

3 Channel fixed flush with wall in (Sopro Rapidur® M1/Sopro Rapidur® M5) rapid-set screed mortar.

4 Shower surface (Sopro Rapidur® M1/Sopro Rapidur® M5) with fitted wall drainage channel.

5 Waterproofing around channel using sealing tape/scrim and Sopro TDS 823 two-component turbo sealing slurry.

6 Waterproofed shower surface, ready for tiling.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Proline system

1 Channel installed with Sopro Rapidur® M1/Sopro Rapidur® M5 rapid-set screed mortar.

2 Shower surface laid to falls towards channel, directly formed in freshly laid screed.

3 Scrim installed to reinforce waterproof membrane at junction between channel and screed.

4 Shower corner waterproofed with Sopro DSF 523 one-component flexible sealing slurry, ready for tiling.

Dallmer system

1 Dallmer floor drain unit coated with Sopro's No.1 flexible tile adhesive to ensure good bond with screed mortar.

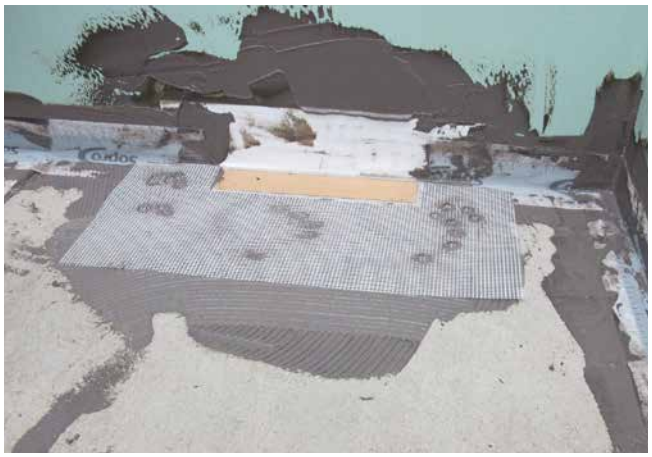
2 Floor drain unit installed with Sopro Rapidur® M1/Sopro Rapidur® M5 rapid-set screed mortar, which is laid to necessary falls.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Dallmer system

3 Installed floor drain unit with factory-welded-on sealing collar to facilitate waterproofing in wall area.



4 Floor drain unit and surface waterproofed using sealing tape, scrim and Sopro TDS 823 two-component turbo sealing slurry.

5 Surface waterproofed with Sopro TDS 823, ready for tiling.

6 Water collection channel, bonded to floor with (Sopro's No.1) tile adhesive and fitted elastically to wall.

7 Tiles laid adjacent to water collection channel.

8 Shower surface, with tile joints finished with Sopro DF 10 flexible designer tile grout and movement joints sealed with Sopro Sanitary Silicone, combines easy cleaning with visual appeal.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Dallmer system (thin-coat construction with resin-bound screed)

1 Coating of drain housing with adhesion promoter to improve bond with thin-coat screed.

2 Mixing of Sopro BH 869 construction resin with Sopro EEK 871 epoxy screed aggregate to produce resin-bound screed mortar.

3 Spreading of resin-bound mortar and fitting of floor drain.

4 Thin cover over drain is feasible with resin-bound mortar.

5 Resin-bound mortar is easy to apply, strike off and smooth.

6 Finished surface, ready for subsequent waterproofing.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

GUTJAHR Systemtechnik GmbH system

1 Channel is provided with factory-fixed collar flange.

2 Channel installed with Sopro Rapidur® M1/Sopro Rapidur® M5 rapid-set screed mortar using Sopro's No.1 (thin-bed) flexible tile adhesive as bonding layer between channel component and screed.

3 Turned-up collar flange embedded and sealed with Sopro DSF 523 one-component flexible sealing slurry.

4 Channel and shower area fully sealed with (Sopro DSF 523) waterproof membrane.

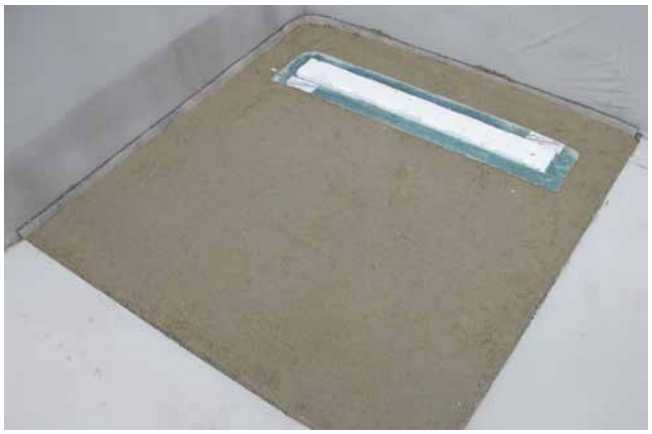
Note:

The absence of a continuous upstand on the grate may be advantageous, particularly in relation to natural stone finishes, in that no water can accumulate at the front tile edge (see also Section 6 "Reliable laying of natural stone").

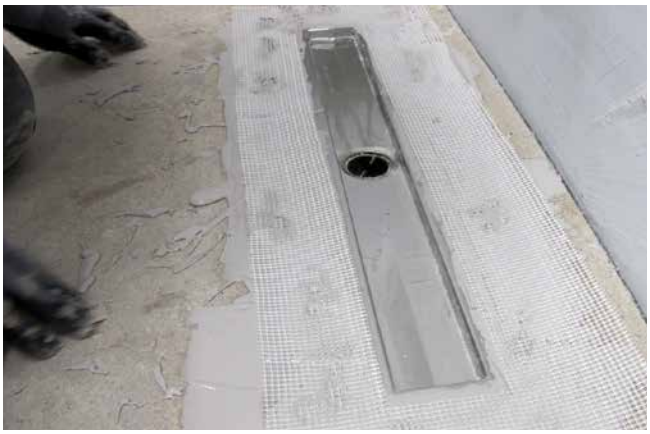
Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

TECE system



1 TECE channel installed in Sopro Rapidur® M1/Sopro Rapidur® M5 floating screed, with Sopro's No.1 (thin-bed) flexible tile adhesive used to promote adhesion between channel component and screed mortar.



2 Scrim collar incorporated as reinforcement for (Sopro DSF 523 one-component flexible sealing slurry) waterproof membrane at flange/screed junction.

3 Corner shower fully waterproofed with two coats of Sopro DSF 523.

4 Where discoloration-sensitive natural stone is laid in shower area, TECE channel system – due to absence of upstand – also allows drainage of water below stone units, i.e. over waterproof membrane (see also Section 6 "Reliable laying of natural stone").

Other channel systems

Schlüter-Systems K system

Geberit system.

Dallmer system.

The channel types shown on this page can be reliably installed with Sopro ready-to-use screed mortars (Sopro Rapidur® M1/Sopro Rapidur® M5) and sealed with Sopro waterproof membranes (Sopro DSF 523/Sopro DSF 623 one-component flexible sealing slurries). The channels have no continuous upstand on the frame. Particularly for natural stone finishes, this may be an important detail to be considered (see also Section 6 "Reliable laying of natural stone").

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Kermi system – shower unit

1 Plane surface formed with Sopro Rapidur® FE 678 self-levelling screed as base for shower unit.

2 Soundproofing sheet bonded to plane surface with Sopro's No.1 flexible tile adhesive.

3 Rear face of shower unit coated with (Sopro's No.1) tile adhesive for bonding to substrate. Tile adhesive is also applied to substrate.

4 Shower unit fitted in screed sinking at corner.

5 Surface waterproofed with Sopro TDS 823 two-component turbo sealing slurry and sealing tape together with specially cut sheet membrane strips.

6 Waterproofed surface, ready for tiling.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Poresta systems GmbH system – shower unit

1 Plane surface created with Sopro Rapidur® FE 678 self-levelling screed as sound base for shower unit.

2 Adhesive bed (Sopro's No.1 flexible tile adhesive) applied to level base.

3 Poresta shower unit laid in fresh adhesive bed. After waterproofing around perimeter of unit with Sopro DSF 423 two-component flexible sealing slurry, tilelaying can commence.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Rigid foam unit with cementitious Sopro Rapidur® FE 678 self-levelling screed as system solution

1 Uneven sinking with screed on refurbishment project.

2 Plane base created with Sopro Rapidur® FE 678 self-levelling screed for reliable, fully supported installation of shower unit.

3 Shower unit bonded to level base with (Sopro's No.1) flexible tile adhesive.

4 Fitted shower unit, ready for waterproofing.

5 Shower unit fully waterproofed with two coats of Sopro DSF 423 two-component flexible sealing slurry.

Note:

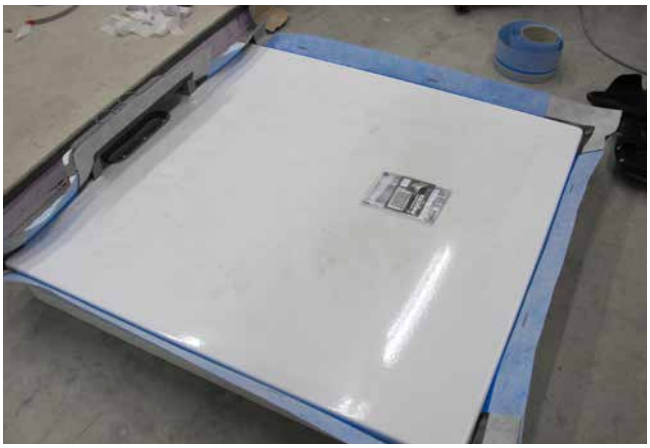
When specifying a shower unit, the designer should consult the relevant manufacturer on the size limitations for the covering materials. Particularly with very small-format glass mosaic (tesserae) finishes, the combination of point loads (heels) and low resistances may result in the debonding of individual units. To prevent such failures, the areas should be additionally coated with epoxy (Sopro FEP epoxy tile grout) and the glass tesserae also laid with epoxy (Sopro DBE 500 epoxy tile adhesive or Sopro FEP epoxy tile grout).

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Flat shower trays flush with floor covering Franz Kaldewei GmbH & Co. KG system

1 Waterproofing fittings tailored to specific shower unit (Xetis).



2 Flush shower unit provided with perimeter flange for connection of waterproof membrane.

3 Shower unit installed flush with adjacent tile covering in screed. Drainage component is housed in wall. A Schedel wall unit may offer a suitable solution here.

4 Close-up showing flush junction between shower unit and tile covering.

5 Perimeter sealing tape flanges are embedded in liquid-applied waterproof membrane.

6 As a further bathroom design option, Schedel range also includes a bench solution for Xetis shower trays. Water from Xetis shower tray runs off via Schedel unit. All surfaces waterproofed with Sopro TDS 823 two-component turbo sealing slurry.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Flat shower trays
Geberit Setaplano system

1 Geberit Setaplano shower units are factory-fitted with sealing tape for connection to waterproof membrane.

2 Additional use of Sopro WDM 813 bath/shower multi-angle seals allows reliable waterproofing in niches.

3 Sopro WDM 813 bath/shower multi-angle seal also simplifies waterproofing details where tray edge and wall section are in alignment.

4 Sopro TDS 823 two-component turbo sealing slurry used for embedding and sealing.

5 Gerberit Setaplano shower unit integrated in adjoining wall and floor membrane.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Guideline solutions for barrier-free and walk-in showers in bathrooms

Flat shower trays flush with floor covering Franz Kaldewei GmbH & Co. KG system

1 Base drainage frame (ESR) fitted in shower corner and connected by system sealing tape to (Sopro FDF flexible sealing compound and/or Sopro DSF 523 one-component flexible sealing slurry) waterproof membrane.

2 Shower tray unit installed on base drainage frame (ESR) with tiled and grouted surrounds. Joint between shower tray and ceramic covering to be sealed with Sopro Sanitary Silicone.

Villeroy & Boch AG system

1 Shower tray unit with bonded sealing tape (system component) for joining up to waterproof membrane.

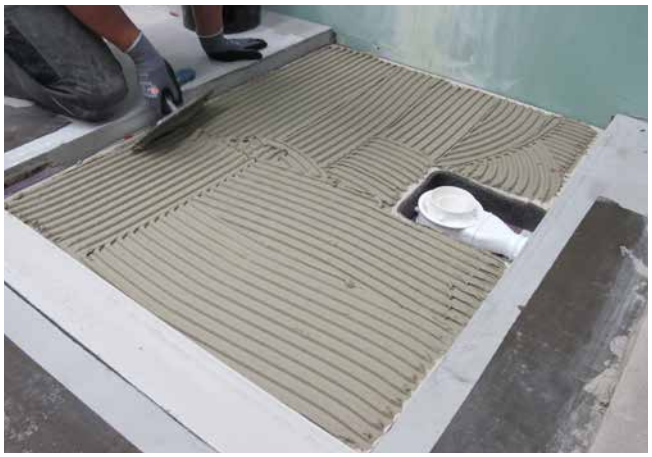
2 Straightforward waterproofing by hand around perimeter of shower tray with Sopro FDF flexible sealing compound or Sopro DSF 523 one-component flexible sealing slurry.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

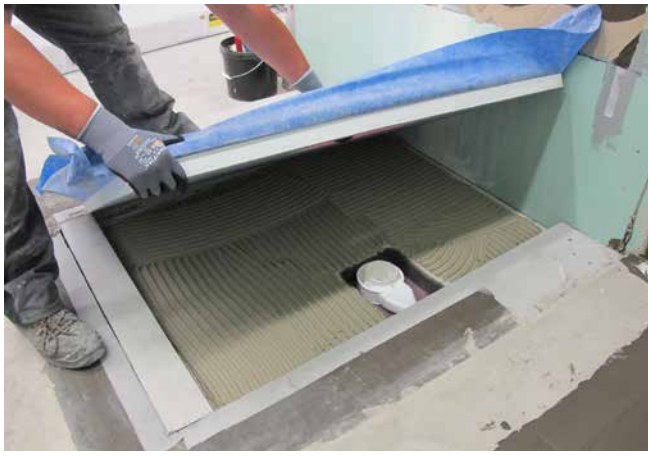
Guideline solutions for barrier-free and walk-in showers in bathrooms

Schedel system

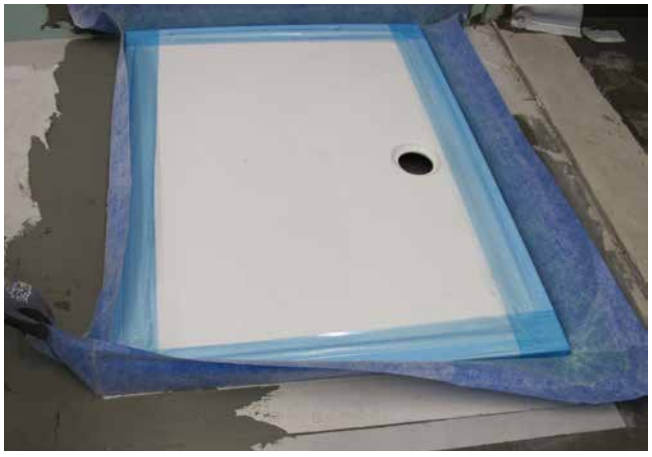
1 Plane surface formed with Sopro Rapidur® FE 678 self-levelling screed as base for shower unit.



2 Tile adhesive (Sopro's No.1) applied for bonding shower unit.



3 Shower unit placed in adhesive bed.



4 Perimeter factory-welded sealing tape is easy to embed in Sopro TDS 823 two-component turbo sealing slurry to produce watertight seal.

5 Waterproofing around perimeter with Sopro TDS 823.

6 Shower unit neatly and reliably installed in waterproof membrane.

Water action class W2-I, high exposure, bathrooms with floor drain or channel

Sensitive details: channels for walk-in showers

A wide variety of channels and drainage systems are now available for installation in walk-in shower areas. These products require careful assessment by the applicator or relevant waterproofing contractor.

Adequately wide flanges should be provided on all sides to allow a strong and durable connection with the waterproof membrane. Particular attention should also be given to channels with lateral upstands for joining up the membrane. Pre-folded sealing tape should be used in such cases. Where standard, non-pre-folded tape is used, channels tend to form at the upstand angles and create leakage paths.

Non-pre-folded sealing tape.

Channel is clearly visible despite installed membrane.

Pre-folded sealing tape.

Sealing tape fits tightly to steel surface.

Tight-fitting sealing tape after waterproofing, with no potential water path or risk of leakage.

Water action classes W0-I to W2-I, low/moderate/high exposure

Liquid-applied waterproof membranes

System composition

Product recommendation

Sopro GD 749

Sopro FDF
(W0-I and W-1 only)

Sopro DSF 523/623

Sopro DSF 423

Sopro TDS 823

Sopro's No. 1

Sopro FF 450

Sopro VF XL 413
(floors only)

Sopro FKM XL 444

Sopro DF 10

Sopro FL plus

Sopro
Sanitary Silicone

Sopro DMW 090 and
Sopro DMB 091

Sopro DB 438

Sopro DE 014/015

Water action classes W0-I to W2-I, low/moderate/high exposure

Application of Sopro FDF flexible sealing compound (polymer dispersion)

1 First seal corners using preformed Sopro DE 014/015 sealing tape units, angles and wall/floor joints using Sopro DB 438 sealing tape. To do this, first apply Sopro FDF to primed substrate, place and embed sealing tape, and thickly overcoat nonwoven edge with Sopro FDF using brush or spatula.

2 Push Sopro DMW 090 sealing collar for walls over pipe end.

3 Then embed Sopro sealing collars in sealing compound.

4 To waterproof surfaces, apply Sopro FDF thickly to substrate using lambswool roller or finishing trowel, taking care to avoid pore formation. Apply second coat in a different colour when first coat has achieved adequate strength. Tile covering may be applied using flexible thin-bed adhesive (e.g. Sopro's No.1) when second coat has set.

Standard colour

grey FDF 525

Contrast colour

light grey FDF 527

Highly elastic, crack-bridging, solvent-free, one-component **liquid polymer waterproof coating**. Applied to walls and floors as membrane in composite waterproofing systems with tile finish. Used in damp and wet spaces not subject to hydrostatic pressure, e.g. bathrooms, showers, washrooms and sanitary facilities. Suitable for water action classes W0-I/W1-I.

Contrast colour in syringe

Water action classes W0-I to W2-I, low/moderate/high exposure

Waterproof sheet membranes System composition

Product recommendation

Sopro GD 749

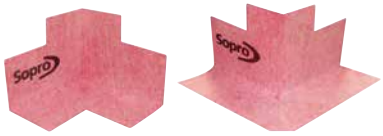
Sopro SG 602

Sopro's No. 1

Sopro FF 450

Sopro AEB 640

Sopro AEB 644



Sopro AEB fittings

Sopro AEB 642/643 internal/external angles

Sopro's No. 1

Sopro FF 450

Sopro DF 10

Sopro FL plus

Water action classes W0-I to W2-I, low/moderate/high exposure

Application of Sopro AEB 640 waterproofing and separating membrane system

1 Sopro AEB 640 waterproofing and separating membrane cut to size for subsequent installation on wall and floor surfaces.

2 Application of flexible tile adhesive (Sopro's No.1) using finely notched spatula or roller application of Sopro FDK 415 fixing and waterproofing adhesive to surfaces pretreated with Sopro GD 749 primer.

3 After placing in adhesive bed/Sopro FDK 415 fixing and waterproofing adhesive, Sopro AEB 640 membrane is pressed down firmly using roller or smoothing spatula.

4 All joints and collars at penetrations (pipes, floor drains etc.) are bonded and watertightly sealed with Sopro RMK 818/MKS 819 Racofix® universal adhesive or Sopro FDK 415.

5 Tiles can be laid on Sopro AEB 640 membrane with thin-bed adhesive (Sopro's No.1 flexible tile adhesive) only short time after completion of waterproofing works.

