Problematic substrates not readily amenable to trouble-free ceramic floor installation are frequently encountered on refurbishment schemes and even on isolated new-build contracts.

Unfortunately, in the case of renovation work, these critical substrates may only come to light when the walls and floors are uncovered – a factor that significantly complicates the design process. Yet, critical substrates are not confined to refurbishment work and similar problems may also arise on new-build projects. Such problems are particularly likely to occur where substrates have been damaged during site operations, have been wrongly installed or, due to time pressure, still exhibit too much residual moisture when work proceeds.

As a rule, it is not until tile layers start work on site that the problems become evident.

They nonetheless have to find a way of installing comparatively thin, inflexible tile or natural stone coverings on unstable and critical substrates so as to guarantee satisfactory long-term performance and eliminate the risk of failures.

In terms of movement, timber joist floors covered with floorboards or particleboard are a frequent cause of headaches. The trouble-free laying of tile or natural stone coverings on these (wood, composite etc.) substrates may be achieved through the insertion of a separating layer between substrate and finish. The separating layer must, at the same time, be able to accommodate all design live loads and stresses.

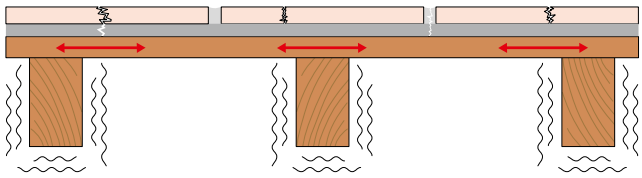
Sopro FDP 558 tile insulation board, a polyester fibre-board product manufactured in a range of thicknesses (2 mm, 4 mm, 7 mm, 9 mm and 12 mm), may be installed as a break in the floor assembly as well as to provide thermal and impact sound insulation. It also serves to improve the bending strength (from 7 mm upwards) and stiffen the overall construction.

Sopro TDP 565 impact sound insulation board (8 mm) offers a suitable alternative where enhanced impact sound insulation requirements are additionally specified.

Apart from providing impact sound insulation, it can also serve as a thermal insulation layer. Specialized applications include stair constructions in multi-storey residential facilities.

Refurbishment of old properties.

Where tile coverings are directly installed on deformation-sensitive substrates, crack formation in joints and coverings is inevitable.



Timber floorboards as tiling substrate.

Sopro FDP 558/Sopro TDP 565 Technical data

Sopro FDP 558 tile insulation board

Sopro TDP 565 impact sound insulation board

	Sopro FDP 558 tile insulation board					**Sopro TDP 565 impact sound insulation board**
Composition	Pressed, resin-bonded polyester fibreboard.					Pressed, resin-bonded polyester fibreboard with special sandwich nonwoven coating.
Thickness	2 mm separating board	4 mm separating board	7 mm universal underlay and insulation board	9 mm universal underlay and insulation board	12 mm comfort insulation board	8 mm impact sound insulation board
Board size	100 cm × 60 cm	100 cm × 60 cm	100 cm × 60 cm	100 cm × 60 cm	100 cm × 60 cm	100 cm × 60 cm
Weight	Approx. 0.8 kg/m²	Approx. 2.9 kg/m²	Approx. 4.5 kg/m²	Approx. 6.3 kg/m²	Approx. 8.4 kg/m²	Approx. 4.2 kg/m²
Packaging	Box: 30 panels = 18 m² pallet: 400 panels = 240 m²	Box: 15 panels = 9 m² pallet: 200 panels = 120 m²	Box: 12 panels = 7.2 m² pallet: 120 panels = 72 m²	Box: 10 panels = 6 m² pallet: 100 panels = 60 m²	Box: 7 panels = 4.2 m² pallet: 80 panels = 48 m²	Package: 5 panels = 3 m²
Impact sound reduction	Up to 8 dB* with tiling	Up to 10 dB* with tiling	Up to 10 dB* with tiling	Up to 10 dB* with tiling	Up to 10 dB* with tiling	Up to 16 dB* with tiling
Thermal conductivity	0.0511 W/mK	0.0954 W/mK	0.0793 W/mK	0.0950 W/mK	0.0944 W/mK	0.085 W/mK
Thermal resistance	0.039 m² K/W	0.042 m² K/W	0.088 m² K/W	0.095 m² K/W	0.127 m² K/W	0.10 m² K/W
Reaction to fire to DIN EN 13501-1	Class E	Class E	Class E	Class E	Class E	Class E

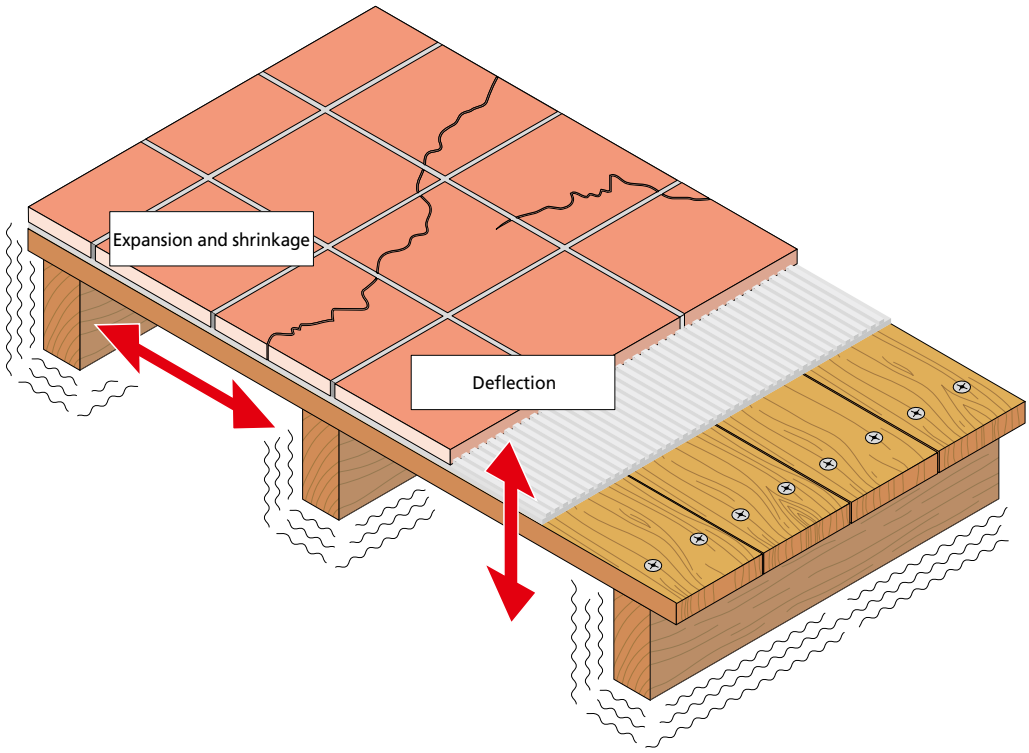
*Test stand value to DIN EN ISO 140-8 serving as a general guide. **Note:** The impact sound reduction values determined and stated by the test institute are not always applicable to particular construction projects due to differences between the project-specific assembly and the standard test set-up. The performance of trial installations and measurements is therefore recommended, in each case, to establish the actual impact sound reduction index achievable on site!

Separating layers for critical substrates
Timber substrates

In older buildings, timber constructions are a frequently encountered substrate for the installation of ceramic coverings. However, as a material, wood is inherently subject to dimensional changes due to the water stored in the material. Release of this water (through drying) leads to shrinkage while water absorption causes swelling. In the long term, rigid coverings are unable to accommodate these dimensional changes. Direct installation, without a separating layer, is certain to result in cracking and void formation.

Cracking in floor finish at particleboard joints caused by vibration (e.g. through washing machine).

Cracking and fracturing of tiles due to direct laying on timber floorboards.

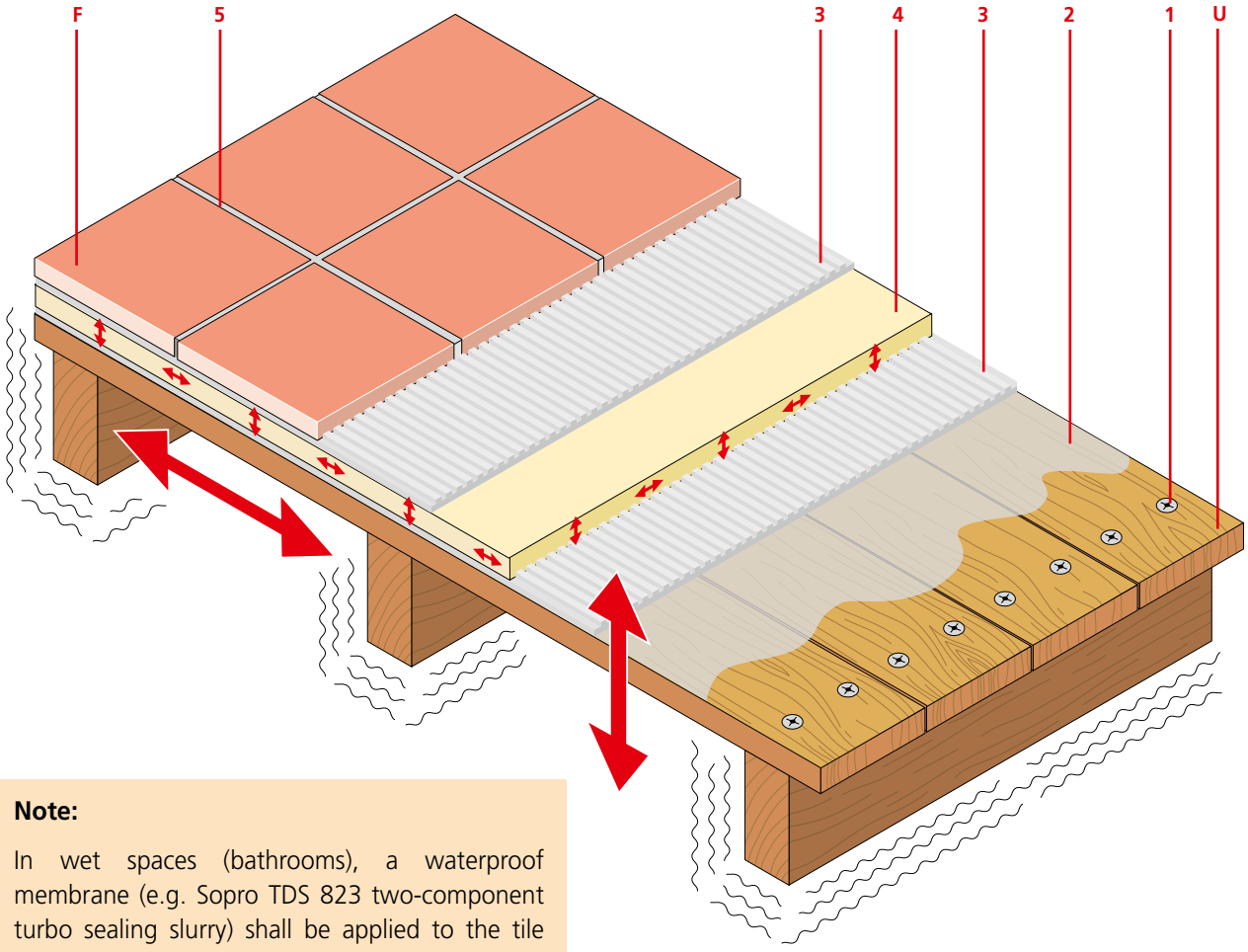


Direct stress transmission to rigid floor finish with consequent cracking.

Separating layers for critical substrates
Timber substrates

Given that ceramic and natural stone coverings, as an integral element (with grouting), behave like a large glass pane, due provision is required to accommodate any stresses and movement in the substrate such as those described above. The Sopro FDP 558 tile insulation board (≥ 7 mm) bonded to the timber substrate reliably separates this from the finish. The separating layer also serves to increase the bending strength of the overall construction and accommodate the incident stresses and deformation. The rigid (tile/natural stone) covering is thus permanently protected against damage.

Example of wood-board flooring.



Note:

In wet spaces (bathrooms), a waterproof membrane (e.g. Sopro TDS 823 two-component turbo sealing slurry) shall be applied to the tile insulation board prior to tiling.

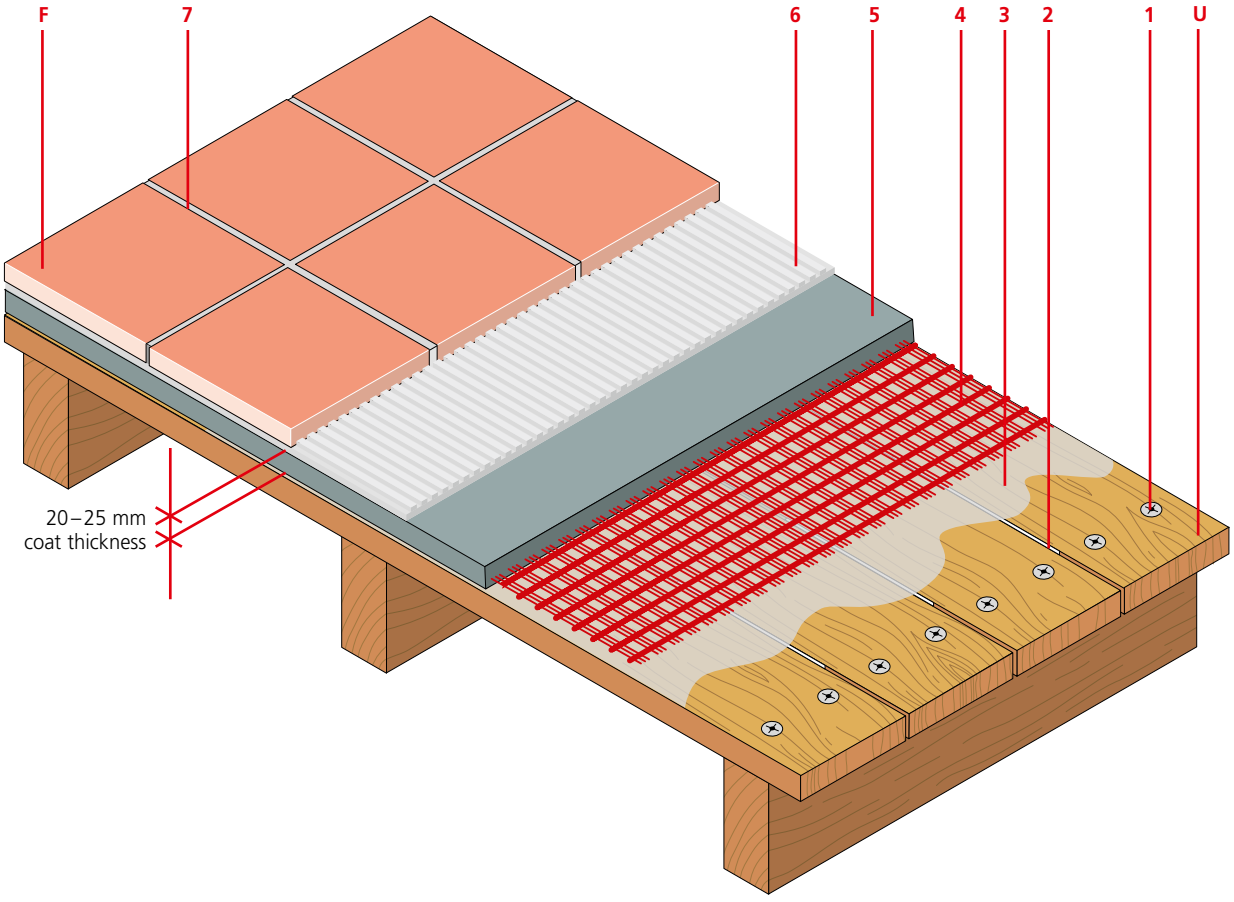
Performing the triple function of cushion, stiffening layer and sliding bearing, the (Sopro FDP 558) separating layer accommodates both vertical and horizontal forces.