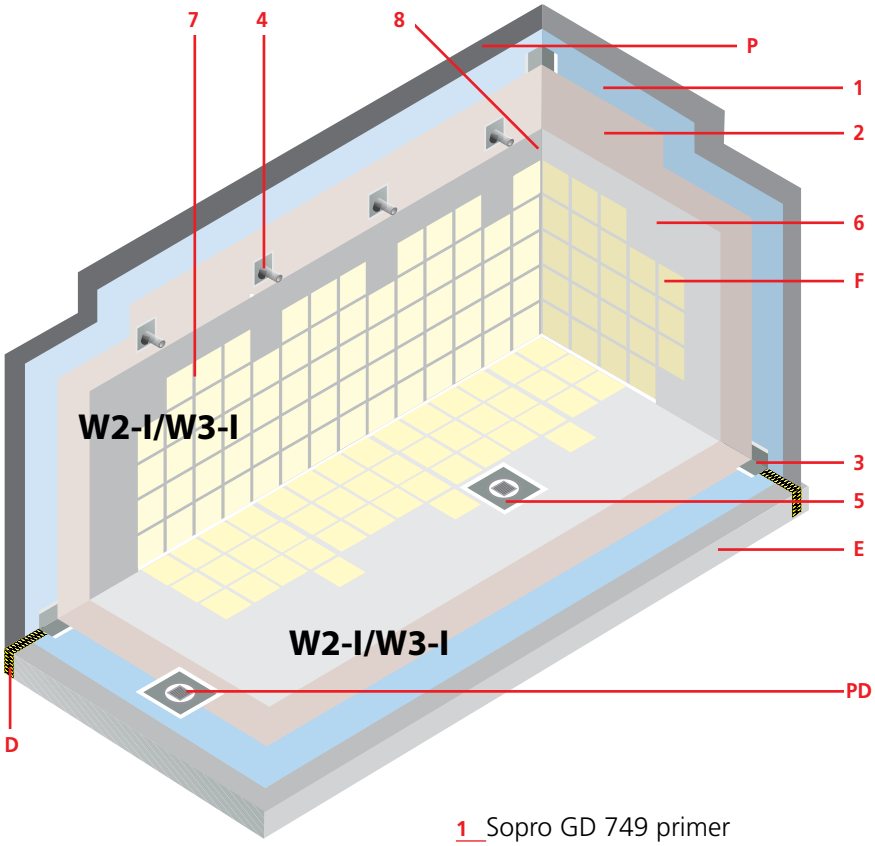
Water action class W2-I to W3-I, high/very high exposure

Definition W2-I, W3-I

Directly and indirectly exposed surfaces in spaces which come into contact with process, domestic or cleaning water very frequently or for longer periods, e.g. poolside areas or (public and private) shower facilities.

The floors in such areas frequently have tiled coverings with floor drains and are typically subject to temporary hydrostatic pressure.

One important factor to consider in the design of waterproof membranes is the provision of suitable connections for the incorporated wall penetrations and floor drains/channels. Relevant details are presented on the following pages.



1 Sopro GD 749 primer
2 Two-coat waterproof membrane using Sopro FDF flexible sealing compound (walls) or Sopro DSF flexible sealing slurry (walls and floors)
3 Sopro DB 438 sealing tape
4 Sopro DMW 090 sealing collar for walls
5 Sopro DMB 091 sealing collar for floors/Sopro AR 562 scrim
6 Flexible thin-bed adhesive
7 Cementitious tile grout
8 Sopro Sanitary Silicone (wall perimeter/movement joints)
PD Floor drain with loose/integral flange
D Insulation/perimeter insulation strip
E Screed
F Tile
P Plaster/render

Suitable substrates

- Concrete, lightweight/aerated concrete
- Cement screed
- Mastic asphalt screed
- Extruded polystyrene (XPS)
- Masonry (calcium-silicate)
- Cement and lime/cement render
- Strong existing tile covering
- Cementitious drylining

Unsuitable substrates

- Gypsum-bearing materials
- Calcium sulphate screeds
- Wood-based products
  Exception: see Section 5

Water action class W2-I to W3-I, high/very high exposure

Failures

On today's construction sites, a bewildering variety of materials are required to serve as substrates for waterproof membranes. While concrete and masonry, as typical substrates in the past, offered the key advantage of being moisture-resistant, many of the drylining products now encountered must be classed as moisture-sensitive. On account of the severe damage that might result from even the smallest leakage, the use of moisture-sensitive construction products is not permissible in conjunction with water action class W2-I or higher.

Drywall construction ravaged by water migration.

Fungal attack in drylining assembly with gypsum plasterboard.

Moisture-resistant materials

Areas allocated to water action class W2-I or W3-I (e.g. large shower facilities, catering kitchens etc.) must be designed and constructed with moisture-resistant materials.

Cement-bound drylining board used for construction of walls in shower.

Cement-bound drylining board in catering kitchen.

Water action class W2-I to W3-I, high/very high exposure

Failures

The specification of inappropriate penetrating components, their improper application, their incorrect connection to the membrane or even damage by operatives who fail to understand their purpose are perennial causes of serious moisture migration failures in buildings.

To prevent such failures, it is the job of designers and contractors to select suitable penetrating components and install these in accordance with good practice.

No provision for connection of waterproof membrane to upper floor drain fitting.

Leak in plunge pool due to use of wrong floor drain (washbasin waste). No flanging provision for connection to waterproof membrane.

To simplify installation (grouting), upper drain fitting with wide adhesive flange for connection to waterproof membrane was unthinkingly damaged.

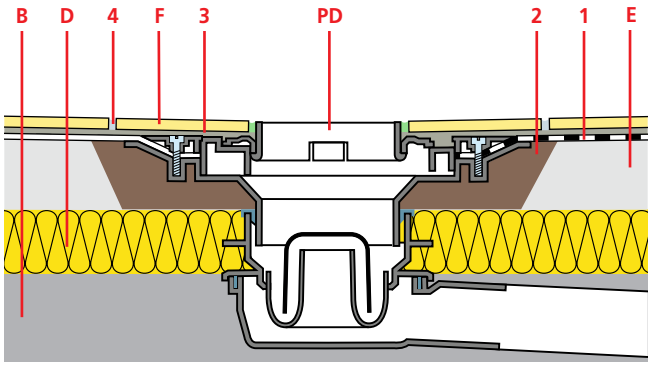
Factory-fixed sealing flange was cut away because it obstructed installation. As a result, no provision for connection to sealing slurry remains.

Water action class W2-I to W3-I, high/very high exposure

Floor drains

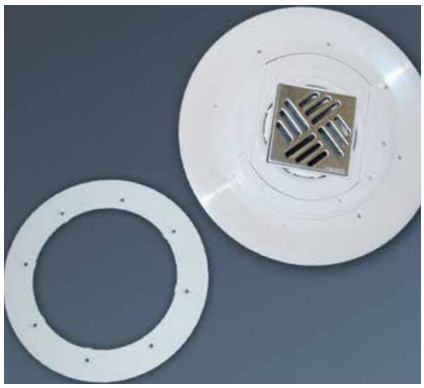
To ensure proper drainage, provision should be made for floor drains (with upper fittings) that allow reliable connection to the waterproof membrane applied to the screed. The floor drain flange should be monolithically incorporated in the screed with its upper surface lying flush with the top of the screed. The flanges should be 50 mm wide.

Detail solutions

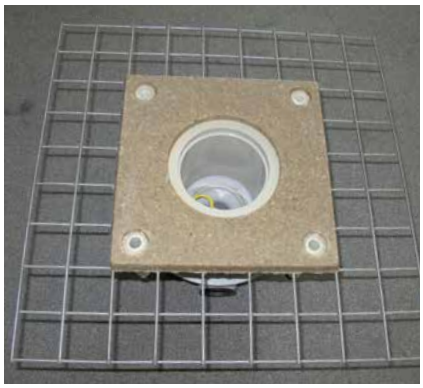


Floor drain with compression flange.

1 Two-coat waterproof membrane
2 Floor drain grouted in with Sopro EPG 522 epoxy primer/silica sand
3 Flexible thin-bed adhesive
4 Cementitious tile grout
B Concrete
D Insulation
E Screed
F Tile
PD Floor drain with compression flange

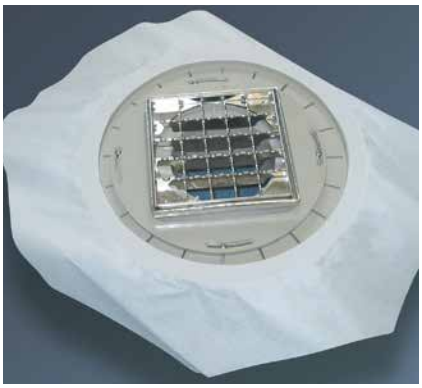


Kessel system: upper drain fitting with loose compression ring for tight connection to waterproof membrane.



Dallmer system: capillary-breaking reaction resin block for structurally continuous installation in screed.

Geberit system: upper drain fitting with adhesive flange for reliable connection to waterproof membrane.



ACO system: upper drain fitting with movable grate insert and flexible sealing edges for embedding in waterproof membrane.

ACO system: upper drain fitting now installed and fully embedded in waterproof membrane.

Viega system: floor drain provided with adhesive flange to which waterproof membrane is applied.

Water action class W2-I to W3-I, high/very high exposure

Wall penetrations

The permanent exposure to water action of wall surfaces in wet areas (showers etc.) – even if they are classed as W1-I – should never be underestimated. In terms of design and workmanship, this means that reliable solutions – in the form of flanges or suitable collars for connection to waterproof membranes – are needed at wall penetrations (taps, mixer units, water fittings etc.).

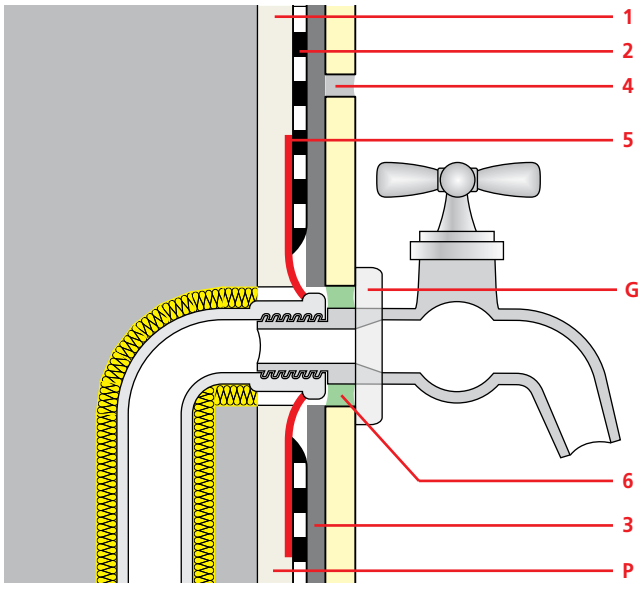
Pipe penetrations
Waterproofing problems caused by standard stoppers

Plastered-in stopper which cannot be properly sealed around.

Sealing collar was cut to allow it to be pushed over stopper.

Sealing collar's waterproofing capability is completely lost as soon as stopper is screwed out for pipe installation.

Detail solutions



Tap.

1 Sopro GD 749 primer
2 Two-coat waterproof membrane
3 Flexible thin-bed adhesive
4 Cementitious tile grout
5 Sopro DMW 090 sealing collar for walls/Sopro AR 562 scrim
6 Sopro Sanitary Silicone
P Plaster/render
T Drylining
G Housing (watertight) with flange seal

Water action class W2-I to W3-I, high/very high exposure

Provision must be made for the reliable connection of fittings to the membrane. No water must be allowed to reach the rear face of the membrane via the fitting!

Sealing collars with flexible lip seals (DIN 18534) must be used at pipe penetrations and junctions with fittings. The collars must be embedded in the membrane coat to create a waterproof barrier.

Sopro DWF 089 flexible sealing collar for walls with elastic central zone (DIN 18534).

Elastic central zone of Sopro DWF 089 collar creates high-performance, watertight junction with water pipe.

Any pipes that do not project from the wall beyond the line of the waterproof membrane must first be lengthened beyond this line by means of an extension piece.

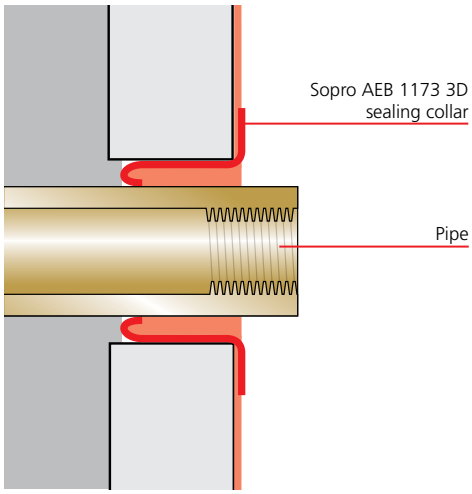
Geberit system

The Geberit system can be adapted to ensure that the pipe projects far enough from the wall to allow proper fitting of the sealing collar.

Water action class W2-I to W3-I, high/very high exposure

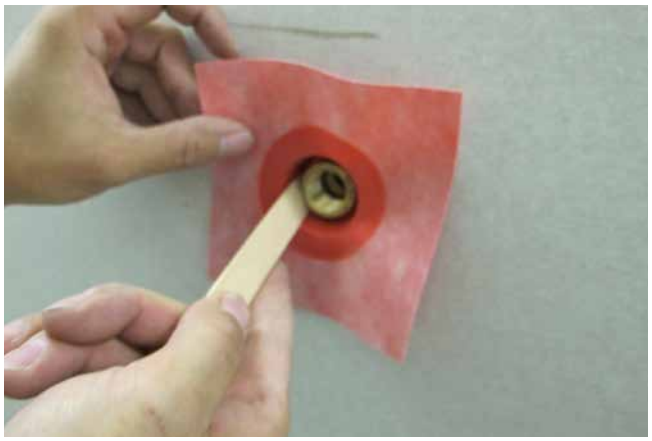
Wall penetrations

To simplify the later installation of water taps and other water fittings/penetrations and eliminate the risk of damage to the waterproof membrane connection in the course of these works, the three-dimensional Sopro AEB 1173 3D sealing collar can be used to backwardly relocate the waterproof barrier within the thickness of the wall.



Protruding rubber zone allows backward repositioning of waterproof barrier and connection.

Approx. 5–7 mm space is required around pipe to be waterproofed.



Collar positioned using wooden splint.

Collar embedded and sealed with Sopro FDF flexible sealing compound or Sopro TDS 823 two-component turbo sealing slurry.

Sealed pipe penetration offering ample working space for plumber.

Pipe can be cut back where necessary.

Water action class W2-I to W3-I, high/very high exposure

Wall penetrations

Sopro collar solutions to match shape and diameter of penetrations.

Surface-mounted taps, valves etc. remain a standard solution for showers and wet areas. Collars fitting standard connection gauges help to ensure reliable seal around penetration.

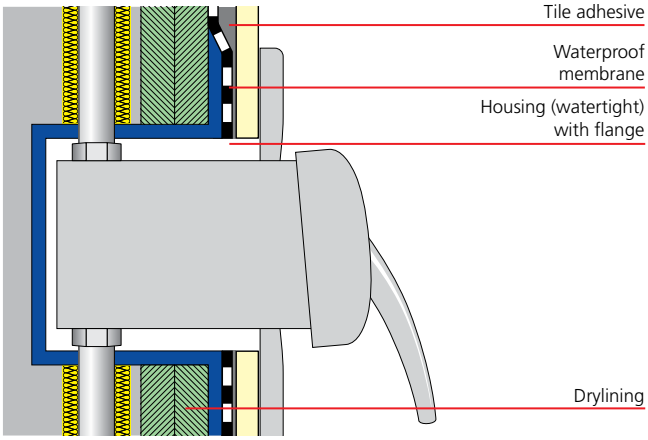
Sopro AEB 644 wall collar range covers wide variety of penetration diameters for reliable on-site sealing in conjunction with Sopro waterproofing materials.

Specially tailored collar solutions are also possible for particular fixture types.

Water action class W2-I to W3-I, high/very high exposure

Water fittings

To facilitate the installation of special fittings with their wide variety of shapes, the onus is on manufacturers to provide components with flanges or collars with elastic zones that allow reliable waterproofing in accordance with DIN 18534.



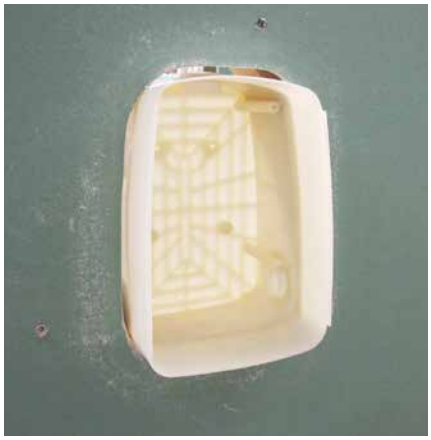
Flush-mounted fitting with housing and integral flange.

This fitting does not permit formation of waterproof junction. This will cause problems on site and, potentially, during later use.

Specially designed flush-mounted fitting with flanged frame ...

... or with integral sealing collar for incorporation in waterproof membrane.

Conti system



Irregular-shaped housing for fitting.

Specially shaped collar with elastic rubber zone fits tightly to fitting to provide waterproof barrier.

Wall fitting reliably waterproofed, e.g. with Sopro FDF flexible sealing compound.

Water action class W2-I to W3-I, high/very high exposure

Grohe system

Flush-mounted fittings not yet provided with collars or elastic zones are sometimes still encountered on site. Such situations require particular care. Manufacturer should be contacted to find out if better solutions have already been developed.

Reliable waterproofing around wall-mounted water fitting with Sopro FDF flexible sealing compound or Sopro DSF 523 one-component flexible sealing slurry.

Flush-mounted fittings of various manufacturers

Flush-mounted wall fittings not yet provided with collars with elastic zones.

Old version.

Solution adapted in line with DIN 18534.

Water action class W2-I to W3-I, high/very high exposure

Construction projects require a wide variety of penetration solutions. The existing range of fittings and collars thus looks set to expand in order to cover all possible site requirements.

Differences in duty also require consideration: the routine waterproofing details for penetrations in domestic bathrooms or guest toilets are obviously inadequate to cater for the intensively used facilities found, for example, at stations or in stadiums.

Accordingly, the Sopro range includes a special product, the Sopro AEB 1174 WC collar, as a reliable solution for wall penetrations through membranes in toilets. By enclosing all penetrating elements (pipes and threaded rods), it prevents any water infiltration via these potential leakage paths.

Toilet wall for waterproofing.

Sopro AEB 1174 WC collar.

Sopro RMK 818 Racofix® universal adhesive applied for waterproof bonding of Sopro AEB 1174 WC collar.

Sopro AEB 1174 WC collar pressed/worked firmly into adhesive bed.

Firmly bonded Sopro AEB 1174 WC collar. WC suite can be installed after tiling.

Water action class W2-I to W3-I, high/very high exposure

Installation of ancillary fittings

The definitive installation of building services appliances normally takes place after completion of the waterproofing and tiling operations. These works inevitably involve the drilling of holes, e.g. to fix shower rail risers, soap dishes, glass door brackets and many other components needed in wet spaces. This produces isolated holes in the waterproof membrane system through which water can infiltrate into the building fabric – particularly where the fittings are installed in heavy-duty facilities such as swimming pools or catering kitchens.

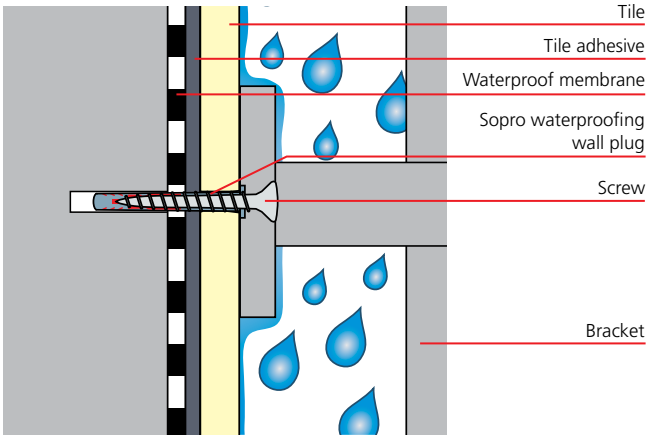
Shower rail riser.