1 Wood screw fixings
2 Sopro HPS 673 bonding primer
3 Flexible Sopro thin-bed adhesive
4 Sopro FDP 558 tile insulation board
5 Sopro DF 10 flexible designer tile grout
F Tile
U Substrate/timber floorboard

Separating layers for critical substrates
Timber substrates

If the structural strength and properties of the timber (joist) floor are adequate, then a fibre-reinforced surface filler (Sopro VS 582) additionally incorporating a reinforcing scrim (Sopro PG-X 1188 armour scrim eXtra) can also be used to produce a thin load-spreading layer.

The scrim is laid on the surface with lapped joints prior to application of the Sopro VS 582 filler. When the filler is placed, it flows around the Sopro PG-X 1188 scrim. The fine-meshed scrim structure then enables the thin-layer construction to accommodate very high flexural tensile and shear forces. The filler coat must, however, be applied with a minimum thickness of 20–25 mm. Tiles can then be installed directly on top of this.

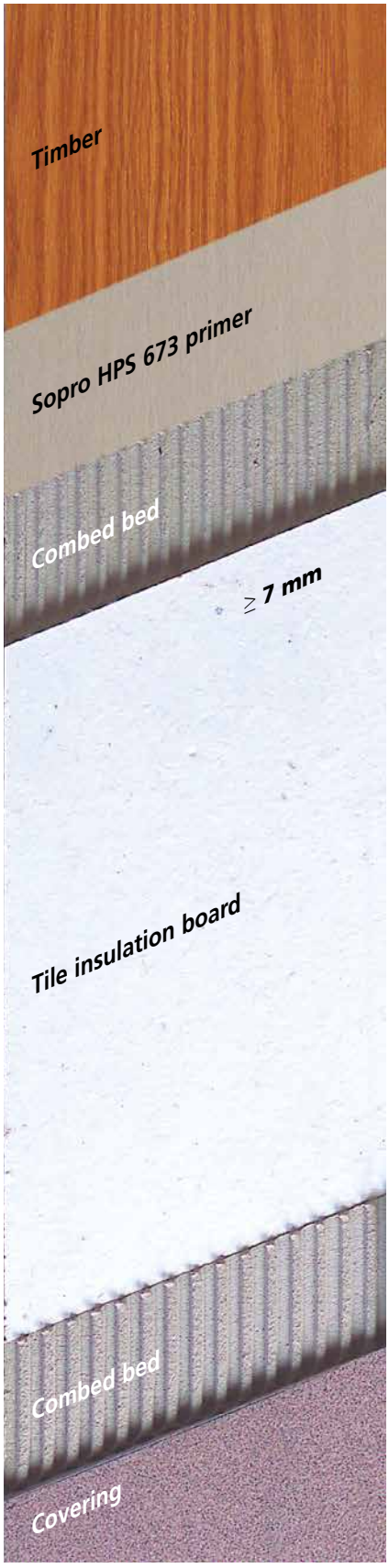


Scrim and filler form a structurally continuous bond.

1 Wood screw fixings
2 Sopro DA 049 acrylic sealant
3 Sopro HPS 673 bonding primer
4 Sopro PG-X 1188 armour scrim eXtra
5 Sopro VS 582 self-levelling filler
6 Flexible Sopro thin-bed adhesive
7 Sopro DF 10 flexible designer tile grout
F Tile
U Substrate/timber floorboard

Separating layers for critical substrates
Timber substrates

System composition



Product recommendation

Sopro HPS 673

Sopro FAS 551

Sopro VS 582

Sopro FDP 558

Sopro MG 669

Sopro MG 679

Sopro VF 419

Sopro VF XL 413

Sopro DF 10

Sopro FL plus

Separating layers for critical substrates
Timber substrates

Application

1 Wood-board flooring to be overlaid with ceramic covering as part of refurbishment scheme.

2 First secure elastic floorboards with wood screws.

3 Check wood flooring for levelness. Uneven flooring requires levelling out.

4 Start by sealing floorboard joints with Sopro DA 049 acrylic sealant to prevent escape of flow-applied floor-levelling compound.

5 Install perimeter insulation strip, e.g. Sopro RDS 960, at junctions with all vertical elements (walls).

6 Pretreat timber floorboards with Sopro HPS 673 bonding primer. This seals off wood surface and significantly improves bond with subsequently applied products.

Separating layers for critical substrates
Timber substrates

Application

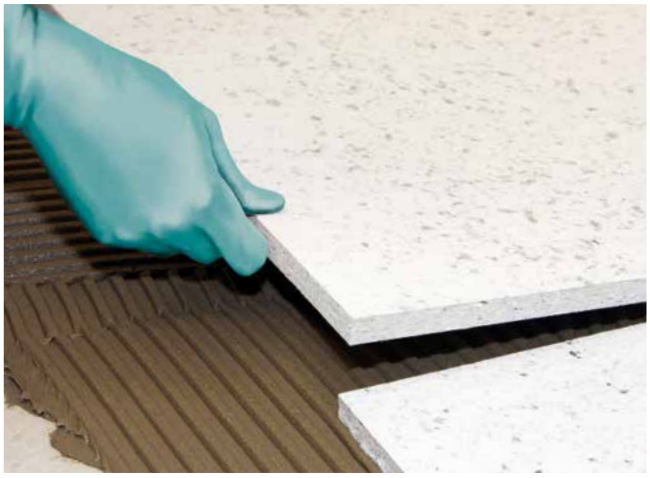
7 Pour flexible Sopro FAS 551 fibre-reinforced self-levelling filler or Sopro VS 582 self-levelling filler directly onto wood-board flooring.

8 Spread and compact self-levelling filler using spiked roller to create plane, level surface.

9 If wood-board flooring is level (no filler required), comb adhesive, e.g. Sopro VF XL 413 VarioFlex® large-format flexible tile adhesive, directly onto floorboards primed with Sopro HPS 673, prior to installation of Sopro FDP 558 tile insulation board.

10 Place Sopro FDP 558 (9 mm) tile insulation board into freshly applied adhesive so as to ensure full bedding.

11 Sopro FDP 558 board can be worked and cut to size as required, e.g. using hand-held circular saw.



12 Sopro FDP 558 boards are easy to lay as they only require butt-jointing.

Separating layers for critical substrates
Timber substrates

Application

13 Lay FDP 558 board with staggered joints.

14 Finished separating layer over wood-board flooring, ready for installation of ceramic covering.

15 To install ceramic covering, apply e.g. Sopro VF XL 413 VarioFlex® large-format flexible tile adhesive to Sopro FDP 558 board.

16 Lay ceramic units in prepared adhesive bed.

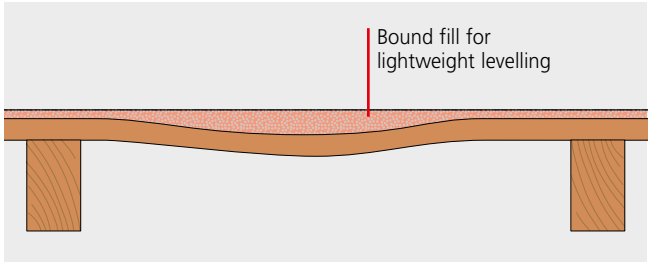
17 Finish joints in covering with Sopro FL plus flexible tile grout or Sopro DF 10 flexible designer tile grout.

18 Ceramic covering installed with separating layer over timber substrate.

Separating layers for critical substrates Lightweight thick-layer floor assemblies

On refurbishment schemes, the project team is often confronted with floor constructions which, due to their age, have become so warped or deformed from settlement or the "working" of the incorporated materials that thin levelling coats no longer offer a viable solution.

The use of standard screeds is not feasible due to their weight. Here, a lightweight levelling layer is needed to even out the "old flooring".



Warped floor construction levelled out by lightweight coat.

Placement of bound lightweight fill directly onto uneven concrete slab.