Soap dish.

Bracket in swimming pool.

Watertight seal with Sopro waterproofing wall plug

The purpose-developed Sopro waterproofing wall plug prevents any water infiltration into the building fabric via drill holes. The plug is specially designed to provide the hole with a watertight seal after fixing.



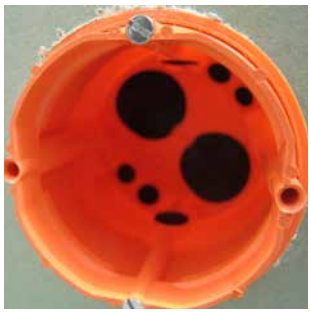
Sopro waterproofing wall plug (first version) with screw.

Water action class W2-I to W3-I, high/very high exposure

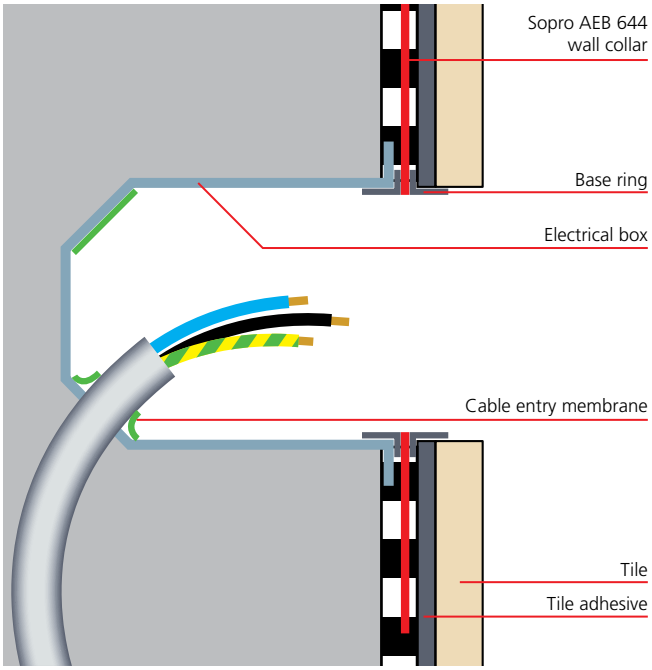
Electrical installations*

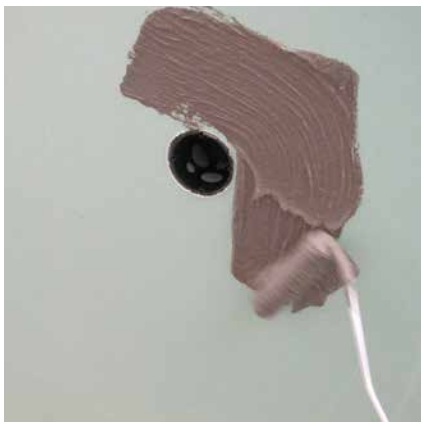
The relevance of socket outlets, switches and other electrical fittings to the waterproofing concept is still widely underestimated. Indeed, such installations are still commonly encountered in wall areas that require waterproofing.

A number of solutions that prevent water infiltration into the substrate via electrical boxes are described below.



Electrical boxes that are inherently air- and watertight. When cables are pushed through the openings, they are tightly gripped and enclosed by a rubbery (grey/black) membrane.





1 Waterproof membrane applied.

2 Sopro AEB 644 wall collar placed in position.

3 Base ring screwed down.

4 Sopro collar and base ring embedded and sealed.

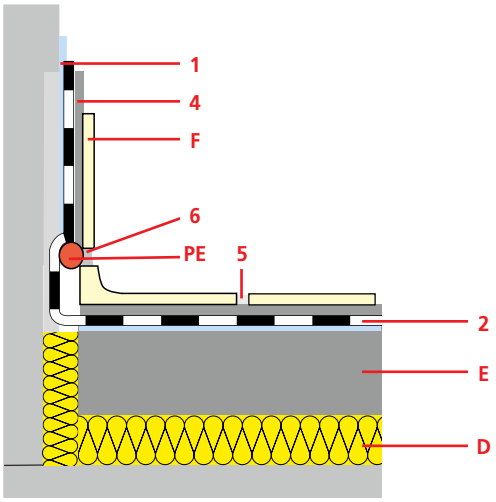
5 Waterproofed electrical box.

***Note:**

An electrical engineer must generally be consulted to ensure compliance with the life safety regulations governing electrical installations.

Water action class W2-I to W3-I, high/very high exposure

Detail solutions: coved skirtings



1 Sopro GD 749 primer
2 Two-coat waterproof membrane
3 Sealing tape
4 Flexible thin-bed adhesive
5 Cementitious tile grout
6 Elastic joint sealant
7 Epoxy resin/silica sand grout
F Tile
PE Circular-section PE back-up strip
E Screed
D Insulation/perimeter insulation strip

Advantages

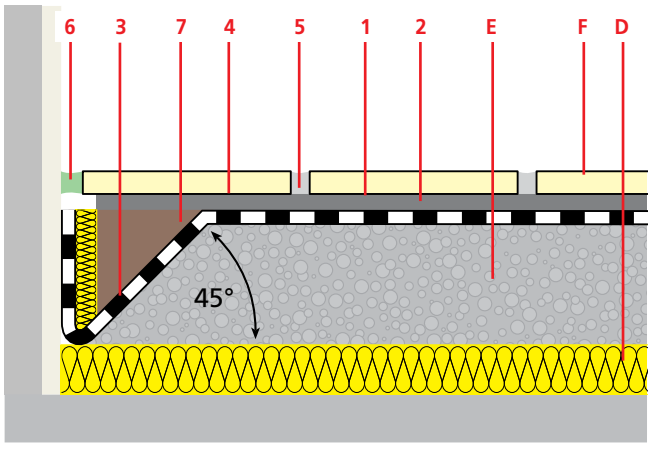
- Location of elastic joint in wall surface (away from floor)
- Reduced risk of damage during cleaning
- No standing water on elastic joints
- Forms tank-like enclosure

Coved skirting tiles with longer leg fixed to wall are prone to fracture in lower part of tile.

Please note:

Where coved skirting tiles are used, the plaster at the base of the wall (particularly with floating constructions) needs to be cut away to eliminate any contact pressure between the coved tiles and vertical building element (see drawing).

Junction of waterproof membrane with vertical elements without tile skirting



Wall surface within depth of screed is used as bonding surface for connection of waterproof membrane.

Sinking in screed at column for skirting-free junction with waterproof membrane.

Water action class W2-I to W3-I, high/very high exposure

System composition

Product recommendation

BK A
(walls + floors)

Sopro GD 749

Sopro SG 602

Sopro DSF 523

Sopro DSF 623

Sopro TDS 823

Sopro's No. 1

Sopro VF XL 413
(floors only)

Sopro FKM XL 444

Sopro FL plus

Sopro DF 10

Sopro TF+

Water action class W2-I to W3-I, high/very high exposure

Application of Sopro DSF flexible sealing slurry

1 Prepare by installing necessary Sopro sealing tape to be embedded in Sopro DSF 523 one-component flexible sealing slurry.

2 Mix Sopro DSF 523 with water to produce easily workable slurry.

3 Apply initial coat of Sopro DSF 523 to secure Sopro sealing tape at movement joints etc.

4 Embed Sopro AR 562 scrim in Sopro DSF 523 at flanges to reinforce junction.

5 Trowel on Sopro DSF 523 using 4 mm serrated tool, then strike off smooth to achieve required minimum coat thickness per application.

6 Waterproofed shower corner after two coats with minimum membrane coat thickness of 2 mm. Tilelaying can commence immediately after curing using approved thin-bed adhesive (Sopro's No.1 flexible tile adhesive).

Water action class W3-I, very high exposure with additional chemical action

Water action class W3-I – very high

Areas exposed to very frequent or long-lasting action of splash, process or domestic water, with high loads due to water accumulation.

Exposure class C (W3-I) is reserved for areas subject to the highest loads and imposing the most stringent requirements on design and materials. Such facilities are commonly encountered in the food-processing sector. Apart from the very high exposure to water (W3-I), allowance must also be made for additional chemical action.

Catering kitchens and industrial spaces are subject to extremely high loads not only due to the production processes, but also during subsequent cleaning.

Suitable substrates

Only moisture-resistant substrates, e.g. concrete, cement render, cement screeds, masonry etc.

Unsuitable substrates

Moisture-sensitive substrates, e.g. gypsum-bearing drylining materials.

Given the susceptibility to damage of catering kitchen floors and the associated waterproofing problems, the German Association of Commercial Kitchen Designers (VdF) has published a technical guidance paper entitled "Flooring in catering kitchens" (German only).

VdF guidance paper is a valuable design and construction aid.

Food-processing sector (e.g. catering kitchen).

Note on screeds:

Given the many penetrations, varying falls and different thicknesses encountered in the screed constructions, often compounded by complex spatial geometries, rapid-set screed binders (Rapidur® B3/B5) should be used for screed laying. Their rapid-drying properties allow a prompt continuation of the works while their chemical composition ensures dimensional stability.

Falls: DIN 18534

As a general rule, all levels of the floor construction carrying water should be provided with falls. Given that falls sometimes pose an obstruction in food-production facilities, exceptions are permissible where alternative provision is made for the removal of water.

Slip resistance in damp spaces

The specification of ceramic coverings should comply with the following standards and guidelines:

- DIN 51130 "Commercial facilities"
- DIN 51097 "Wet-loaded barefoot areas"
- BGR (accident insurance association code) 181 "Floors in workspaces and working areas posing a slip hazard"

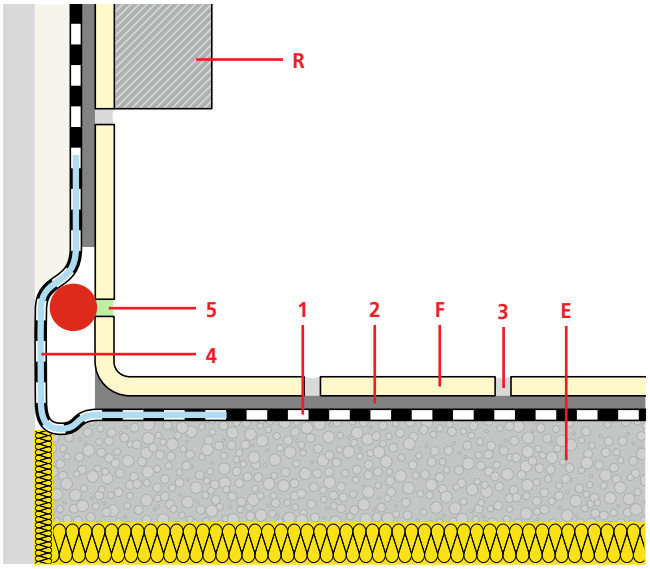
Water action class W3-I, very high exposure with additional chemical action

Details

Given the high loads to which industrial facilities are subjected – e.g. through constant exposure to liquids and a correspondingly regular, intensive cleaning regime – the careful detailing and installation of composite waterproofing systems is vital.

The design of junctions with penetrations (e.g. supply pipes/service runs), channels, floor drains, skirtings, platforms and door frames warrants particular attention.

Coved skirtings



Coved skirting installed horizontally in composite waterproofing system.

Finished skirting with wall guard.

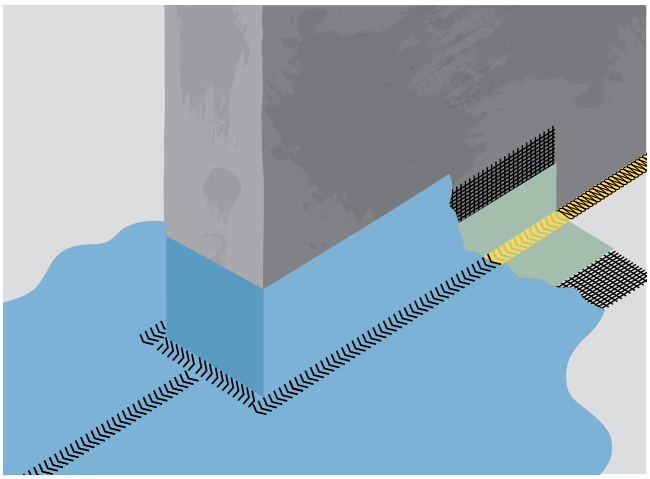
1 Reaction resin waterproof membrane
2 Flexible thin-bed adhesive
3 High-strength tile grout – Sopro TF
4 Sealing tape
5 Elastic joint sealant
DF Expansion joint
E Screed
F Tile
T Door frame
W Wall
WA Wall recess
R Wall guard

Water action class W3-I, very high exposure with additional chemical action

Waterproofing at thresholds and doorways

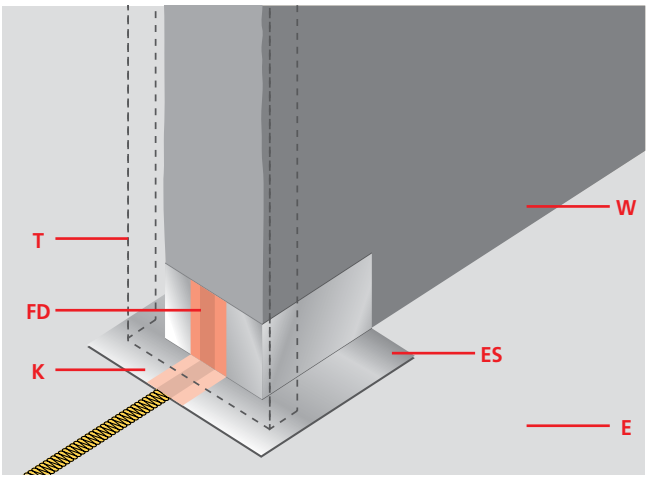
As a general rule, provision should be made during design and construction to ensure that the waterproofing works are performed prior to installation of the door frame.

Remedial waterproofing to a previously fitted door frame is not possible and, indeed, not permissible in areas subject to very high exposure.



Wall and floor waterproof membranes installed prior to fitting door frame.

Should the work sequencing necessitate installation of the door frame prior to waterproofing, then the following detail solution may be adopted:



Stainless-steel fittings must be fabricated and bonded to screed. Movement joint is taped over with Sopro FDB 524 flexible sealing tape or with Sopro AEB 641 sealing tape bonded with Sopro RMK 818 Racofix® universal adhesive. Once door frame is fitted, membrane can be applied to stainless-steel surfaces.

Good-practice sealing of drywall partition at doorway is no longer feasible.

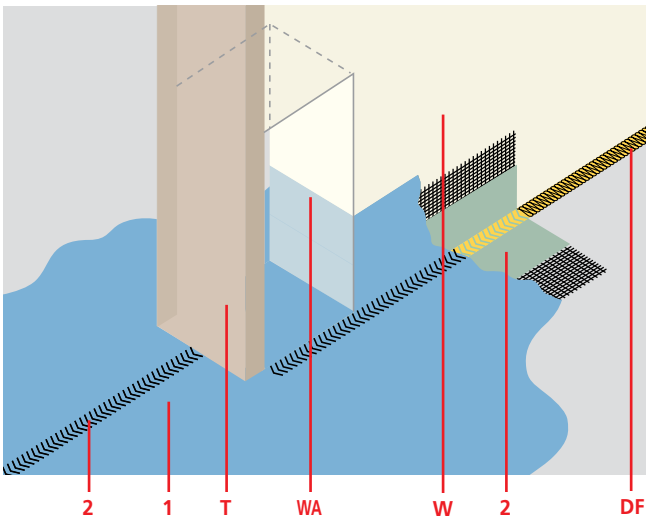
Combined door frame and channel – here, good-practice waterproofing is no longer feasible.

- **K** Adhesive flange for application of waterproof membrane, structurally bonded to screed
- **FD** Sopro FDB 524 flexible sealing tape
- **ES** Stainless-steel fitting
- **DF** Expansion joint
- **E** Screed
- **T** Door frame (position indicated)
- **W** Wall

Water action class W3-I, very high exposure with additional chemical action

Waterproofing at thresholds and doorways

Solutions for existing frames*



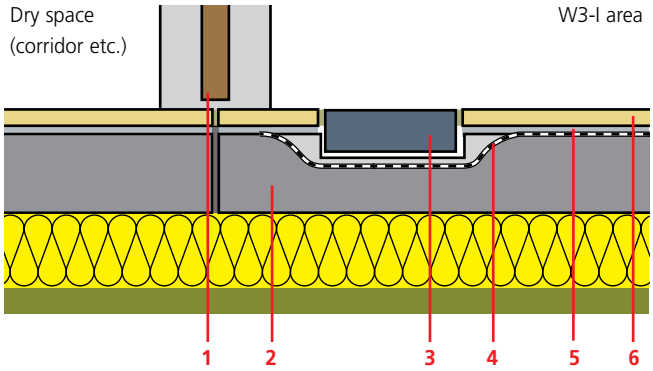
Solution for existing door frame.

Cut-out behind door frame.

1 Reaction resin waterproof membrane
2 Sealing tape
DF Expansion joint
T Door frame
W Wall
WA Wall recess

An additional obstruction is posed by a channel positioned immediately by the door at the edge of a W3-I area (transition to dry space beyond doorway) to catch water.

Door with channel – W3-I area



1 Door
2 Screed
3 Channel
4 Waterproof membrane
5 Tile adhesive
6 Tile

* In case of existing door frames (e.g. on refurbishment projects), it is possible to open up the wall behind the frame in order to carry the membrane through at this position.

Water action class W3-I, very high exposure with additional chemical action

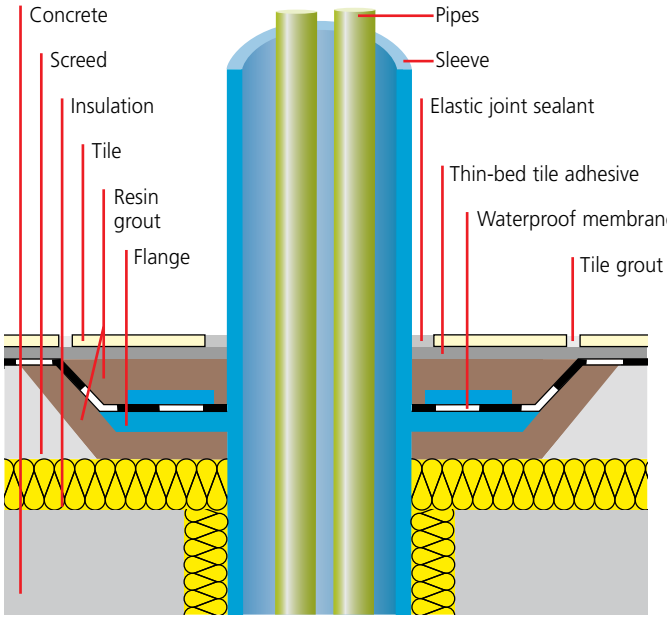
Penetrations – service runs

Catering kitchens and other food-processing or food-manufacturing facilities tend to be heavily serviced spaces, with pipes that typically penetrate the floor. Depending on the floor construction (bonded screed, unbonded screed on separating layer or floating screed), the pipes must be carried through sleeves that can be connected to the waterproof barriers.

Bad practice – uncontrolled projection of piping from screed.

Bad practice – proper waterproofing is not possible due to spatial constraints.

Sleeve for service penetration with single waterproof barrier



Penetration in floating screed installed so as to accommodate free movement. A typical feature of industrial buildings is the multiplicity of penetrations through the waterproof membrane. Provision must be made for a means of connecting the penetrating element to the membrane (e.g. by means of a flange).

Incorporation of penetrating element with compression flange in waterproof membrane.

Slab with penetrations sealed by rubber gaskets.

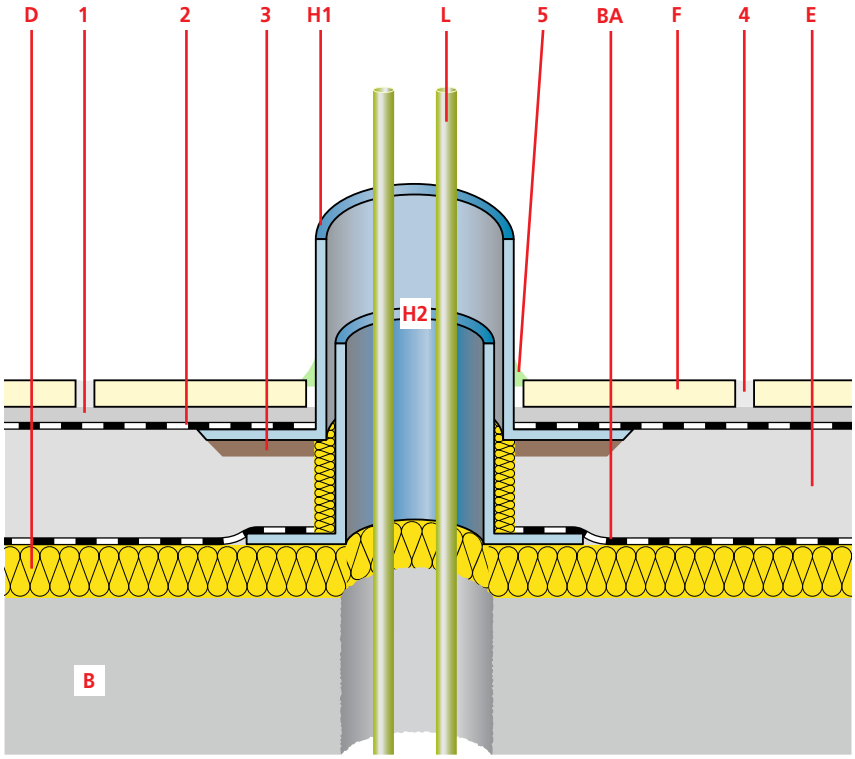
Water action class W3-I, very high exposure with additional chemical action

Construction with two waterproof barriers

Depending on the client's wishes or sensitivity of the project, designers and applicators may be required to incorporate two waterproof barriers in the floor construction. This usually poses a major challenge for design and installation given that the double barrier needs to be factored into all details. For the practical works on site, maximum care and attention are required to prevent conflicts and incompatibilities between the two waterproofing systems or any other weak points resulting from the complexity of the detailing. It is thus vital to consider, in each particular case, whether it is at all appropriate to incorporate two waterproof barriers.

Second waterproof barrier or "safety barrier"

Particular care is required on the part of the applicator at floor drains and channels given the need to bring together and join up the two waterproof barriers for drainage.
Under service conditions, blocked drains may occasionally cause backflow and uncontrolled water infiltration over the lower waterproof barrier, where it can contaminate the overlying construction.
This can be prevented by installing the lower waterproof barrier merely as a "safety barrier" without any provision for drainage or connection to the drainage system.



Combination of two waterproof barriers at floor penetration (e.g. Wolfin system with Sopro polyurethane system).

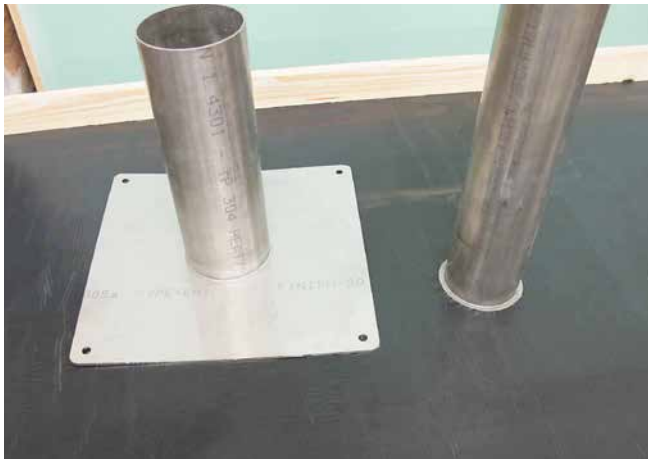
1 Flexible thin-bed adhesive
2 Waterproof membrane:
Sopro PU-FD surface sealant with Sopro AR 562 scrim/Sopro EPG 522 epoxy primer
3 Sopro DBE 500 epoxy tile adhesive for bonding flange to screed
4 Sopro TF high-strength tile grout
5 SoproDur® HF-D 817 high-strength sealant
B Concrete
D Insulation
E Screed
F Tile
H1 Interlocking sleeves
H2 Interlocking sleeves
L Service runs
BA Waterproof sheet membrane

Note:

Penetrating components in areas of very high exposure must be provided with flanges of width ≥ 50 mm.

Water action class W3-I, very high exposure with additional chemical action

Construction of floor penetration with two waterproof barriers



1 First sleeve with flange and bonded waterproof sheet membrane (Wolfin system) above insulation layer, with second sleeve positioned on screed.

2 Installation of load-spreading cement screed, e.g. made with Sopro Rapidur® B1/B5 rapid-set screed binder, with Sopro RDS 960 perimeter insulation strip placed around sleeve.

3 Flange of second sleeve coated with Sopro's No.1 flexible tile adhesive to ensure structural bonding of sleeve on screed.

4 One sleeve is placed inside other to ensure free movement.

5 After pretreatment with Sopro EPG 522 epoxy primer and blinding with silica sand, sleeve is waterproofed with Sopro PU-FD surface sealant. Incorporated scrim reinforces membrane around penetration.

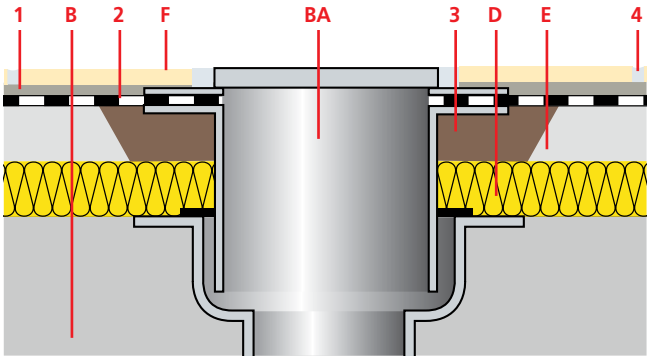
6 Waterproofed sleeves. Sopro PU-FD surface sealant is blinded with silica sand.

Water action class W3-I, very high exposure with additional chemical action

Floor drains and channels

Operations in production facilities involve the permanent exposure of floor drains and channels to dynamic loads. This requires their structurally continuous installation in the floor construction, i.e. the screed, which, in turn, necessitates the use of low-shrinkage, reaction-resin bound grouts.

Floor drain structurally grouted with reaction resin/silica sand mix



1 Flexible thin-bed adhesive
2 Waterproof membrane: Sopro PU-FD surface sealant with Sopro AR 562 scrim/Sopro EPG 522 epoxy primer
3 Sopro EPG 522 epoxy primer/silica sand grout
4 Sopro TF high-strength tile grout
B Concrete
D Insulation
E Screed
F Tile
BA Floor drain

Drain pan incorporated in membrane and ready to receive upper drain fitting.

Upper drain fitting (manufactured by ETU) accurately positioned and aligned at required level.

Capillary seal installed with reaction resin grout mixed in ratio 1 : 1 : 1 (1 part Sopro BH 869 construction resin, 1 part Sopro KQS 607 crystal quartz sand, 1 part Sopro QS 507 fine silica sand).

After reaction resin has cured, floor drain has structurally continuous connection with building fabric and is able to accommodate extremely high live loads.

Water action class W3-I, very high exposure with additional chemical action

Waterproofing design for channels subject to thermal loads

Due to the thermal expansion of metal and damaging effect of the resulting shear stresses, the waterproof membrane should not be directly connected to thermally loaded stainless-steel channels, such as those commonly encountered in catering kitchens, but to the channel drain pan.

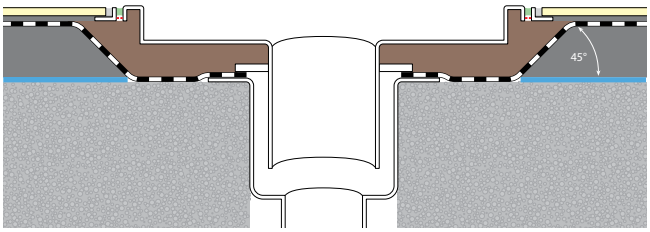
Channels subject to thermal loads should also be provided with a full-perimeter stainless-steel frame. This creates a clear-cut boundary between tiling and channel while also protecting tile edges. Any movement of the channel is thus accommodated within the stainless-steel frame, without any transmission of stresses to the tile covering.

Channel without stainless-steel frame – unsightly tile finish, with partially chipped edges.

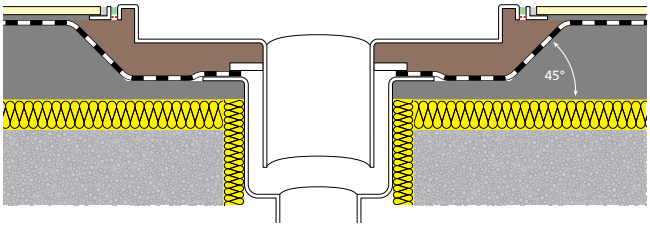
Channel with stainless-steel frame – superior and more durable movement joint solution.

The following solutions are feasible depending on the adopted floor construction:

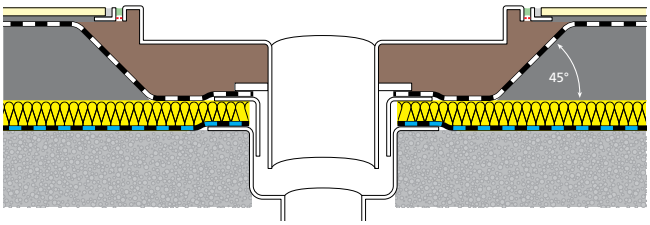
Bonded screed construction



Floating screed construction

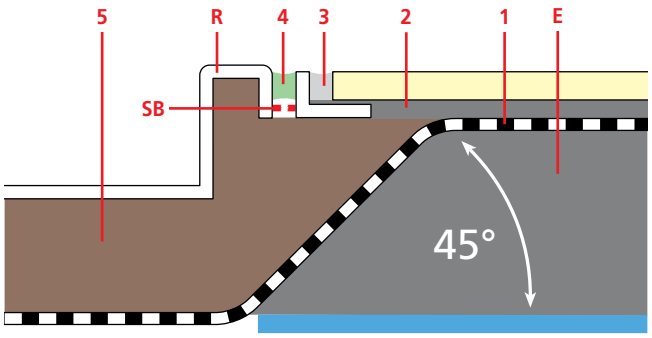


Construction with two waterproof barriers

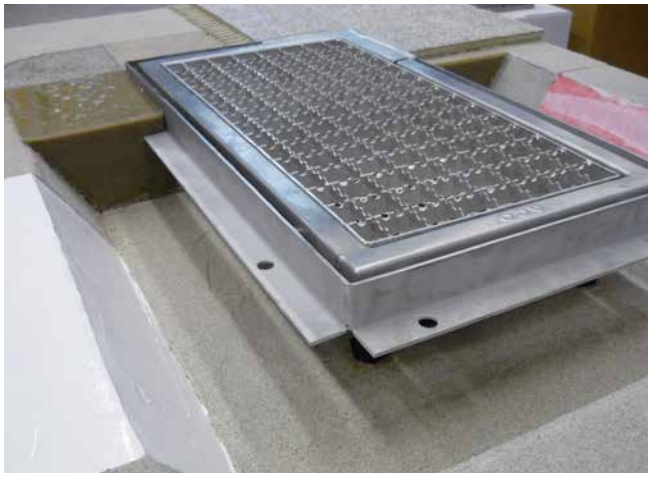


Water action class W3-I, very high exposure with additional chemical action

Channel with perimeter stainless steel frame

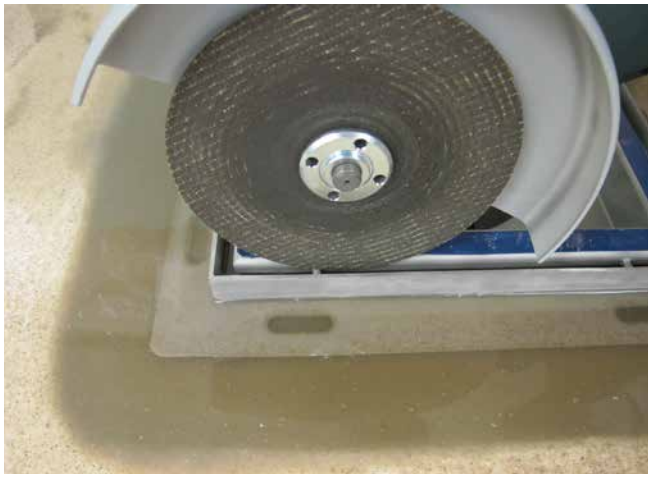


1 Waterproof membrane with Sopro PU-FD surface sealant
2 Sopro's No.1 flexible tile adhesive
3 Sopro TF high-strength tile grout
4 Elastic joint sealant
5 Epoxy resin/silica sand grout
R Channel
E Screed
SB Bolt connecting frame and channel



Exploded view of channel sinking. Clearly visible perimeter stainless-steel frame also protects edges of adjoining tiles.

Cross-section of model clearly shows capillary seal below body of channel.



Once grout has cured, bolts connecting frame and channel are severed and joint subsequently filled with elastic sealant.

Water action class W3-I, very high exposure with additional chemical action

Waterproofing of floor area with channels subject to thermal loads

Application of Sopro PU-FD surface sealant and junction with flange, with reinforcing scrim additionally embedded at flange.

Waterproofed sinking. Compression flange ring is screwed down. Chamfered screed surfaces are clearly visible.

Leakage testing of floor membrane by flooding.

Channel mounted in waterproofed sinking.

Capillary seal to channel by grouting with epoxy resin/silica sand mix (Sopro EPG 522 epoxy primer mixed in proportions 1 : 1 : 1 with Sopro KQS 607 crystal quartz sand and Sopro QS 511 coarse silica sand). Channel is ballasted to protect against uplift.

Perimeter stainless-steel frame is clearly visible. Bolts are later severed to permit free movement of channel.

Water action class W3-I, very high exposure with additional chemical action

Floor drains and channels

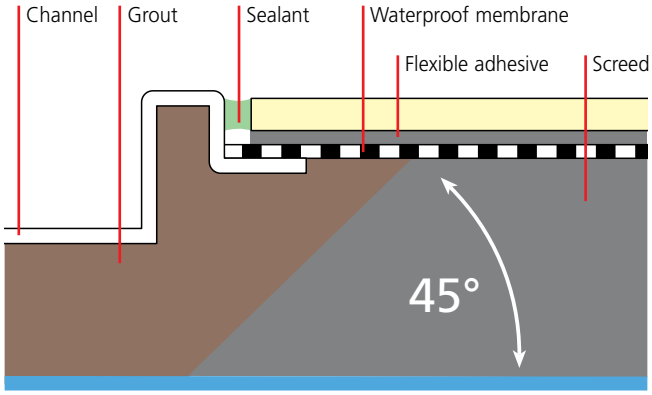
Dishwashing spaces have a special washing area for large items (e.g. trolleys), which is subject to extremely high live loads. The washing trays installed here also require proper grouting.

Stainless-steel washing tray manufactured by ETU.

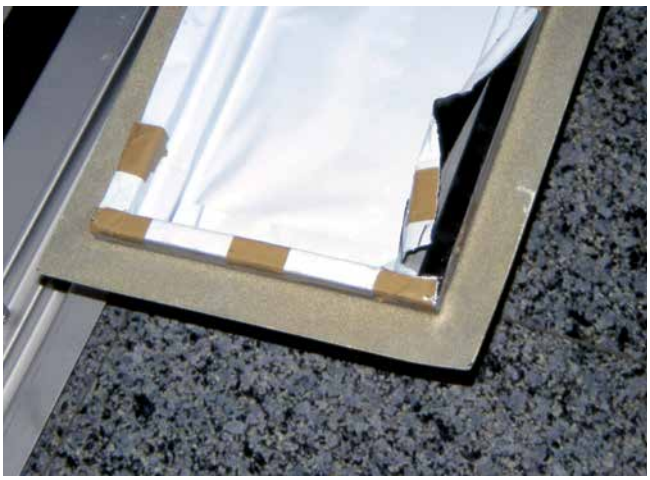
Resin/sand mix (1 : 1 : 1) is fluid enough to create capillary seal at all points of tray.

Clearly visible perimeter resin grout settles to uniform level on all sides. Tray must be secured against uplift.

Channels not subject to thermal loads



Channels not subject to thermal loads (e.g. in workshops) may be directly connected to waterproof membrane. These should be provided with an adequately wide (min. 50 mm) flange.

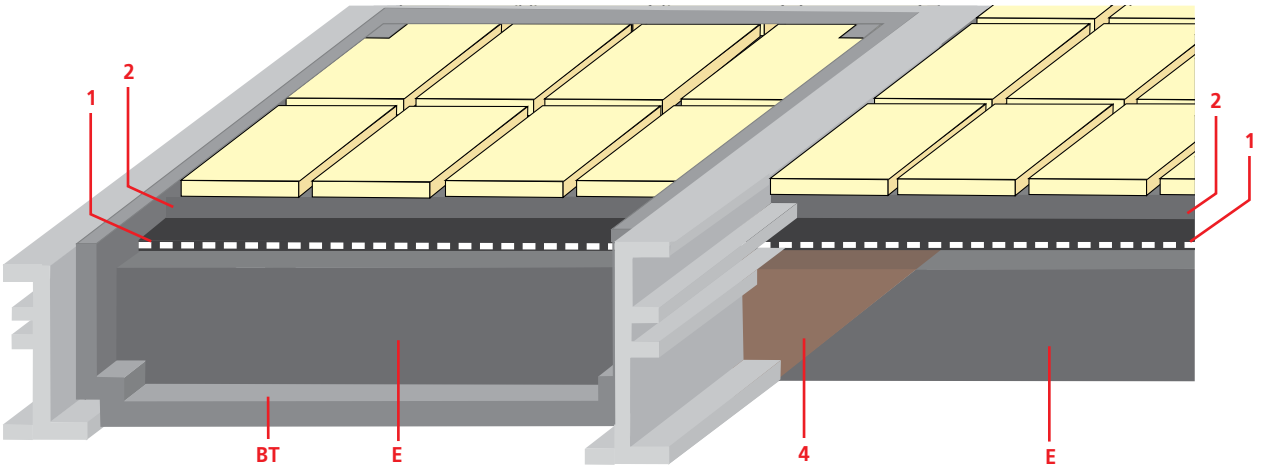


Channel with sand-faced flange.

Water action class W3-I, very high exposure with additional chemical action

Waterproof underfloor tank opening for industrial applications

If floors are raised or carry service runs that must remain accessible, then "watertight" underfloor tank openings are required.



1 Waterproof membrane with Sopro PU-FD surface sealant
2 Sopro's No.1 flexible tile adhesive
3 Elastic joint sealant
4 Epoxy resin/silica sand grout
R Channel
E Screed
BT Underfloor tank opening

Incorporation of waterproof underfloor tank opening (ACO) allowing service access in extra-heavy-duty areas.