BEB
BUNDESVERBAND ESTRICH UND BELAG

Hinweise zur Planung und Ausführung von Fußbodenkonstruktionen bei Rohren, Leitungen und Einbauteilen auf Rohdecken
Stand: Januar 2015

Sammelmappen-Register-Nr. 4.6

Herausgegeben von:
Bundesverband Estrich und Belag e.V., Troisdorf-Oberlar
Bundesfachgruppe Estrich und Belag im Zentralverband des Deutschen Baugewerbes e.V., Berlin

Inhaltsverzeichnis

0. Einleitung

Rohdecken, auf denen keine Rohre, Leitungen, Kanäle und andere Einbauteile vorhanden sind, nachfolgend als Installationen bezeichnet, gibt es im realen Baugeschehen in der Regel nicht. Um daraus resultierende Einschränkungen der Fußbodenkonstruktion (z. B. bezüglich Trittschallschutz, Wärmeschutz und Tragfähigkeit) zu vermeiden, sind planerische und ausführungstechnische Aspekte zu berücksichtigen. Dieser Sachverhalt wird meistens planerisch nicht beachtet. Die nachträgliche Anpassung der Fußbodenkonstruktion ist sehr aufwändig oder nicht realisierbar.

Nach DIN 18353 [1] muss der Estrichleger bei Prüfung der Vorleistung Bedenken anmelden, wenn z. B. Rohrleitungen oder dergleichen auf dem Untergrund verlegt sind und kein Höhenausgleich vorgesehen ist.

Auch DIN 18560 [2] schreibt vor, dass der tragende Untergrund keine punktförmigen Erhebungen, Rohrleitungen oder Ähnliches aufweisen darf, die zu Schalltrücken und/oder Schwankungen in der Estrichdicke führen können.

Das bedeutet:

– Installationen müssen auf dem tragenden Untergrund befestigt sein. Durch eine Ausgleichsschicht ist wieder eine ebene und tragfähige Oberfläche zur Aufnahme der Dämmschicht – zumindest jedoch der Trittschalldämmung – zu schaffen. Die dazu erforderliche Konstruktionshöhe muss geplant sein.

– Die Ausgleichsschicht muss im eingebauten Zustand eine gebundene Form aufweisen. Ungebundene Schüttungen dürfen verwendet werden, wenn deren Brauchbarkeit nachgewiesen ist.

– Bei ausreichender Ebenheit des Untergrunds, nicht aber bei unterschiedlich hohen Installationen, kann die Ausgleichsschicht durch druckbelastbare Dämmstoffe in Plattenform erfolgen. Ausnahmen hierzu sind unter 4.2.3 geregelt.

1. Anwendungsbereich

Der Anwendungsbereich dieses Hinweisblattes betrifft schwimmende Fußbodenkonstruktionen und Fußbodenkonstruktionen auf Trennschicht. Estriche auf Ausgleichsschichten sind in der Regel nach DIN 18560-2 [2] als Estriche auf Dämmschichten zu bemessen.

Dieses Blatt gibt Hinweise für Maßnahmen, die bei Installationen auf Rohdecken zu ergreifen sind, um den Wärme-, Trittschall- und Korrosionsschutz sowie die Tragfähigkeit der Fußbodenkonstruktionen zu gewährleisten. Die Maßnahmen sind raum- oder etagenweise zu betrachten. Die Auswahl von Bodenbelägen, die Materialauswahl von Rohren, deren Umhüllung sowie Brandschutzbelange sind nicht Gegenstand dieses Hinweisblattes.

2. Begriffe

Gebundene Schüttungen bzw. Ausgleichmörtel:

– als gebundene Schüttung: Körnung verklebt beim Einbau
Beim Ausbau können zusammenhängende Teile entnommen werden, die manuell wieder in Körnung zerbrochen werden können.

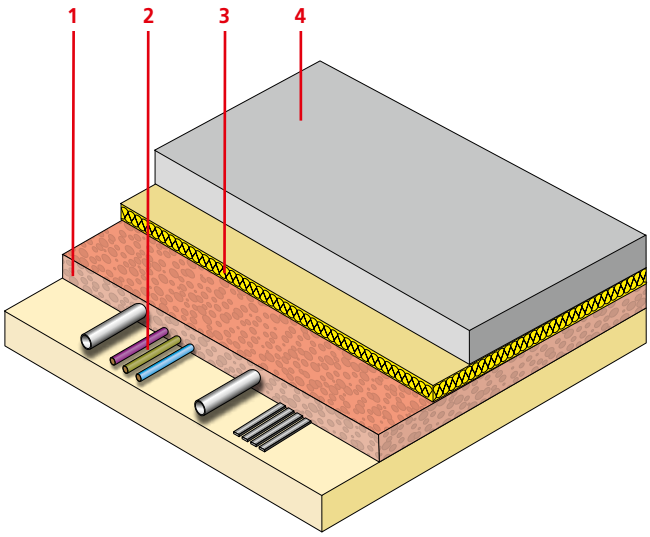
– als Ausgleichmörtel: Mörtel aus Bindemittel mit (Leicht-) Zuschlag oder Bindemittel mit Schaum/Luftporen oder in Kombination

The BEB (German Federal Association of Screed and Floor Covering) data sheet "Guidance on design and workmanship for floor constructions with pipes, other service installations, fixtures and fittings on structural slabs" offers a useful basis for designing floor solutions incorporating bound fill.

Service runs

The common present-day practice, particularly on new-build projects, of carrying service installations (e.g. pipes) through the floor construction is an added complication. Here too, lightweight levelling layers are required to provide a sound base for the overlying floor construction.

Service runs carried across structural slab.



1 Sopro LZ 987 SMART® lightweight aggregate with Sopro Rapidur® B5/B3/B1 rapid-set screed binder
2 Service runs
3 Insulation
4 Screed

Separating layers for critical substrates
Lightweight thick-layer floor assemblies

Application

1 Protect (timber) substrate against moisture infiltration with sheeting or Sopro HPS 673 bonding primer.

2 Prepare bound lightweight fill material with Sopro LZ 987 SMART® lightweight aggregate and Rapidur® B5 rapid-set binder.

3 Spread, compact and smooth down bound lightweight fill material.

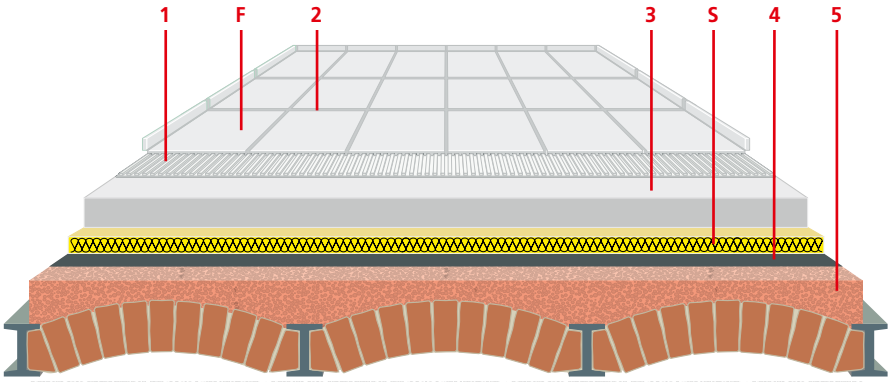
4 Bound fill ready to serve as base for screed laying.

Separating layers for critical substrates
Lightweight thick-layer floor assemblies

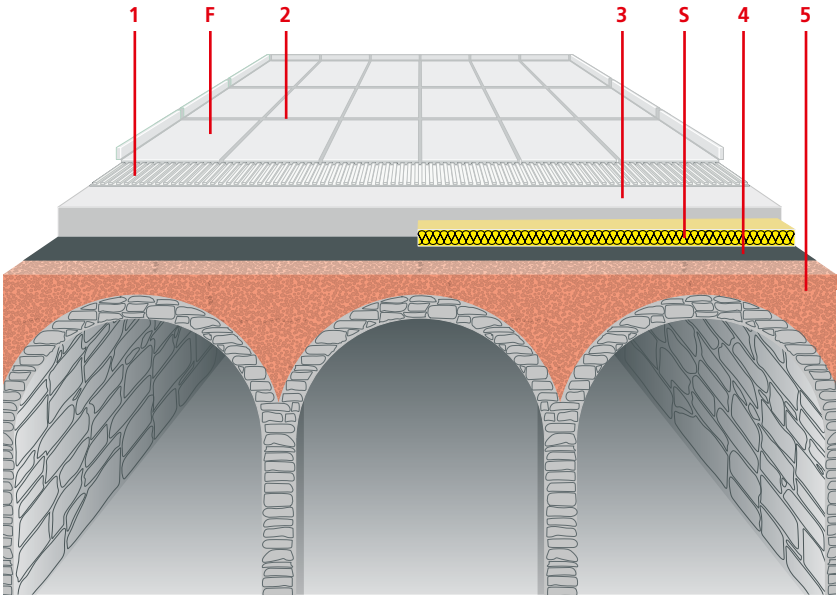
These lightweight levelling layers are installed using bound materials (prepared with rapid-set binders, e.g. Rapidur® B5/B3/B1) and exhibit a very high compressive strength after hardening. Their use in conjunction with a (wet) screed or board subfloor offers a reliable solution for a wide range of situations on site.