Water action class W3-I, very high exposure with additional chemical action

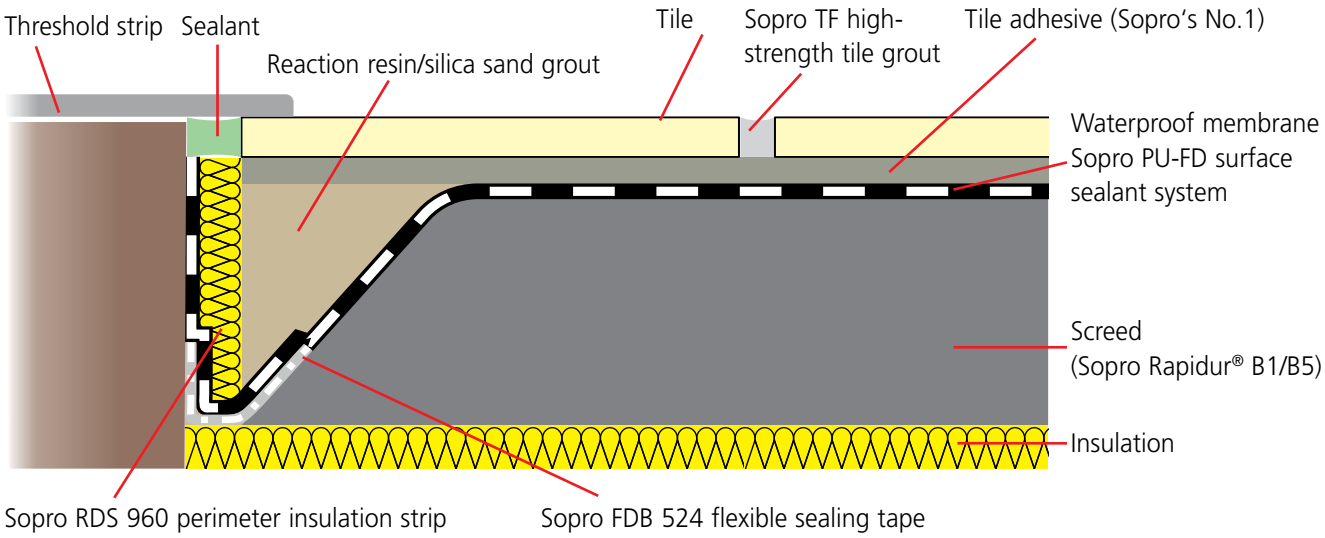
Refrigerated rooms/stores

Refrigerated rooms and stores are an indispensable facility in catering kitchens and food-processing spaces.

The detailing of membrane junctions and connections depends on the particular design of the refrigerated store. Given that skirtings are not always installed and a doorway also usually needs waterproofing, a proven solution involves connection of the membrane vertically on the wall of the refrigerated store over the depth of the screed.
If the refrigerated storage itself has a conventional screed construction, then the same principle must be adopted here to install the waterproof membrane.

Refrigerated store in catering kitchen.

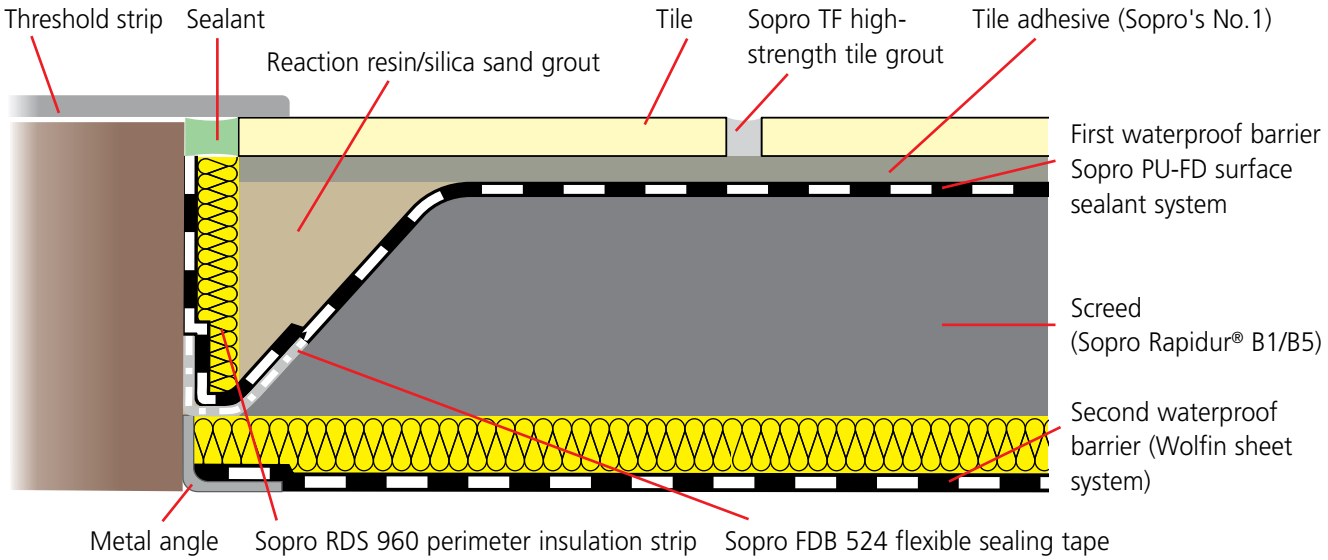
Junction with waterproof membrane



Coved skirting at junction with refrigerated store.

Water action class W3-I, very high exposure with additional chemical action

Junction with two waterproof barriers



Cutaway model without skirting.

Connection to refrigerated store (Vissmann system)

Sopro PU-FD surface sealant applied directly to refrigerated store wall.

Junction at refrigerated store door.

Water action class W3-I, very high exposure with additional chemical action

System composition

Sopro EPG 522

Sopro PU-FD 570
Sopro PU-FD 571

Sopro PU-FD KF 572 (contrast colour)

Note:

Addition of Sopro PU-FD KF 572 provides colour contrast between individual coats, thereby facilitating on-site membrane application.

Sopro's No. 1

For high acid exposure:

Sopro DBE 500

Sopro TFb

Sopro TF+

Sopro FEP

Sopro FDB 524

SoproDur® HF-D 817

Water action class W3-I, very high exposure with additional chemical action

Application of reaction resins

Reaction resin waterproofing systems are composed of priming coat and waterproof membrane.

A minimum temperature of +10 °C is required on site to guarantee trouble-free application (important for winter working).

To comply with good practice, the dewpoint should be determined prior to the commencement of works by measuring the fabric temperature, air temperature and humidity. This serves to eliminate the risk that condensation forms by the time of or during application, with impairment of adhesion between the individual layers as the consequence.

The works should not be performed where dew formation occurs.

Determination of dewpoint

Definition of dewpoint:
The dewpoint is the temperature at which air is fully saturated with water vapour. Condensation forms (as fog) as soon as the temperature falls below the dewpoint. The capacity of air to absorb water vapour varies according to temperature. Warm air may thus contain more water vapour than cold air.

Determination of dewpoint:
a) Measure air temperature
b) Measure relative humidity
c) Measure substrate temperature
d) Use table to determine dewpoint

Measurement of fabric temperature.

Measurement of air temperature and relative humidity.

Water action class W3-I, very high exposure with additional chemical action

Determination of dewpoint

Air temperature	Dewpoint temperatures in °C with a relative humidity of										
(°C)	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2	-7.77	-6.56	-5.43	-4.40	-3.16	-2.48	-1.77	-0.98	-0.26	+0.47	+1.20
4	-6.11	-4.88	-3.69	-2.61	-1.79	-0.88	-0.09	+0.78	+1.62	+2.44	+3.20
6	-4.49	-3.07	-2.10	-1.05	-0.08	+0.85	+1.86	+2.72	+3.62	+4.48	+5.38
8	-2.69	-1.61	-0.44	+0.67	+1.80	+2.83	+3.82	+4.77	+5.66	+6.48	+7.32
10	-1.26	+0.02	+1.31	+2.53	+3.74	+4.79	+5.82	+6.79	+7.65	+8.45	+9.31
12	+0.35	+1.84	+3.19	+4.49	+5.63	+6.74	+7.75	+8.69	+9.60	+10.48	+11.33
14	+2.20	+3.76	+5.10	+6.40	+7.58	+8.67	+9.70	+10.71	+11.64	+12.55	+13.36
15	+3.12	+4.65	+6.07	+7.36	+8.52	+9.63	+10.70	+11.69	+12.62	+13.52	+14.42
16	4.07	5.59	6.98	8.29	9.47	10.61	11.68	12.66	+13.52	14.58	15.54
17	5.00	6.48	7.92	9.18	10.39	11.48	12.54	13.57	14.50	15.36	16.19
18	5.90	7.48	8.83	10.12	11.33	12.44	13.48	14.56	15.41	16.31	17.25
19	6.80	8.33	9.75	11.09	12.26	13.37	14.49	15.47	16.40	17.37	18.22
20	7.73	9.30	10.72	12.00	13.22	14.40	15.48	16.46	17.40	18.36	19.18
21	8.60	10.22	11.59	12.92	14.21	15.36	16.40	17.44	18.41	19.27	20.19
22	9.54	11.16	12.52	13.89	15.19	16.27	17.41	18.42	19.39	20.28	21.22
23	10.44	12.02	13.47	14.87	16.04	17.29	18.37	19.37	20.37	21.34	22.23
24	11.34	12.93	14.44	15.73	17.06	18.21	19.22	20.33	21.37	22.32	23.18
25	12.20	13.83	15.37	16.69	17.99	19.11	20.24	21.35	22.27	23.30	24.22
26	13.15	14.84	16.26	17.67	18.90	20.09	21.29	22.32	23.32	24.31	25.16
27	14.08	15.68	17.24	18.57	19.83	21.11	22.23	23.31	24.32	25.22	26.10
28	14.96	16.61	18.14	19.38	20.86	22.07	23.18	24.28	25.25	26.20	27.18
29	15.85	17.58	19.04	20.48	21.83	22.97	24.20	25.23	26.21	27.26	28.18
30	16.79	18.44	19.69	21.44	23.71	23.94	25.11	26.10	27.21	28.19	29.09
32	18.62	20.28	21.90	23.26	24.65	25.79	27.08	28.24	29.23	30.16	31.17
34	20.42	22.19	23.77	25.19	26.54	27.85	28.94	30.09	31.19	32.13	33.11
36	22.23	24.08	25.50	27.00	28.41	29.65	30.88	31.97	33.05	34.23	35.06
38	23.97	25.74	27.44	28.87	30.31	31.62	32.78	33.96	35.01	36.05	37.03
40	25.79	27.66	29.22	30.81	32.16	33.48	34.69	35.86	36.98	38.05	39.11
45	30.29	32.17	33.86	35.38	36.85	38.24	39.54	40.74	41.87	42.97	44.03
50	34.76	36.63	38.46	40.09	41.58	42.99	44.33	45.55	46.75	47.90	48.98

Example 1:

Air temperature: (measure)	+10 °C
Relative humidity: (measure)	70 %
Substrate temperature: (measure)	+9 °C
Dewpoint: (read from table)	+4.8 °C
Provided substrate temperature is at least 3 °C above dewpoint:	➥ 7.8 °C < 9 °C

Application possible!

Example 2:

Air temperature: (measure)	+27 °C
Relative humidity: (measure)	75 %
Substrate temperature: (measure)	+22 °C
Dewpoint: (read from table)	+22.2 °C
Provided substrate temperature is at least 3 °C above dewpoint:	➥ 25.2 °C > 22 °C

Application not possible!

Water action class W3-I, very high exposure with additional chemical action

Application of Sopro PU-FD surface sealant

1 Apply Sopro EPG 522 epoxy primer and blind with Sopro QS 507 fine silica sand.

2 Fix Sopro FDB 524 flexible sealing tape at movement joints.

3 Carefully mix Components A and B of Sopro PU-FD surface sealant and transfer to fresh container.

4 Apply Sopro PU-FD to wall in two coats, with minimum total coat thickness of 1 mm.

5 Apply Sopro PU-FD to floor in two coats, with minimum total coat thickness of 1 mm.

6 Sopro PU-FD KF 572 contrast colour can be added to membrane material to help distinguish between first and second coats.

Water action class W3-I, very high exposure with additional chemical action

7 Blend Sopro PU-FD KF 572 with Sopro PU-FD to produce grey colour.

8 Blind freshly applied second Sopro PU-FD coat with Sopro QS 511 coarse silica sand to improve bonding.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

DIN 18531

With the appearance of DIN 18531, covering the waterproofing of roofs, balconies and access balconies, liquid-applied membranes in conjunction with ceramic coverings will achieve the status of officially standardized waterproofing systems.

This means that

a. crack-bridging mineral sealing slurries (CM)

and

b. reaction resins (RM)

can be used on balconies as standardized product solutions.

Minimum dry coat thicknesses of:

a. crack-bridging mineral sealing slurries (CM) ≥ 2 mm

b. reaction resins (CM) ≥ 1 mm

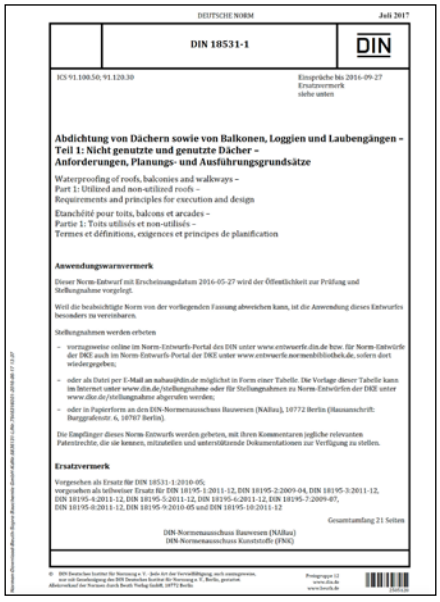
must be observed. The membranes must be applied in two coats. They must also offer certified frost resistance.

A minimum fall of 1.5% is prescribed for both the waterproofed area and the subsequently installed (ceramic tile) covering.

If no gradient is present, a special coating (screed, levelling mortar) is required to provide the necessary falls. Any irregularities or blowholes must also be evened out. Sopro Rapidur® M5 rapid-set screed mortar, Sopro RAM 3 454 renovation and levelling mortar or Sopro VS 582 self-levelling filler are suitable products for these works.

House with balcony.

Balcony/patio waterproofed with flexible cementitious sealing slurry (Sopro TDS 823), ready for subsequent tiling.



DEUTSCHE NORM Juli 2017

DIN 18531-1

DIN

ICS 91.100.50; 91.120.30

Einsprüche bis 2016-09-27
Ersatzvermerk
siehe unten

Abdichtung von Dächern sowie von Balkonen, Loggien und Laubengängen – Teil 1: Nicht genutzte und genutzte Dächer – Anforderungen, Planungs- und Ausführungsgrundsätze

Waterproofing of roofs, balconies and walkways – Part 1: Utilized and non-utilized roofs – Requirements and principles for execution and design

Étanchéité pour toits, balcons et arcades – Partie 1: Toits utilisés et non-utilisés – Termes et définitions, exigences et principes de planification

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2016-05-27 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal des DIN unter www.entwuerfe.din.de bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
- oder als Datei per E-Mail an nabau@din.de möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/stellungnahme oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an den DIN-Normenausschuss Bauwesen (NABau), 10772 Berlin (Hausanschrift: Burggrafenstr. 6, 10787 Berlin).

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Ersatzvermerk

Vorgesehen als Ersatz für DIN 18531-1:2010-05;
vorgesehen als teilweiser Ersatz für DIN 18195-1:2011-12, DIN 18195-2:2009-04, DIN 18195-3:2011-12, DIN 18195-4:2011-12, DIN 18195-5:2011-12, DIN 18195-6:2011-12, DIN 18195-7:2009-07, DIN 18195-8:2011-12, DIN 18195-9:2010-05 und DIN 18195-10:2011-12

Gesamtumfang 21 Seiten

DIN-Normenausschuss Bauwesen (NABau)
DIN-Normenausschuss Kunststoffe (FNK)

DIN 18531.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Outdoor constructions are typically exposed to high loads through the natural action of weather.

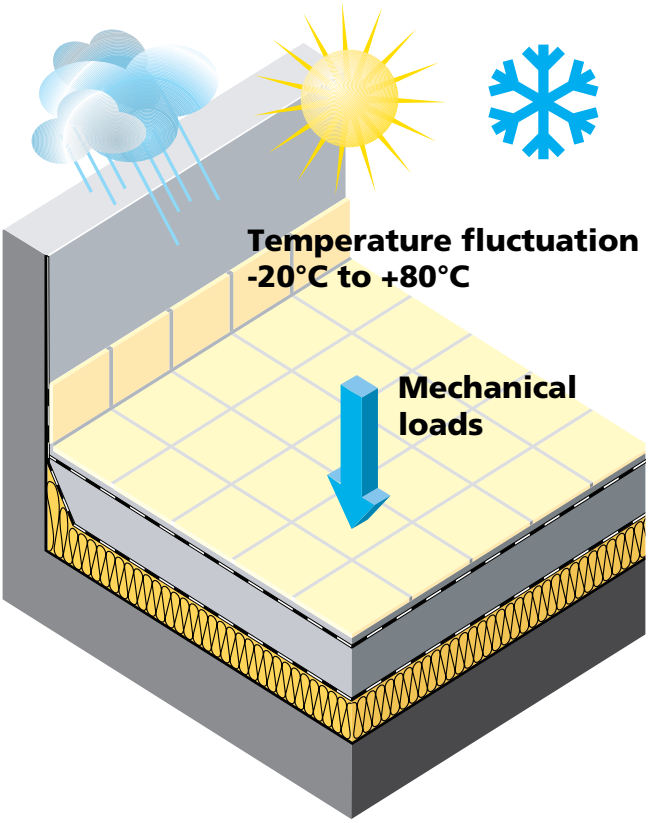
Temperature fluctuations bring about a constant process of expansion and contraction in the covering, which in turn generates stresses in the entire assembly.

Balcony constructions thus demand particularly careful design and installation to eliminate the risk of cracks and voids in the covering.

Tiles require virtually void-free laying. Here, DIN 18157 prescribes the buttering/floating method.

For tilelaying, Sopro recommends the use of a highly flexible (S2-grade), reactive, water-free, two-component, cementitious thin-bed adhesive (Sopro MEG 665/Sopro MEG 666) with floating-bed properties as a means of achieving the required full bedding of tiles on the membrane (Sopro TDS 823 two-component turbo sealing slurry).

The tiles should then be finished with Sopro FL plus, an efflorescence-free, water-repellent, flexible cementitious tile grout.



Balcony/patio (above habitable space) with incident loads.

Outdoor tile covering.

External areas are required to withstand all weather conditions.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Water/moisture action to DIN 18531

Waterproofing solutions for balconies and roof areas are required to provide a barrier to water without hydrostatic pressure. The membrane must nonetheless be able to withstand temporary water accumulation (e.g. ponding).

Membrane application to DIN 18531 is subject to the following:

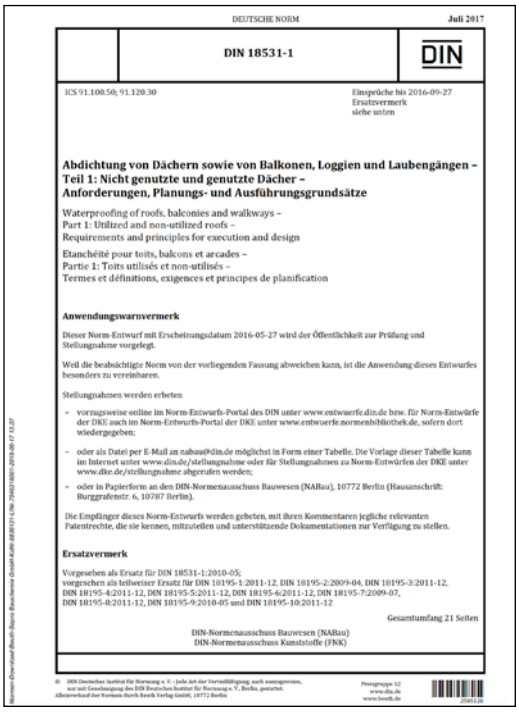
- Tiles must be laid with a thin-bed adhesive that is compatible with the membrane (e.g. Sopro MEG 665/ Sopro MEG 666).
- The tiles must, as far as possible, be fully bedded.
- A regular, straight-lay (i.e. grid) tile pattern is preferable.
- The works must be performed at a temperature of between +5°C and max. +30°C.