They are particularly useful for vaulted floor constructions, where the required levelling layers are often centimetres thick. Not being prone to shrinkage or settlement, bound mineral fill (e.g. Sopro LZ 987 SMART® lightweight aggregate) is ideal for such applications. It can then serve as a base for an unbonded screed on a separating layer or for a floating screed.

Shallow-vaulted ceiling.



Shallow ("Prussian") vaulted floor construction.



Vaulted floor construction (groin or barrel vaults), e.g. old basement ceiling slabs.

F Tile

S Insulation layer

1 Sopro tile adhesive (various adhesives can be used)

2 Grouting
Sopro DF 10 flexible designer tile grout

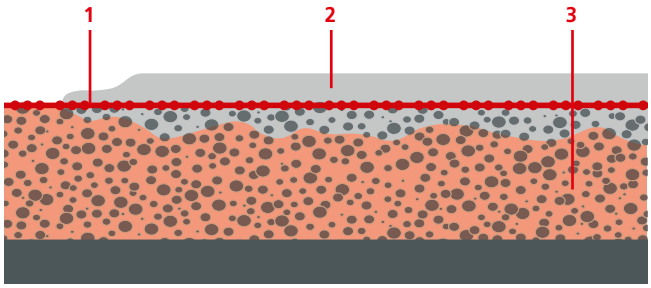
3 Screed
Sopro Rapidur® FE 678 self-levelling screed (floating and/or on separating layer)

4 PE sheet

5 Bound Sopro LZ 987 SMART® lightweight aggregate with Sopro Rapidur® B5/B3/B1 rapid-set screed binder

Separating layers for critical substrates
Lightweight thick-layer floor assemblies

Due to its low shrinkage and high resistance to compressive loads, bound mineral fill (e.g. Sopro LZ 987 SMART® lightweight aggregate) allows the installation of diverse floor assemblies. Through the use of a reinforcing scrim (e.g. Sopro PG-X 1188 armour scrim eXtra) in conjunction with a flow-applied, self-levelling filler (e.g. Sopro VS 582 or Sopro FS 15 550), it is possible to produce a finished floor surface in direct contact with the lightweight levelling layer.



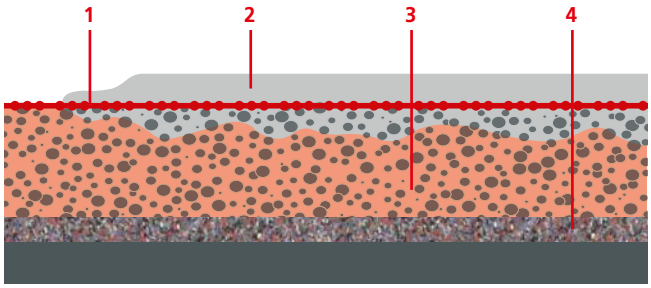
Bonded construction.

1 Sopro PG-X 1188 armour scrim eXtra

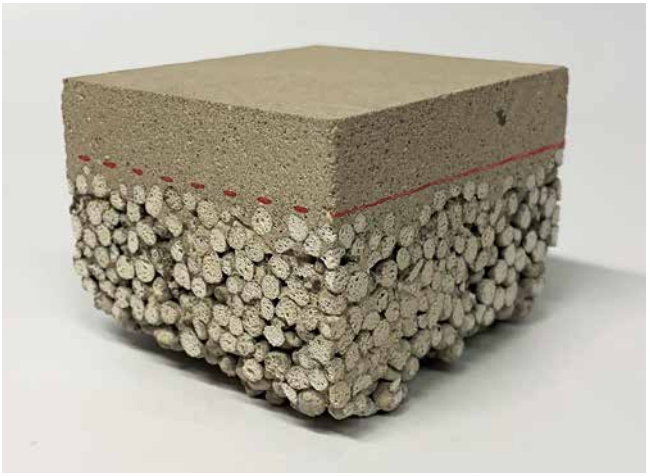
2 Self-levelling filler (Sopro VS 582)

3 Bound fill (Sopro LZ 987 SMART®)

4 Sopro TEB 664 impact sound insulation and separating layer



Additional impact sound reduction is achievable through incorporation of Sopro TEB 664 impact sound insulation and separating layer below bound fill.



Sopro VS 582 self-levelling filler plus scrim in bonded construction with lightweight aggregate.

Lightweight aggregate.

Scrim laid out on floor.

Pouring of Sopro VS 582 self-levelling filler onto floor.

Separating layers for critical substrates
Walls

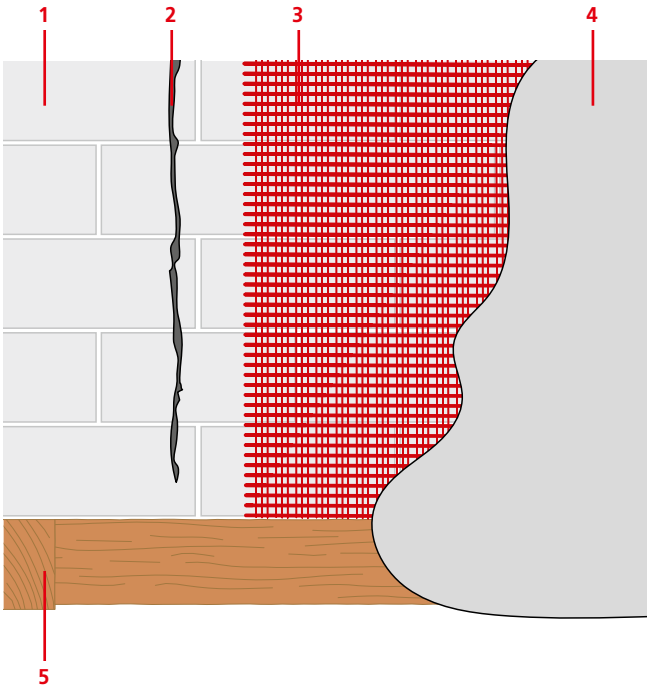
Wall surfaces are often in a similarly poor condition and unsuitable for the direct installation of tile coverings. Moreover, in such cases, the insertion of a lining is frequently unfeasible due to spatial constraints.

Cracked substrate.

Composite substrate.

The application of a surface filler coat with incorporated Sopro PG-X 1188 armour scrim eXtra may provide the solution. As the scrim is able to accommodate very high shear forces due to its structure, it can transform a poor base into an acceptable tiling substrate.

It is applied monolithically with an approx. 2–3 mm coat of flexible (S1-grade) thin-bed adhesive.



1 Masonry

2 Crack

3 Sopro PG-X 1188 armour scrim eXtra with (S1-grade) Sopro thin-bed adhesive

4 Tile adhesive or plaster

5 Timber beam

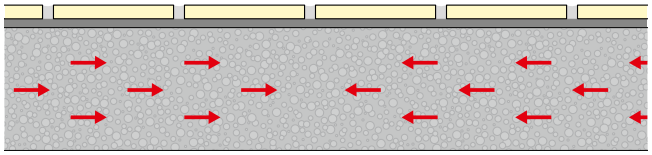
Separating layers for critical substrates
Concrete substrates

The physical properties of new-build facilities – partly as a result of modern-day construction practice (floors with large spans) coupled with the young age of the fabric – are often conducive to strain/deformation through shrinkage, creep and fatigue. The short construction times frequently prevent observance of the waiting times for interior fit-outs (including tiling) prescribed by the relevant DIN standards. The inevitable failures in rigid wall and floor finishes generally take the form of cracking and voids/hollows below the covering.