The setting and curing behaviour of the thin-bed adhesive may vary according to the prevailing temperature on site.

The use of rapid-set adhesive systems may be appropriate in certain weather conditions.

Suitable measures should normally be taken to protect the surfaces during setting (against watering down through rain or premature drying out through sunshine).

A protective enclosure, possibly with heating, is recommended for installing outdoor coverings during cold season.



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Gesamtumfang 21 Seiten

DIN-Normenausschuss Bauwesen (NABau)
DIN-Normenausschuss Kunststoffe (FNK)

Roof waterproofing standard DIN 18531-1 "Requirements and principles for design and execution".

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

System design

According to the ZDB (Federation of the German Construction Industry) data sheet "Guidance on indoor and outdoor installation of composite waterproofing systems with tile finish", the now standardized flexible, cementitious sealing slurries have proved successful in practical applications over many years.

Sheet membranes with tile finish are also strengthening their position as an alternative waterproofing solution alongside the liquid-applied systems.

In conjunction with the composite waterproofing systems – where the situation allows (e.g. with buried constructions) – water run-off can also be improved through the use of a pervious, single-sized aggregate mortar.

Prior to the outdoor installation of waterproof membranes and coverings, the substrates should exhibit a certain level of strength and be sufficiently old (screeds, when they are walkable after approx. 3–5 days; concrete, given its shrinkage, after at least 3 months).

While, indoors, the drying process may virtually eliminate all residual moisture in screeds (➥ importance of moisture testing), outdoor fabric will ultimately reach an equilibrium moisture content of 3–6 %.

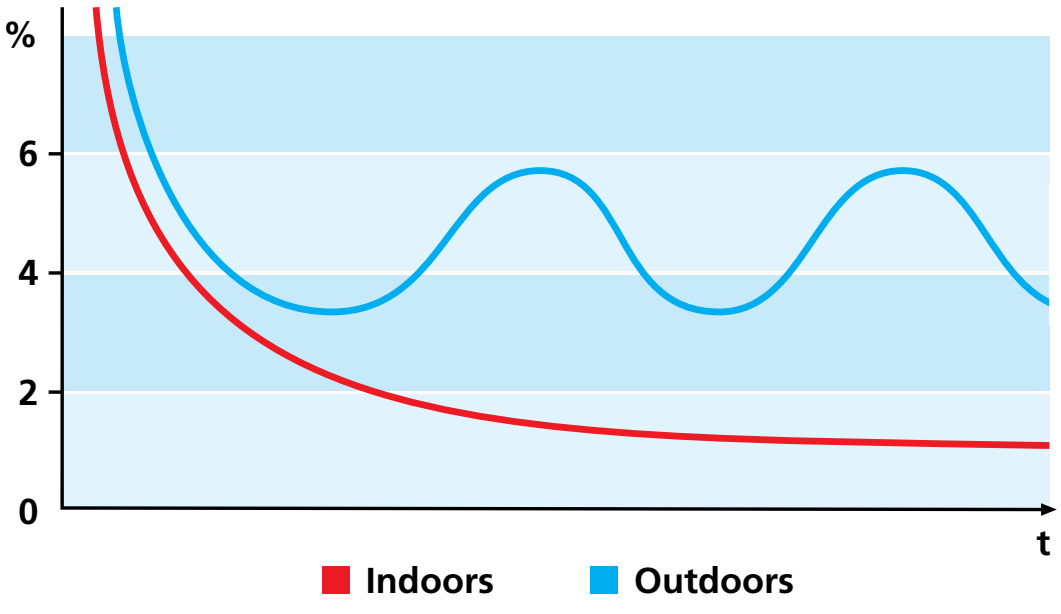
The drying shrinkage-related deformation that poses a perennial problem for indoor ceramic coverings is not encountered outdoors. It should be ensured that outdoor

Tiled balcony.

coverings are normally installed on substrates which are not sensitive to water (concrete, cement screeds, cement-bonded tiles).

Depending on tile format, the following system designs are recommended:

1. **Balcony design with Sopro DSF flexible sealing slurry (tile formats up to 60 x 60 cm)**
2. **Balcony design with Sopro AEB plus 639 waterproofing and separating membrane (tile formats > 60 x 60 cm)**
3. **Pervious screed construction with Sopro DM 610 drainage mortar**

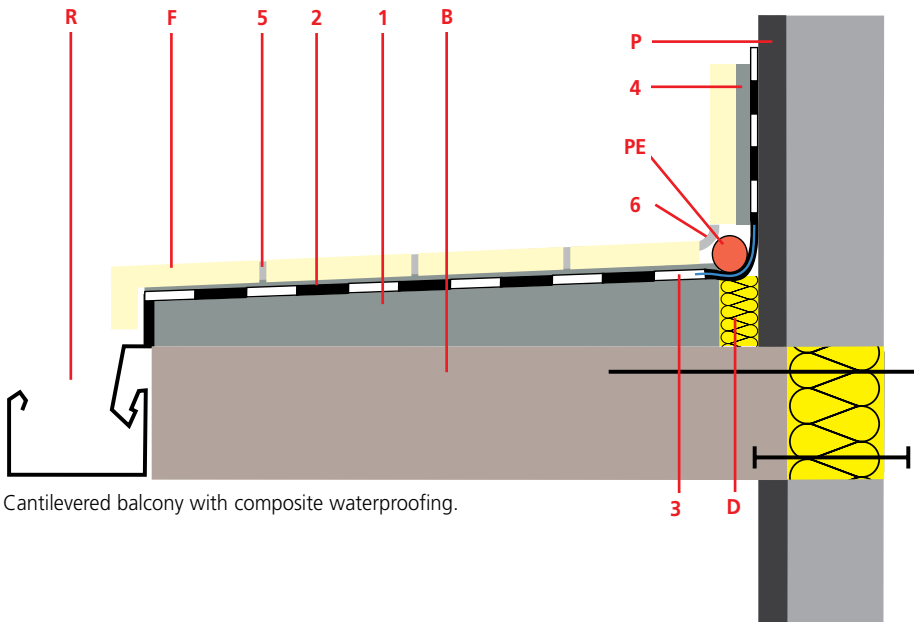


Drying behaviour of cement screeds.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Constructions

Cantilevered balconies and balconies above habitable areas constitute the two basic configurations. Similarly, patios may be either in contact with the ground or installed over used spaces.

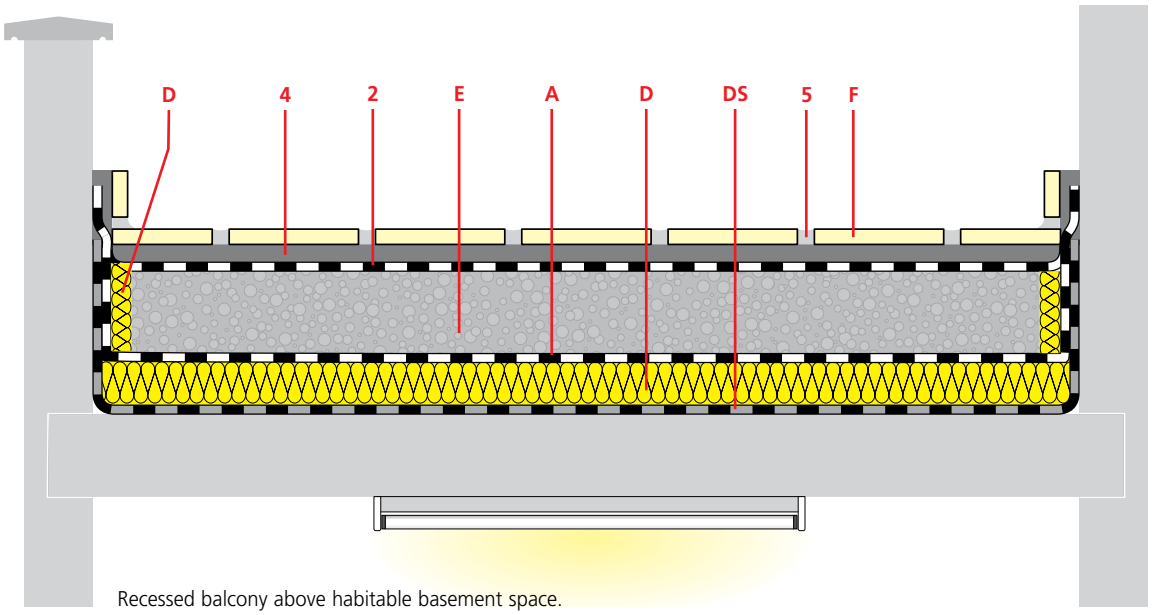


Cantilevered balcony with composite waterproofing.

1 Levelling coat to falls
2 Two-coat mineral waterproof membrane
3 Sopro DB 438 sealing tape
4 Flexible thin-bed adhesive
5 Flexible cementitious tile grout
6 Elastic joint sealant
B Concrete/cantilevered balcony slab
A Waterproof sheet membrane
D Insulation/insulation strip
E Screed
F Tile
P Render
PE Circular-section PE back-up strip
R Gutter section
DS Vapour barrier

German Flat Roof Guidelines

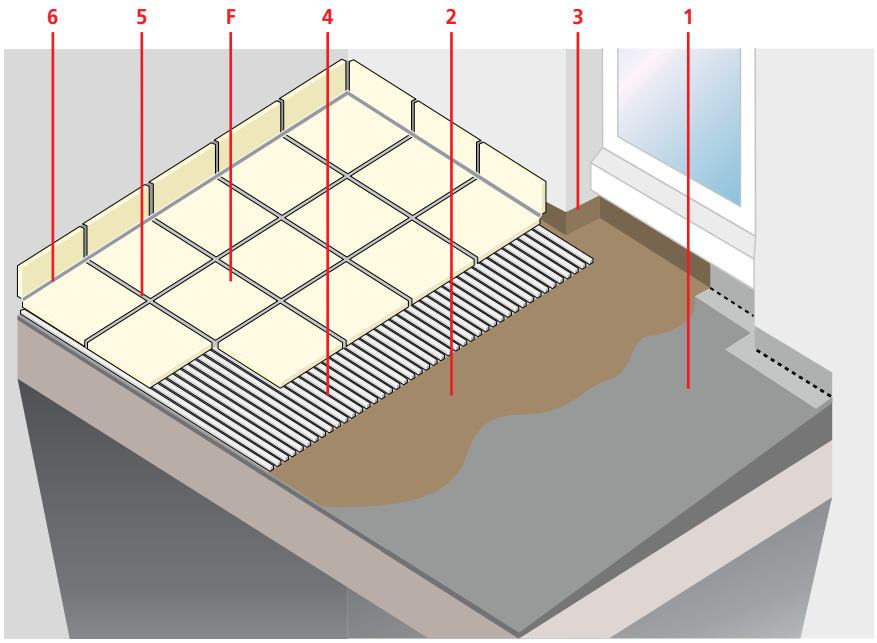
Where habitable spaces are located beneath the balcony or patio, the construction is subject to the Flat Roof Guidelines (issued by Federation of German Roofing Contractors), i.e. incorporation of an insulation layer plus vapour barrier and waterproof sheet membrane is required prior to screed laying and tiling. To eliminate the risk of moisture penetration and possible frost spalling or efflorescence, an additional membrane should be installed between screed and tile finish. Here too, the incorporation of a pervious screed would also be possible (see details on pervious screeds later in this section).



Recessed balcony above habitable basement space.

External areas under ZDB data sheet, DIN 18 531, normal, recessed and access balconies

1 Balcony design with Sopro DSF 523 one-component flexible sealing slurry (tile formats up to 60 x 60 cm)



1 Levelling coat to falls
2 Two-coat mineral waterproof membrane
3 Sopro DB 438 sealing tape
4 Flexible thin-bed adhesive
5 Flexible cementitious tile grout
6 Elastic joint sealant
F Tile

Balcony design with Sopro DSF 523 one-component flexible sealing slurry on cantilevered slab.

Flexible, cementitious sealing slurries have proved to be a reliable, straightforward waterproofing material in this context. They are applied in two coats to a total thickness of 2 mm. Priming is not essential. The cement screed, levelling coat to falls or concrete substrate is pre-wetted to ensure it is slightly damp prior to coating.

The residual moisture of outdoor building elements is of minor relevance to the application of the waterproof membrane as these elements, unlike indoors, will never completely dry out.

Slight pre-wetting of substrate prior to application of flexible sealing slurry.

Application of flexible, mineral sealing slurry.

Note:

Even though the use of reaction resin waterproofing products is permitted outdoors, preference should be given to flexible, cementitious sealing slurries due to their high water vapour permeability.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

System composition

Product recommendation

Levelling coat to falls:

Sopro RAM 3 454

Waterproofing:

Sopro TDS 823

Bonding:

Sopro MEG 665

Sopro MEG 666

Grouting:

Sopro FL plus

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Application procedure

1 Application of levelling coat to falls (Sopro RAM 3 454 renovation and levelling mortar or Sopro Rapidur® M5 rapid-set screed mortar) or bonded screed wet on wet with bonding layer.

2 Surface laid to falls ready to receive waterproof membrane (Sopro TDS 823 two-component turbo sealing slurry).

3 Sealing tape and angle units embedded and secured using Sopro TDS 823 prior to waterproofing of surfaces.

4 Balcony area waterproofed by two-coat application of Sopro TDS 823, with total dry coat thickness of 2 mm.

5 Laying of tiles in prepared Sopro MEG 665 megaFlex S2 highly flexible tile adhesive bed.

6 Tiles laid with highly flexible Sopro MEG 665 and joints finished with Sopro FL plus flexible tile grout.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Application procedure for junctions with windows/door units

1 Screed or levelling coat to falls turned down at angle of 45° at junction with door unit.

2 Sopro FDB 524 flexible sealing tape adhesive-fixed in joint to be waterproofed.

3 Joint waterproofed with Sopro TDS 823 two-component turbo sealing slurry.

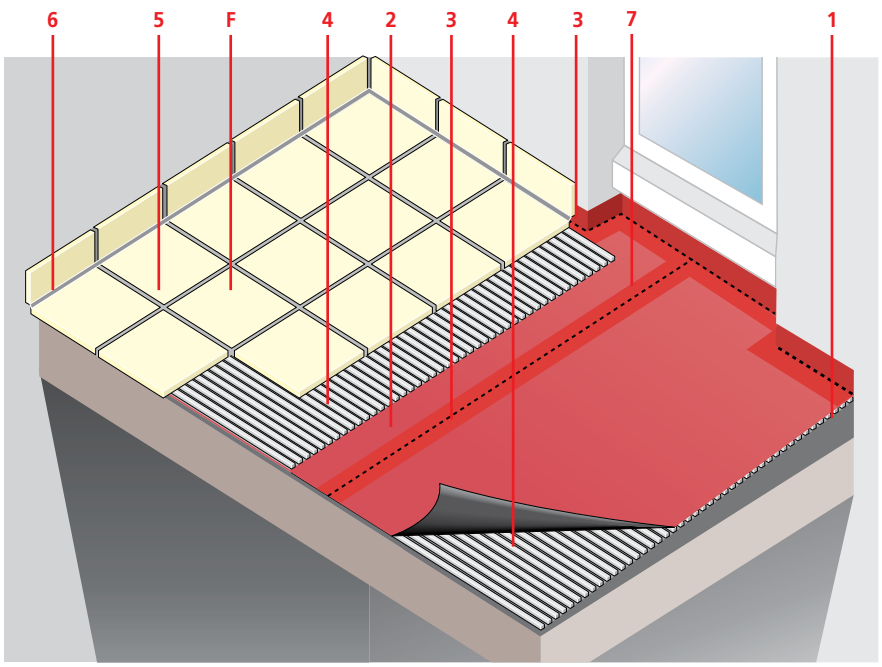
4 Waterproofed balcony surface and junction with door unit.

5 After insertion of perimeter insulation strip, sinking is filled with low-shrinkage, capillary-sealing reaction resin mortar.

6 Tiles laid with Sopro MEG 665 megaFlex S2 highly flexible tile adhesive using thin-bed method. Metal rail installed as termination at door threshold.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

2 Balcony design with Sopro AEB plus 639 waterproofing and separating membrane (tile formats > 60 x 60 cm)



1 Sopro RAM 3 454 renovation and levelling mortar or Sopro VS 582 self-levelling filler
2 Sopro AEB plus 639
3 Sopro AEB 641 sealing tape
4 Flexible thin-bed tile adhesive
5 Sopro FL plus flexible tile grout
6 Sopro Ceramic Silicone
7 Sealing tape adhesive Sopro RMK 818 Racofix® universal adhesive
F Tile

Sopro AEB plus 639

Sopro AEB plus 639 is a flexible, crack-bridging, stress-relieving waterproofing and separating membrane. Under service conditions, the dual-purpose, sandwich-construction membrane provides a reliable, heavy-duty water barrier while at the same time, through its separating function, offering high stress relief.

Sopro AEB plus 639 is easily bonded to the substrate using a flexible thin-bed adhesive. The sheets are simply butted, i.e. no lapping is required. The joints are covered over with Sopro AEB 641 sealing tape, which is bonded using Sopro RMK 818 Racofix® universal adhesive, Sopro MKS 819 Racofix® universal adhesive or Sopro TDS 823 two-component turbo sealing slurry.

The tile covering is then installed on top of the membrane using Sopro MEG 665 or Sopro MEG 666 highly flexible water-free thin-bed adhesive.

Use of Sopro AEB plus 639 waterproofing and separating membrane in conjunction with Sopro MEG 665 or Sopro MEG 666 allows trouble-free installation of ceramic units > 60 x 60 cm.

Sopro AEB 641

Sopro RMK 818

Note:

Given that the outdoor use of waterproof sheet membranes is not yet covered by the standard, this still constitutes a special construction to be agreed with the client.

Sopro MEG 666

Sopro MEG 665

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

System composition

Product recommendation

Levelling coat to falls:

Sopro RAM 3 454

Bonding:

Sopro MEG 665

Sopro MEG 666

Waterproofing: mandatory for formats > 60 x 60 cm

Sopro AEB plus 639

Sopro AEB 641

Sopro RMK 818 / Sopro MKS 819

Sopro TDS 823

Bonding:

Sopro MEG 665

Sopro MEG 666

Grouting:

Sopro FL plus

External areas under ZDB data sheet, DIN 18 531, normal, recessed and access balconies

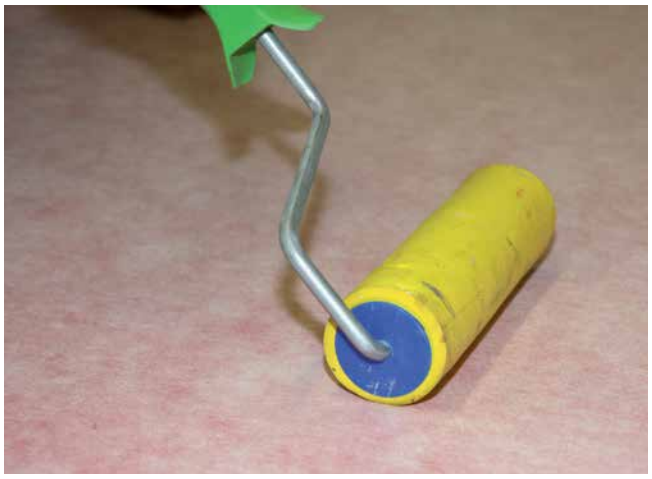
Application procedure on patio with Sopro AEB plus 639*

1 Strong existing tile covering on patio.

2 Even out defects using Sopro RAM 3 454 renovation and levelling mortar in preparation for installation of waterproof membrane.

3 Apply Sopro MEG 665 megaFlex S2 highly flexible tile adhesive for bonding of Sopro AEB plus 639 waterproofing and separating membrane.

4 Lay Sopro AEB plus 639 membrane in prepared adhesive bed.



5 Press down Sopro AEB plus 639 membrane into adhesive bed.

6 Form joints in Sopro AEB plus 639 membrane by butting adjacent sheets.

* To be agreed as special construction.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Application procedure on patio with Sopro AEB plus 639*

7 To seal joint area, first apply Sopro RMK 818 Racofix® universal adhesive.

8 Spread Sopro RMK 818 over joint area using notched spatula.

9 Tape over joints using Sopro AEB 641 sealing tape. Alternatively, sealing tape can be bonded and watertightly sealed using Sopro MKS 819 Racofix® universal adhesive or Sopro TDS 823 two-component turbo sealing slurry.

10 Apply Sopro MEG 665 megaFlex S2 highly flexible thin- and floating-bed tile adhesive.

11 Comb Sopro MEG 665 onto waterproofed surface.

12 Lay tiles (with rear face coated) in prepared adhesive bed.

* To be agreed as special construction.

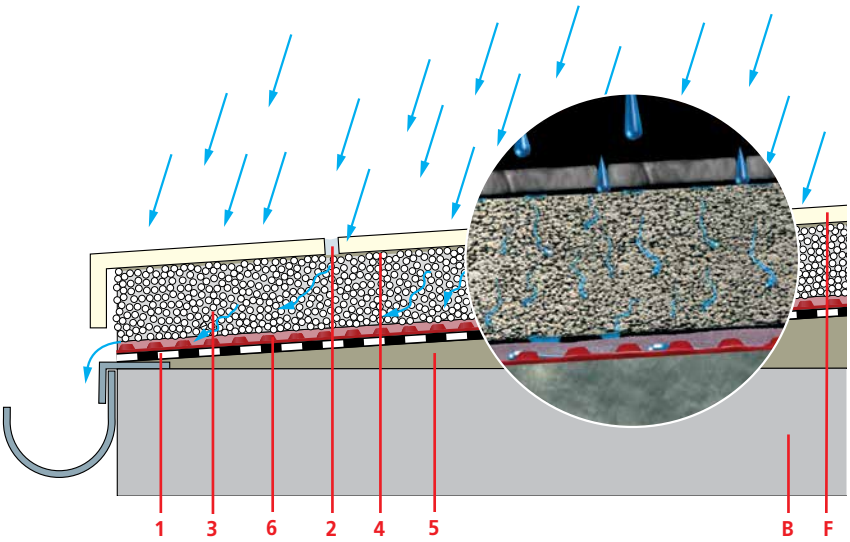
External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

3 Pervious screed

To ensure **rapid drainage** where **ceramic tile,** and, in particular, **natural stone coverings** are installed and thereby minimize the risk of efflorescence and discoloration to the finish, use of Sopro DMX 619 drainage mortar eXtra as the bedding material is recommended. The single-size aggregate grading of the mortar lends it an exceptionally high water permeability, which ensures the rapid permeation of water down to the waterproof barrier (Sopro DSF flexible sealing slurry/SoproThene® 878 bitumen sheet membrane).

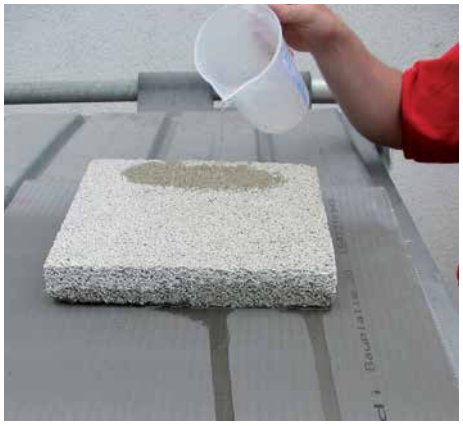
The construction is frost-resistant due to the lack of capillary action and the large quantity of voids that readily accommodate the crystallization of water into ice, thereby preventing spalling and consequent adhesion failures.

The drainage mortar may be used as a bedding mortar for bonded systems or, laid to a suitable thickness (min. 50 mm), for the installation of unbonded or floating load-spreading layers.



Balcony design with Sopro DMX 619 drainage mortar eXtra
See also Section 6 "Reliable laying of natural stone" (under 6.4 "Pervious bedding systems")

1 Two coats of Sopro DSF flexible sealing slurry or SoproThene® 878 bitumen sheet membrane
2 Sopro FL plus flexible tile grout
3 Sopro DMX 619 drainage mortar eXtra
4 Sopro HSF 748 flexible bonding slurry with trass/flexible thin-bed adhesive
5 Sopro VS 582 self-levelling filler or Sopro RAM 3 454 renovation and levelling mortar
6 Sopro DRM 653 drainage mat*
B Concrete
F Tile



Easy drainage of water through pervious screed specimen.

Tile laying on pervious screed using thin-bed method.

Sopro DMX 619 drainage mortar eXtra
Water permeability: approx. 3.2 ltr/(m² x s)

* Sopro DRM 653 drainage mat should generally be laid over waterproof barrier as protective layer and to improve water run-off.

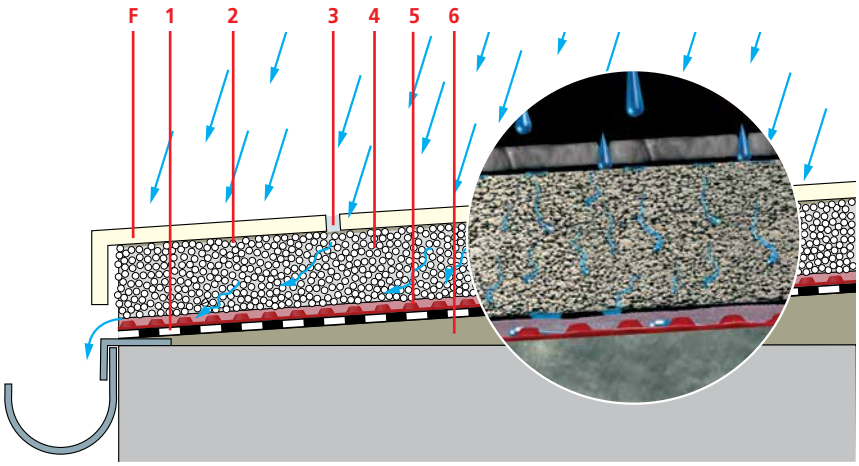
External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Pervious screed construction with Sopro DMX 619 drainage mortar eXtra

Pervious screed constructions for large balcony/patio areas, whose size makes it unfeasible to provide adequate falls, always require the additional incorporation of a drainage mat. This allows the water percolating through the pervious screed to drain off easily, thus eliminating the risk of waterlogging.

The pervious screed can be laid on top of the above-described flexible, cementitious membranes as well as on a surface waterproofed to DIN 18531 (bitumen sheet). The latter solution is preferable for waterproofing constructions subject to the Flat Roof Guidelines (i.e. with habitable spaces located beneath), which always require a load-spreading layer as a base for rigid coverings. The relatively "simple" system offers the merit of ensuring rapid drainage of the assembly, thereby guaranteeing the integrity of the covering.

Note: In these situations – as opposed to surfaces in contact with ground – pervious tile grouts are not recommended. The falls provided should cause the incident water to run off over the surface rather than draining through the construction. The joints should be sealed using Sopro FL plus flexible tile grout.



Sopro DMX 619

Sopro DRM 653
8 mm

1 Waterproof membrane with Sopro DSF flexible sealing slurry

2 Sopro HSF 748 flexible bonding slurry with trass/flexible thin-bed adhesive

3 Sopro FL plus flexible tile grout

4 Sopro DMX 619 drainage mortar eXtra

5 Sopro DRM 653 drainage mat

6 Sopro VS 582 self-levelling filler or Sopro RAM 3 454 renovation and levelling mortar

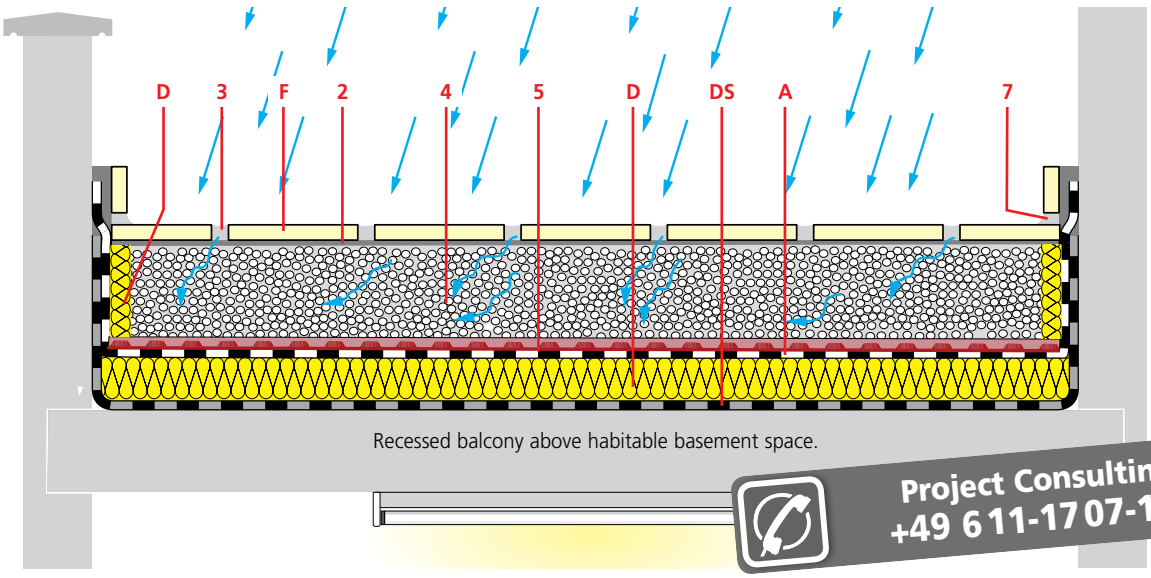
7 Sopro Ceramic Silicone

A Waterproof sheet membrane

D Insulation/perimeter insulation strip

DS Vapour barrier

F Tile



Recessed balcony above habitable basement space.

Project Consulting:
+49 611-1707-170

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

System composition

Product recommendation

Sopro DSF 523

Sopro DSF 623

Sopro TDS 823

Sopro ZR 618

Installation on load-spreading layer

Sopro DMX 619

Sopro DRM 653

Sopro MEG 666

Sopro MEG 667

Sopro FL plus

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Application

1 Waterproof sheet membrane with SoproThene® aluminium edging tape at junction with door unit.

2 Sopro DRM 653 drainage mat laid over membrane and Sopro RDS 960 perimeter insulation strip bonded to door unit.

3 ACO channel installed at junction with door and set to required height.

4 Sopro DMX 619 drainage mortar eXtra is placed over Sopro DRM 653 drainage mat with minimum thickness of 50 mm. It is then pre-compacted and struck off.

5 Tiles are immediately laid wet on wet, e.g. with Sopro MEG 667 megaFlex TX highly flexible tile adhesive.

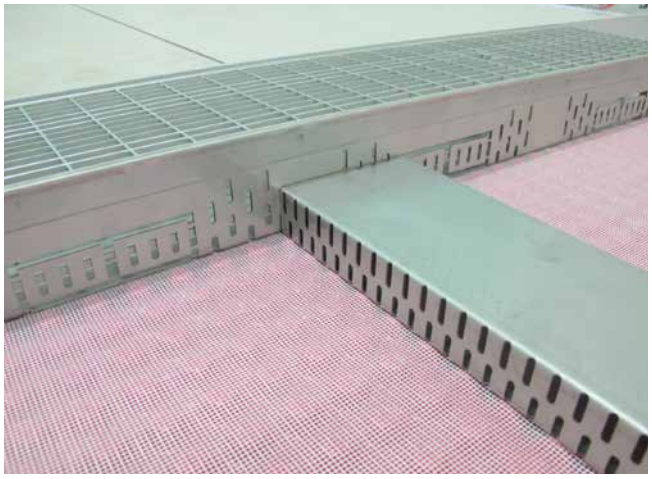
6 Tile covering lies flush with ACO channel.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Application

7 Tile joints are finished using Sopro FL plus flexible tile grout.

8 Metal strip fitted by rainwater plumber to protect waterproof membrane and ensure proper shedding of water from drip on door unit into (ACO) channel.



9 To ensure reliable drainage of channel, this must be connected via a branch channel to floor drain/gully.

10 Floor drains (ACO) located in middle of a surface must also be drained via a branch channel.

11 Branch channel enclosed by pervious bedding mortar.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Patios

An expanding range of thick, large-format ceramic units is now available for the design of outdoor pavements. The new-generation ceramic paving flags are available in practically any size and with a near-limitless variety of finishes.

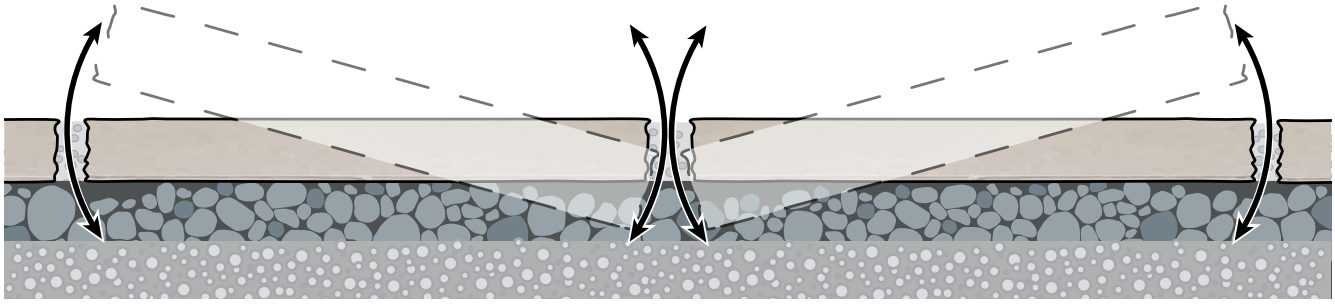
The key feature of these flags is their thickness, which ranges between 2 and 3 cm. Various installation options are possible, depending on the envisaged use of the area – the projected live loads being the decisive factor.

Rigid installation on a concrete ground slab or suitably thick pervious mortar bed has, of course, established itself as the best solution. Unfortunately, this is not always feasible or proves to be too elaborate. A partially bound assembly may, however, be possible in such cases.

Complete loose laying of the units is not recommended. One of the reasons is that, despite their 2 cm thickness, the flags are prone to "rocking" and vertical displacement when loaded at the edges due to leverage action and inadequate interlock between the flags at their joint faces. This may lead to the formation of "steps", i.e. trip hazards.

The above-mentioned bound or partially bound constructions are a useful option for laying flags or tiles, particularly on patios and terraces with the associated live loads. Clients are thus provided with a continuous patio surface that is easy to maintain and remains perfectly level throughout its service life.

New-generation ceramic flags in various formats for patios and terraces.



Ceramic flags on gravel bed subject to non-uniform loads, with unwanted "rocking" and vertical displacement.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Installation of bound-construction patio with 2 cm ceramic flags

Placement of unbound frost protection course.

Compaction of unbound base and frost protection course.

Preparation of pervious bedding mortar using screed pump.

Compaction and striking off of pervious mortar bed at required level.

Sopro MEG 665 megaFlex S2 highly flexible tile adhesive combed onto rear face of flag for laying by buttering method.

Installed flag paving, ready for finishing with Sopro FL plus flexible tile grout.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Partially bound construction on patios

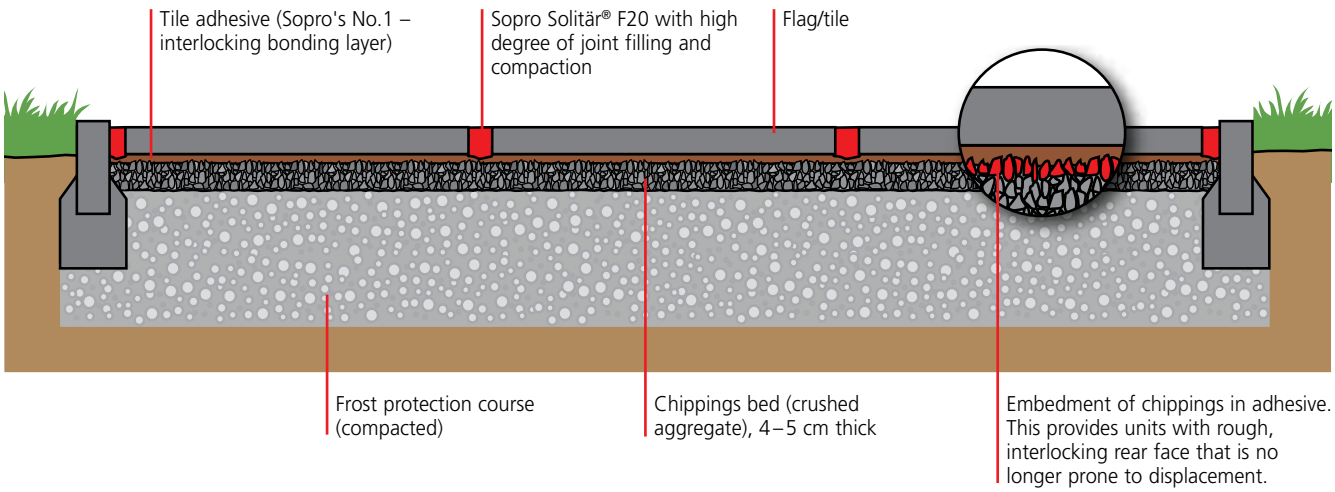
A partially bound construction may be adopted as long as it is clearly specified that the patio will only be subject to pedestrian traffic.

To ensure the proper performance of this solution, certain parameters need to be considered.

Composition:

- Properly compacted and suitably sized frost protection course.
- Chippings bed – crushed, angular aggregate, compacted.
- Perimeter edging to area (lawn kerbing etc.).
- Units laid with tile adhesive combed onto rear face (Sopro's No.1 flexible tile adhesive etc.) to achieve interlock between units and chippings.
- Joints filled with Sopro Solitär® F20 using water hose to wash in grout.
- Once Sopro Solitär® F20 has cured, it will remain pervious.

Sopro Solitär® F20



Adhesive (e.g. Sopro's No.1 flexible tile adhesive) applied to rear face of units.

Embedded chippings on rear face are clearly visible.

Straightforward grouting with Sopro Solitär® F20 using water hose and rubber squeegee.

External areas under ZDB data sheet, DIN 18531, normal, recessed and access balconies

Special applications
Balcony design with low construction height

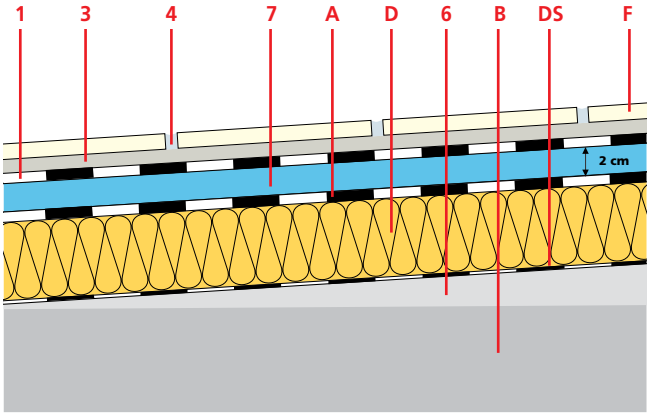
The required construction heights may not be available due to various site factors and constraints. Yet, floating and unbonded cement screeds require a minimum thickness to ensure failure-free accommodation of the incident flexural tensile forces.

The extension of DIN EN 13813 to include reaction resins as a new screed binder nonetheless allows the installation of thinner-layer floating screed constructions.

Bay lengths are limited to max. 3 m, while bay sizes are not allowed to exceed approx. 8–9 m².