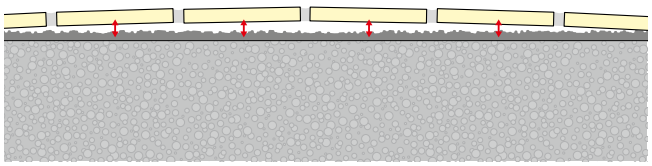
1. Green concrete slabs

Freshly laid concrete slabs and walls require a certain time to dry and harden. In view of the material's inherent drying shrinkage, German standard DIN 18157 prescribes a six-month waiting time prior to tiling over standard in-situ concrete substrates. This period is, however, seldom observed. Indeed, tile laying with highly flexible thin-bed adhesives is possible on three-month-old concrete and has now become standard practice. Where the construction window is even tighter, the incorporation of a separating layer offers the only viable solution.

Freshly placed concrete slab at airport terminal.

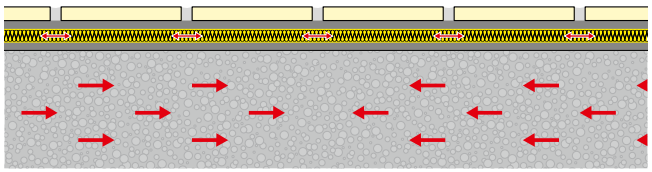


Stress accumulation due to slab shrinkage.



Large-scale adhesion failure of floor covering as result.

Adhesion failure due to premature tiling over concrete floor slab.



Prevention of void formation through incorporation of separating layer that acts like a sliding bearing.

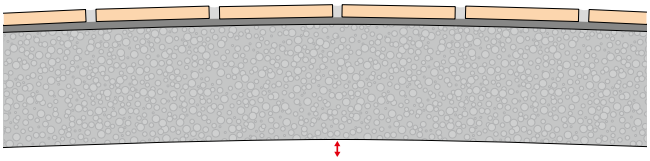
Separating layers for critical substrates
Concrete substrates

2. Prestressed slab constructions

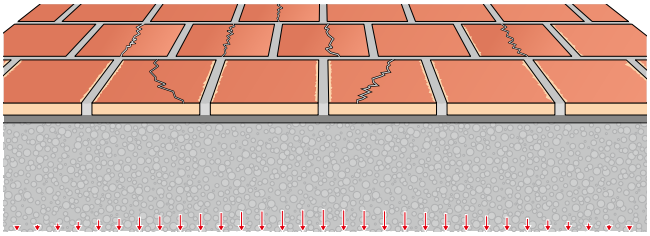
Prestressed concrete slabs, which are installed with a (1 – 5 cm) camber, are prone to stress relaxation due to material fatigue and creep and may ultimately even sag (structurally irrelevant). This stress relaxation will, of course, affect any rigid coverings in direct contact with these slabs, with failures in the form of spalling, cracking etc. as the upshot. Here too, then, measures are needed to prevent failure of the coverings.

Problems addressed by German Natural Stone Association (DNV) data sheet.

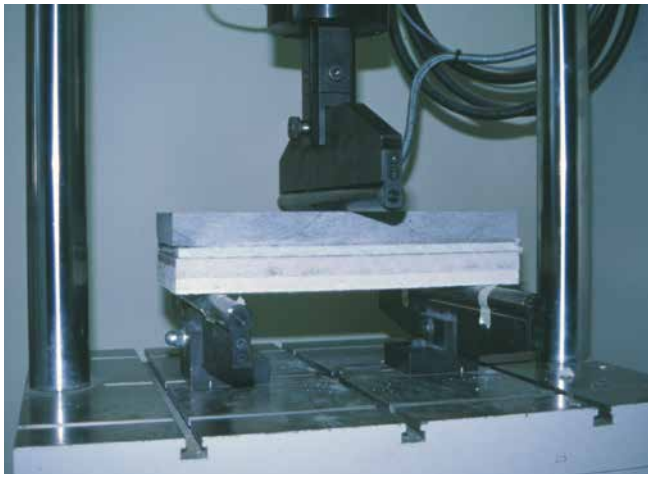
Cambered, prestressed concrete slab, which may sink by 2 – 4 cm at mid-span due to stress relaxation.



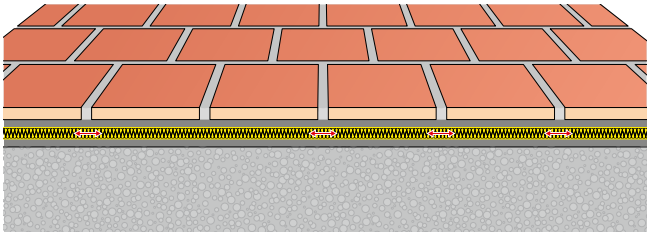
Cambered prestressed concrete slab.



Stress relaxation in slab causing cracks in floor covering.



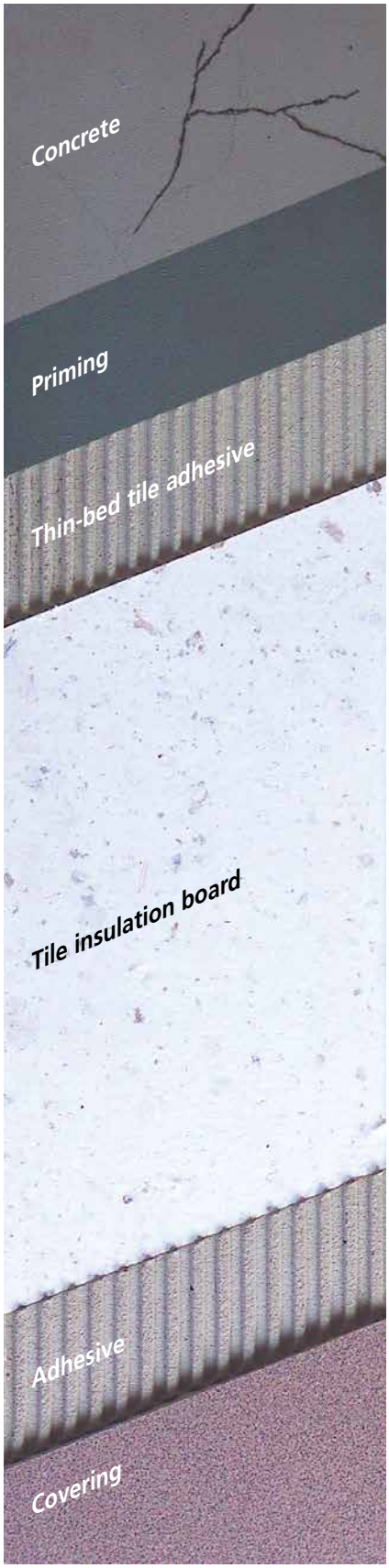
Test set-up to determine deflection and maximum load capacity of separated system.



Separating layer (Sopro FDP 558 tile insulation board) allowing failure-free transmission of vertical displacement to horizontal plane.

Separating layers for critical substrates
Concrete substrates

System composition



Product recommendation

Sopro GD 749

Sopro VF 419

Sopro FDP 558

Thin-bed tile adhesive

Sopro VF XL 413, Sopro FKM XL 444, Sopro's No.1

Medium-bed tile adhesive

Sopro MB 414

Sopro MDM 888

Sopro FL plus

* Meets C2 TE requirements to DIN EN 12004 where 10 mm serration is used.

Separating layers for critical substrates
Concrete substrates

Application

1 Prime absorbent substrate.

2 Install Sopro FDP 558 tile insulation board to separate substrate from (natural stone) floor covering.

3 Lay natural stone covering using Sopro MB 414 medium-bed flexible tile adhesive.

4 Finished floor covering.

Impact sound insulation
Additional measures to DIN 4109

To achieve contemporary levels of sound control in older buildings or in buildings without sound-insulating, floating screed constructions, it is often necessary to separate coverings and finishes from structurally continuous elements such as floor slabs, landings or stairs (reduction of sound transmission through discontinuous construction). On refurbishment schemes, this may be achieved through incorporation of Sopro FDP 558 tile insulation board, Sopro TDP 565 impact sound insulation board or Sopro TEB 664 impact sound insulation and separating layer between substrate and tile covering. Such solutions allow compliance with the thresholds specified in **DIN 4109** and the VDI (Association of German Engineers) guidelines.