Despite the insufficient height of the overall construction, a **design compliant with the German Flat Roof Guidelines** is feasible using a (min. 2 cm thick) floating, load-spreading layer of Sopro EE 771 epoxy mortar.

Moreover, the shrinkage-free curing properties of Sopro EE 771 allow laying in varying thicknesses (e.g. to falls) without any risk of stress accumulation.



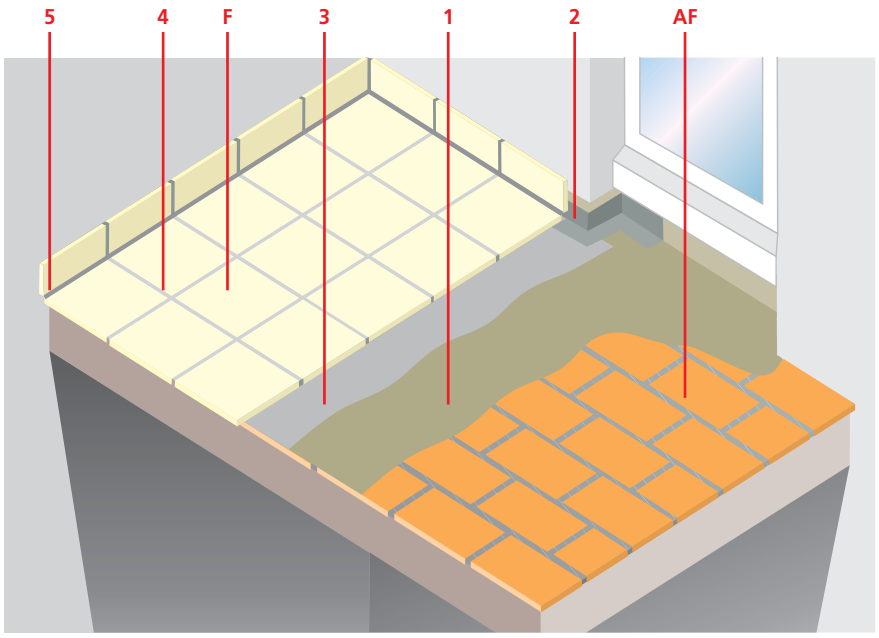
Outdoor construction with tile covering above habitable space to German Flat Roof Guidelines.

Sopro EE 771 epoxy mortar
Flexural tensile strength: ≥ 15 N/mm²
Compressive strength: ≥ 60 N/mm²

Further applications of the shrinkage-free Sopro EE 771 epoxy mortar are detailed in Section 11 "Levelling of substrates".

New finish on existing tile covering

Existing coverings, which inspection shows to be of adequate strength, can be overlaid with a new tile finish. The application of Sopro TDS 823 two-component turbo sealing slurry as a waterproof membrane is feasible in such situations, after cleaning and mechanical roughening of the existing covering. The tiles can then be laid using Sopro MEG 665/Sopro MEG 666 highly flexible tile adhesive.



Refurbishment.

1 Waterproof membrane with Sopro TDS 823 two-component turbo sealing slurry
2 Sealing tape
3 Flexible thin-bed tile adhesive
4 Sopro FL plus flexible tile grout
5 Sopro Sanitary Silicone
6 Levelling coat to falls using Sopro RAM 3 454 renovation and levelling mortar or Sopro VS 582 self-levelling filler
7 Thin screed produced with Sopro EE 771 epoxy mortar
A Waterproof sheet membrane
B Concrete
D Insulation
DS Vapour barrier
F Tile
AF Existing tile covering

Assessment and testing of waterproof membranes

The waterproofing materials approved under DIN 18534 Part 3 take the form of liquid-applied membranes that act compositely with the subsequently installed tile covering and must therefore be assessed as part of an integral system. The liquid membrane products are applied in at least two coats and are ultimately required to achieve a predetermined minimum dry coat thickness. Contractors are free to adopt their preferred application technique depending on their particular skills and experience. Common methods include brush, trowel, roller and spray application. Irrespective of the procedure, however, achievement of the specified minimum dry coat thicknesses for the particular materials is required upon completion of the works.

The minimum dry coat thickness comprises the nominal dry coat thickness plus a thickness supplement. In the absence of a specification by the manufacturer, a supplement of 25% should be applied.

The following minimum dry coat thicknesses are mandatory:

Polymer dispersions: (Application in two different colours to facilitate verification)	0.5 mm
Polymer/mortar composites:	2 mm
Reaction resin products:	1 mm

Calliper rule for measurement of coat thickness.

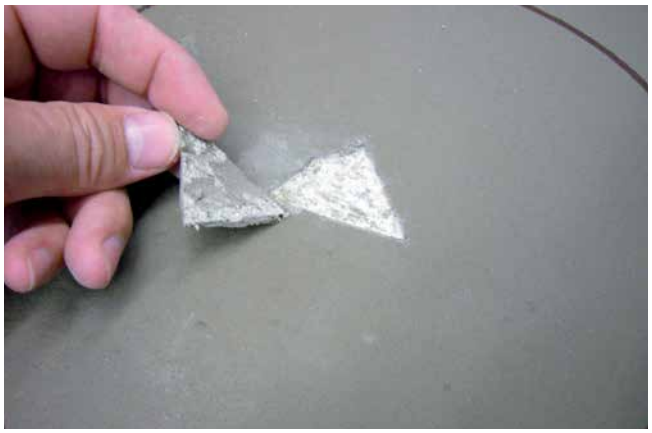
To ensure that the required coat thicknesses are achieved, checks on random specimens are recommended prior to tiling. The more critical the application (e.g. swimming pools, industrial facilities), the more intensive should be the treatment of waterproofing issues and the stricter the on-site quality control regime.

Coat thicknesses can be measured both on freshly applied material (using template) and on membranes that have set in order to confirm compliance or determine the magnitude of any deviations*.

It is recommended that all relevant parties (e.g. designer, site supervisor, applicator and, where appropriate, the client) be present during the performance of these tests.

A proven method involves cutting out a specimen whose thickness is then measured with a calliper rule.

The measurement points should be marked with a felt-tip pen and entered in the relevant project layout drawing.



Cut-out membrane specimen to be used for coat thickness measurement.

The measurement results should be duly recorded and appended to the site diary.

Schichtdickenmessung der Verbundabdichtung

Datum: 02.11.2010

Firma:	Fa. Sopro Bauchemie GmbH
Baustelle:	Hallenbad, Musterstadt
Systembezeichnung:	Verbundabdichtung
Produkt:	Sopro DichtSchlämme Flex 1-K (DSF 523)

Sportbecken
Prüfung der Abdichtung (zementäre, flexible, bauaufsichtlich zugelassene Dichtschlämme; geforderte Mindestschichtdicke 2 mm) bezüglich ihrer Schichtdicke

Bodenfläche "oben"
1. 2,6 mm
2. 3,1 mm
3. 3,9 mm
4. 3,3mm

mittleres Teilstück "Schräge"
5. 2,9 mm
6. 2,8 mm

Bodenfläche "unten"
7. 2,5 mm
8. 3,0 mm

Anmerkung
Die Schichtdickenwerte erfüllen die Vorgaben der Bauregelliste. Der optische Eindruck der Abdichtung ist mit "sehr gut" zu bewerten.

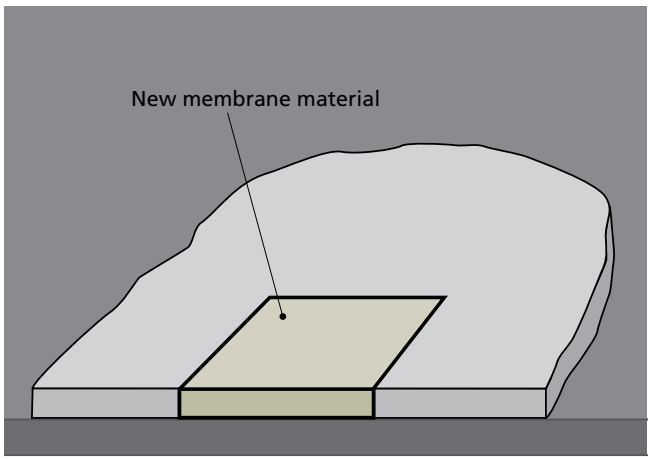
Report for site diary.

* Here, testing of W3-I areas is mandatory.
Up to 20 m^2 – 5 measurements; 100 m^2 – 10 measurements.

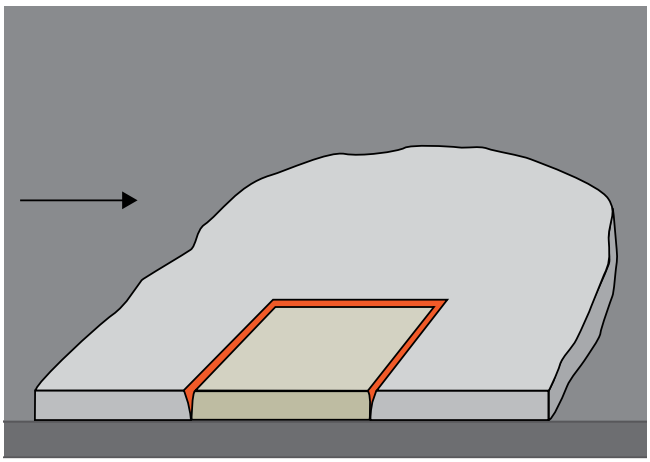
Assessment and testing of waterproof membranes

Resealing of measurement points:

To properly reseal the measurement points and reinstate the membrane, it is not enough simply to fill in the recess left by the cut-out with waterproofing compound. In such an event, the drying process would lead to shrinkage cracks at the junction between the existing membrane and the freshly applied material. To avoid this, the perimeter area around the cut-out should be lightly sanded down to produce a gently tapering transition.

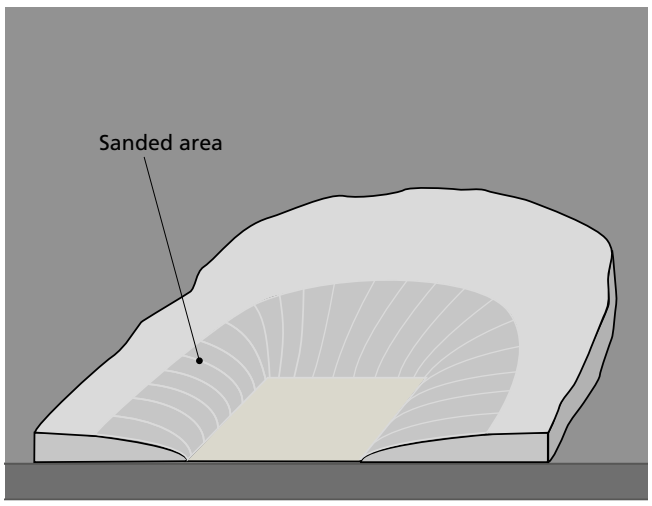


Measurement point "only" filled in…

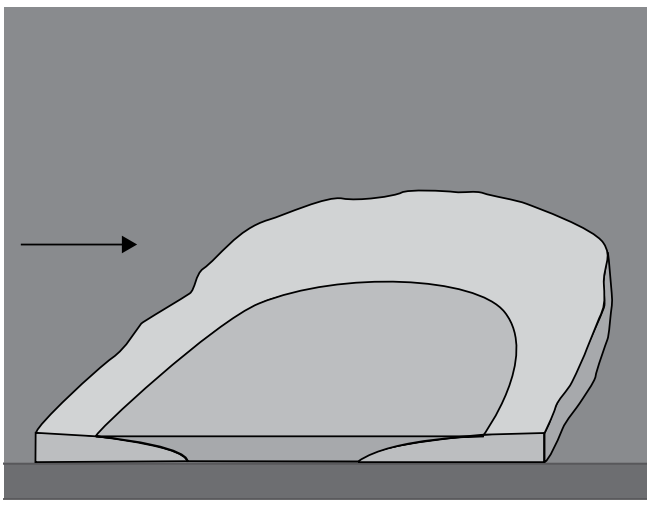


…leads to notch cracks at junction between old and new membrane.

Wrong



Measurement point sanded into funnel shape…



…and then filled with membrane material to produce lapped area.

Right

Assessment and testing of waterproof membranes

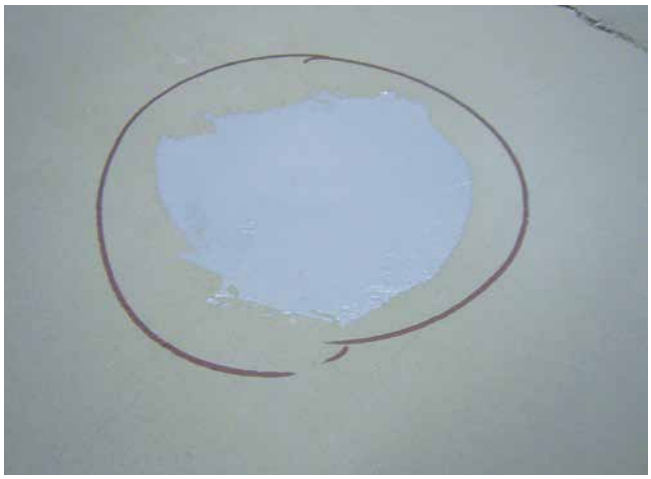
Resealing/overcoating of measurement point:

Measurement point.

Sanding around edges of cut-out to produce tapering transition.

Measurement point sanded into "dish" shape.

Filling of measurement point with membrane material.



Cut-out properly resealed to reinstate membrane.

Assessment and testing of waterproof membranes

Test methods for waterproof membranes

At the latest since their inclusion in the new waterproofing standard for indoor spaces, DIN 18534, composite waterproofing systems have acquired a new significance in terms of design, construction and on-site quality assurance/ acceptance. Various methods for assessment of the waterproof membranes are currently under development.

1. Inspection during installation

Templates can be used to perform an immediate check on coat thickness and the application of adequate material.

2. Sopro eScann® – electronic measurement of cured membrane

This method allows detection of any defects or "holidays", i.e. discontinuities, in the membrane. In order to use the measurement device, an electrically conductive coating (e.g. Sopro's No.1 flexible tile adhesive with Sopro ELD 458 conductive dispersion) must be applied below the membrane.

3. Vacuum test

The watertightness of joints between sheet membranes can be tested using a vacuum pump.

Repair of tile coverings in composite waterproofing systems

It is inevitable, given that waterproof/damp-proof membranes are nowadays installed below tile coverings in all wet areas, that various factors – e.g. damaged (fractured/cracked) tiles or retrofitted pipes – may necessitate later work to or extension of these membranes.

Case 1: Damaged tile

1 External action may cause damage to tile coverings, e.g. in the form of cracks or glaze spalling. The following precautions should be taken to prevent damage to the waterproof membrane during tiling repair.

2 To avoid any harm to the adjacent tiling when removing the damaged tile, the joint should first be carefully cut out with a joint cutter or angle grinder. It should be ensured that the waterproof membrane is not damaged during this operation.

3 After the joints are cut, the damaged tile can be shattered by gentle hammer blows and the fragments removed.

4 Removal of the tile fragments reveals the old adhesive bed.

5 To avoid the formation of steps and ensure flush installation of the new tiles, the old adhesive should be removed from the waterproof membrane using a disc sander. Once this is done, work can commence on replacing the tiles.

Repair of tile coverings in composite waterproofing systems

Case 2: Retrofitted penetrations

Alterations and extensions to building services systems may necessitate new installations that penetrate the waterproof membrane. Retrofitted installations require careful detailing by the designer and particularly careful workmanship on the part of the contractor.

1 As in Case 1: The damaged tile at the penetration is carefully removed and the adhesive bed sanded down to the level of the waterproof membrane. Provision is also required for a "dished" transition zone at membrane level to receive the new waterproofing material.

2 The penetrating pipe is enclosed by a Sopro sealing collar, which is worked into the membrane material.

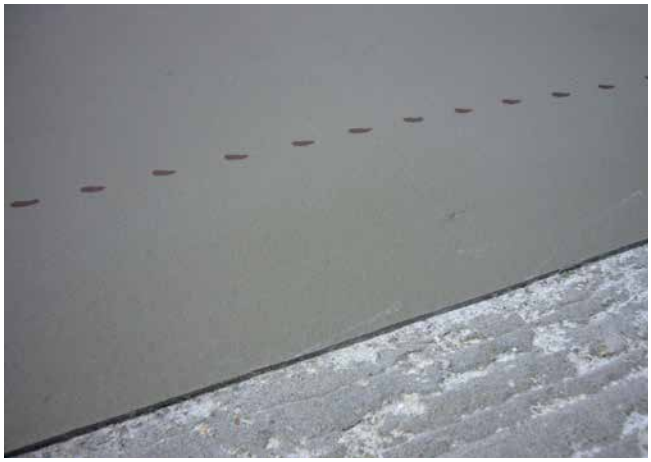
3 Careful waterproofing of the area around the penetration is crucial for long-term performance.

4 Finished penetration seal. The missing tiles can be replaced when the membrane has set. Of particular importance is the incorporation of an elastic seal between pipe and tile.

Repair of tile coverings in composite waterproofing systems

Case 3: Junctions between new and existing waterproof membranes

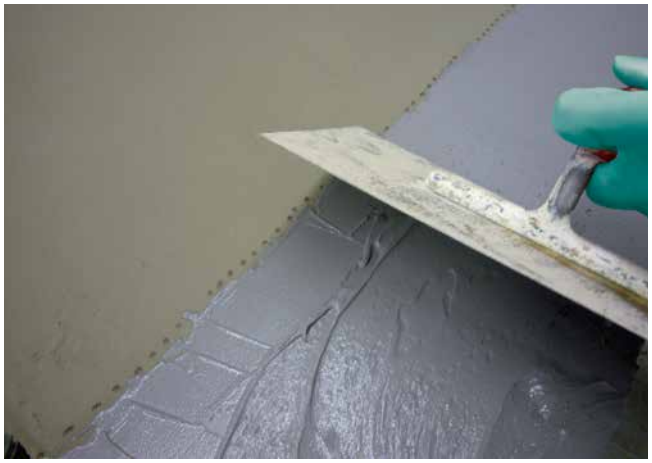
The procedure to be adopted for joining up new to existing waterproof membranes is similar to that for retrofitted penetrations (Case 2). The tiling should be carefully removed at the junction to uncover the existing membrane and allow a lapped transition.



1 The exposed membrane requires an approx. 10 cm wide edge zone for the junction with the new waterproof coating.

2 The edge zone of the membrane is feathered (thinned) out by sanding.

3 Properly prepared transition zone for junction with new waterproof membrane.



4 Overlapping and flushing up of new waterproof coating to existing membrane, e.g. using smoother.

Repair of tile coverings in composite waterproofing systems

Case 4: Junctions between new and existing waterproof membranes as part of a refurbishment

Example: Connection of newly installed barrier-free shower area to existing waterproof membrane

1 The joints in the first tile row are cut out.

2 The tiles are then shattered and the fragments carefully removed without damaging the membrane.

3 The waterproof barrier is scuff sanded and the adhesive residue removed using a small angle grinder.

4 An overlapping membrane is applied at the junction between shower and existing area.

5 Installed waterproof membrane (Sopro DSF 423 two-component flexible sealing slurry). Mosaic covering can be laid after drying.

Sopro product systems for sustainable construction

Schematic system composition

Low-emission waterproofing products*

Sopro FDF 525/527
flexible sealing compound

DGNB:
Top quality level 4,
Line 9**

Sopro TDS 823
two-component turbo sealing slurry

DGNB:
Top quality level 4,
Line 9**

Sopro AEB 640
waterproofing and separating membrane

DGNB:
Top quality level 4,
Line 9**

Other waterproofing products

Sopro PU-FD 570/571
surface sealant for walls/floors

DGNB:
Top quality level 3,
Line 20**

*For details of all relevant Sopro products, please consult our sustainability brochure.
**Rating under German Sustainable Building Council (DGNB) quality certification scheme, Criterion "ENV1.2 Local Environmental Impact" (2018 version).