Where refurbishments in multi-storey buildings entail the replacement of resilient floorings contributing to **impact sound control** by tile coverings, which in themselves offer no impact sound reduction, suitable provision is required to ensure preservation of the impact sound insulation performance of the floor construction (for further details, see relevant ZDB (Federation of the German Construction Industry) data sheet). Both Sopro FDP 558 tile insulation board and Sopro TDP 565 impact sound insulation board lend themselves to such applications.

Sopro FDP 558

Sopro TDP 565

Impact sound reduction		
Sopro FDP 558	**2 mm**	**up to 8 dB***
Sopro FDP 558	**4 mm**	**up to 10 dB***
Sopro FDP 558	**7 mm**	**up to 10 dB***
Sopro FDP 558	**9 mm**	**up to 10 dB***
Sopro FDP 558	**12 mm**	**up to 10 dB***
Sopro TDP 565	**8 mm**	**up to 16 dB***

* Test stand value to DIN EN ISO 140-8 serving as a general guide. Note: The impact sound reduction values determined and stated by the test institute are not always applicable to particular construction projects due to differences between the project-specific assembly and the standard test set-up. The performance of trial installations and measurements is therefore recommended, in each case, to establish the actual impact sound reduction index achievable on site!

Impact sound insulation
Additional measures to DIN 4109

The following impact sound requirements apply for stairwells:

- Multi-storey buildings and apartments:
  ➥ weighted normalized impact sound pressure level $L'_{n,w}$ = 58 dB
- Semi-detached and terraced houses:
  ➥ weighted normalized impact sound pressure level $L'_{n,w}$ = 53 dB

The required impact sound reduction is generally achieved by means of floating screeds on landing areas and through elastically suspended stair flights.

A weighted normalized impact sound pressure level $L'_{n,w} \leq 53$ dB is required for separating floors between apartments and working spaces of different occupancies in multi-storey buildings.

This value is achievable by a floating screed. However, where installation of a floating screed is not feasible on refurbishment projects, particularly with stair flights, the use of Sopro FDP 558 tile insulation board or Sopro TDP 565 impact sound insulation board offers a viable alternative for delivering the required sound reduction.

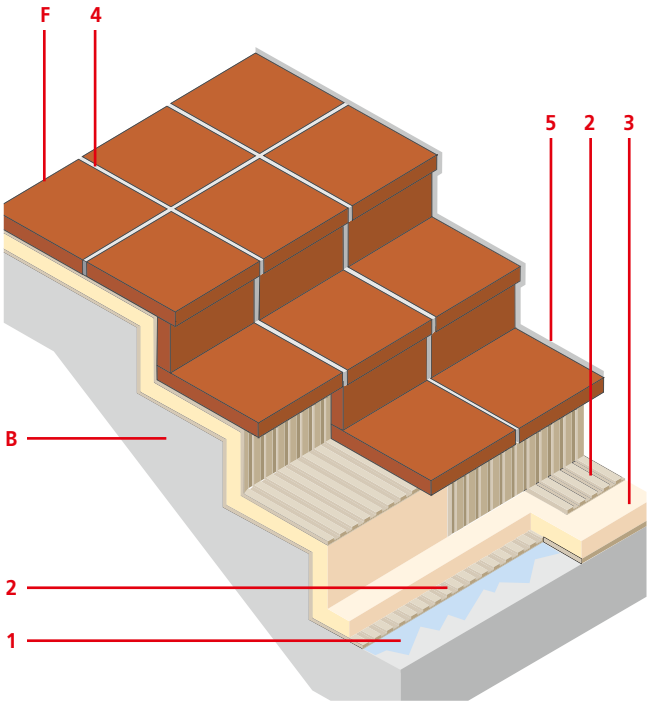
Steel or timber stairs with ceramic finishes are problematic in terms of noise control as they offer no impact sound insulation. Impact sound control may be considerably improved through retrofitting with 9 mm or 12 mm Sopro FDP 558 or 8 mm Sopro TDP 565.

Note:

As the structural floor thickness also affects impact sound insulation performance, the overall construction should be assessed in advance in accordance with DIN 4109 where such measures are planned.

Sopro TDP 565 impact sound insulation board laid on a stair landing, to receive a natural stone finish.

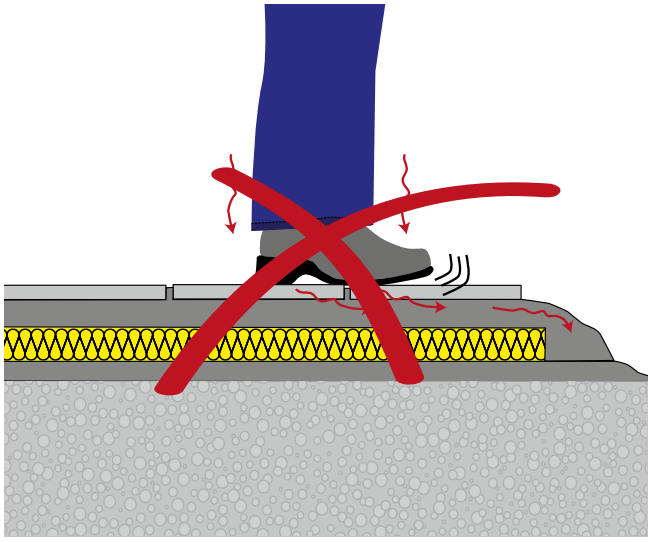
1 Sopro GD 749 primer
2 Flexible Sopro thin-bed adhesive
3 Sopro TDP 565 impact sound insulation board
4 Sopro FL plus flexible tile grout
5 Elastic joint sealant at junction with vertical element/ wall – Sopro Sanitary Silicone
B Concrete
F Tile



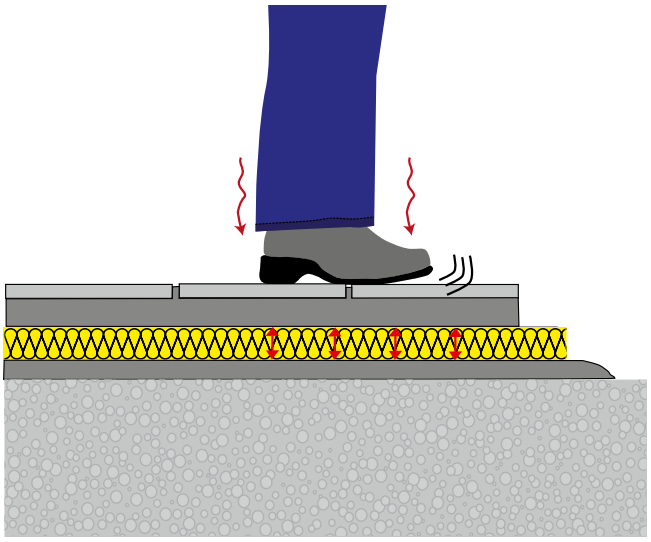
Impact sound insulation
Additional measures to DIN 4109

In applying the described systems to improve impact sound insulation performance, particular care is required on the part of all project team members to prevent the inadvertent creation of sound transmission paths during installation. This would lower or even completely cancel out the achieved impact sound reduction.

Example 1:



Wrong

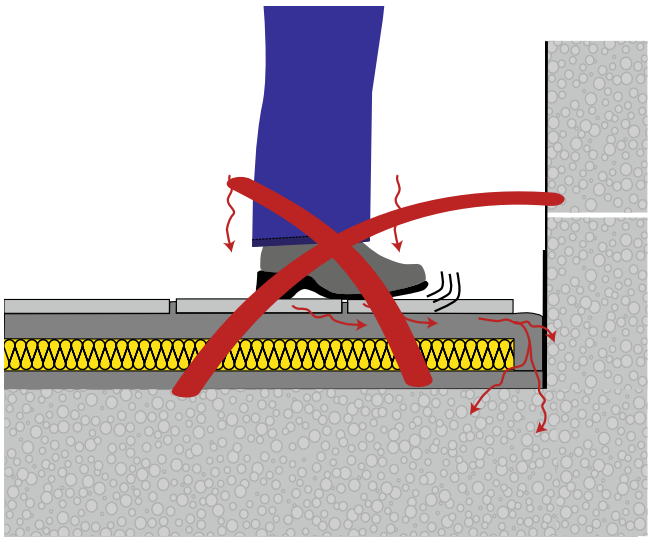


Right

Sound transmission path created by bedding adhesive.

Impact sound insulation
Additional measures to DIN 4109

Example 2:



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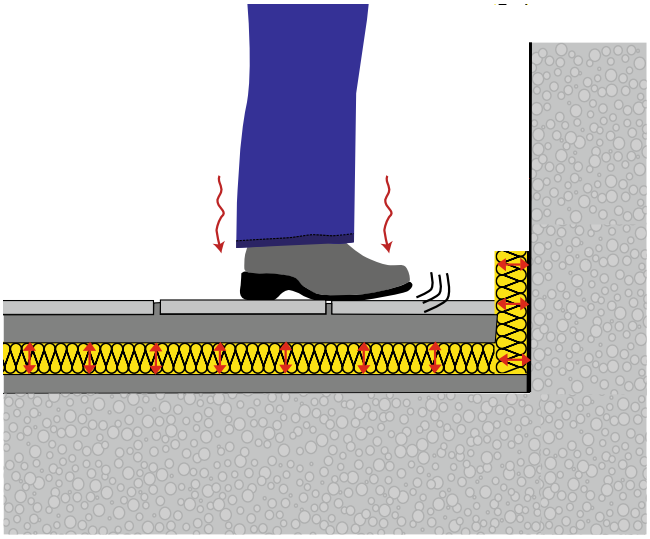
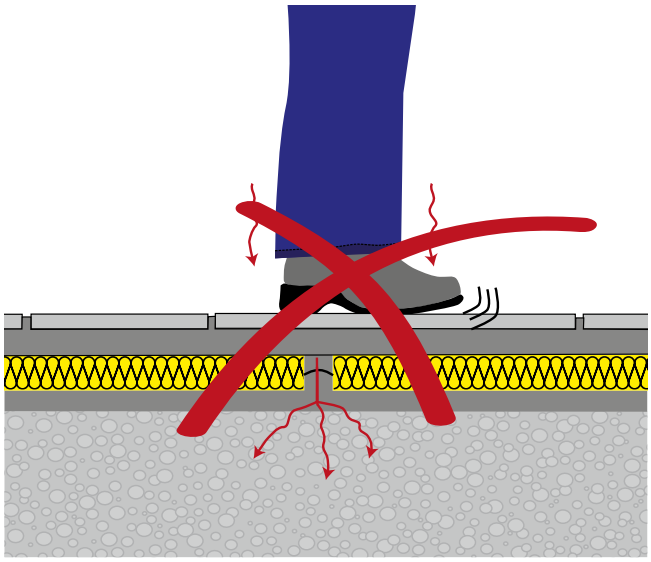


Right

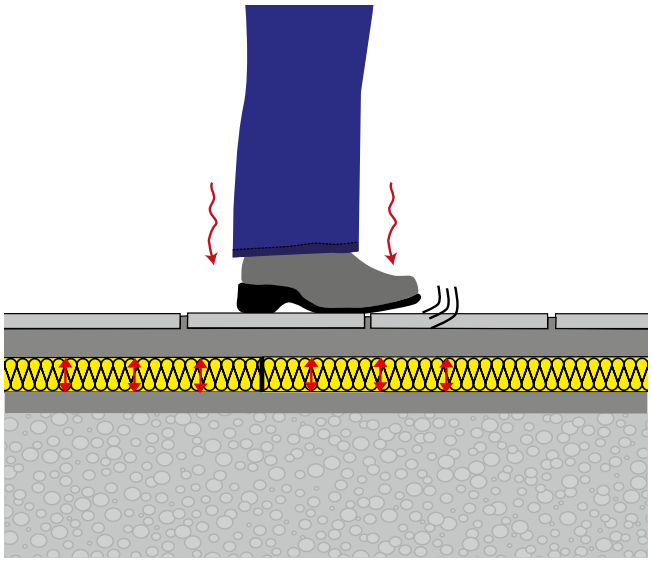
Adhesive in contact with wall due to missing perimeter insulation strip.

Impact sound insulation
Additional measures to DIN 4109

Example 3:



Wrong



Right

Sound transmission path created by adhesive in open joint left between insulation panels.

Impact sound insulation
Additional measures to DIN 4109

System composition

Product recommendation

Sopro GD 749

Sopro MG 669

Sopro VF XL 413

Sopro's No.1

Sopro FKM XL 444

Sopro TDP 565

Sopro FDP 558

Sopro FL plus

Sopro TF+

Sopro Brillant®

Sopro DF 10

Slimline hot-water floor heating

Hot-water floor heating systems have been an established solution on residential projects for many years now. They are described in German standard DIN 18560 Part 2 "Floor screeds and heating floor screeds on insulation layers". The constructions described in the DIN standard are often difficult to implement due to the required layer thicknesses, which – particularly on refurbishment schemes – may not be available.

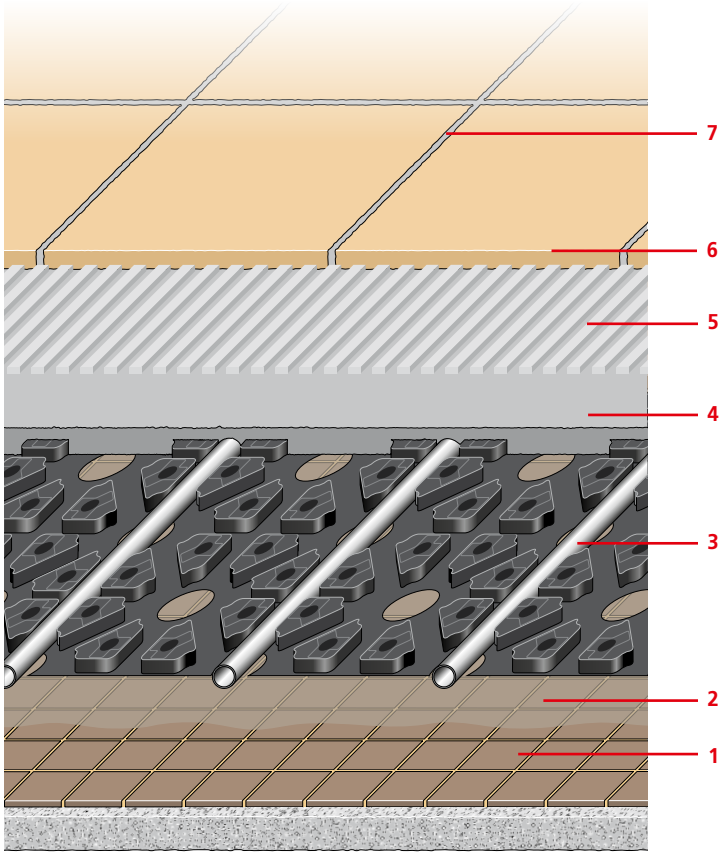
In response to the persistent demand among clients for retrofit-friendly hot-water floor heating systems, recent years have seen the evolution of a new heating concept.

With a total construction height of approx. 17–20 mm, the new slimline heating assemblies can be installed as system solutions on existing floors using standard Sopro tile-fixing products (separating layers, floor-levelling compounds, thin-bed adhesives etc.).

The heating system offered by Sopro partner Kermi is closely tailored to the slimline concept.

Installation on solid substrate

The most straightforward solution can be adopted where the system is to be installed on a strong existing covering (tile, natural stone), an existing screed or concrete floor. The Kermi heating system is directly bonded to the substrate after this has been cleaned and pretreated with Sopro GD 749 primer or Sopro HPS 673 bonding primer. The honeycomb structure with heating pipes is then filled up with Sopro FS 15 550 floor-levelling compound or Sopro FAS 551 fibre-reinforced self-levelling filler. The required cover for the system is 3 mm. The fact that the total construction height of the heated layer runs to only around 17 mm makes the system a prime option for refurbishment applications.



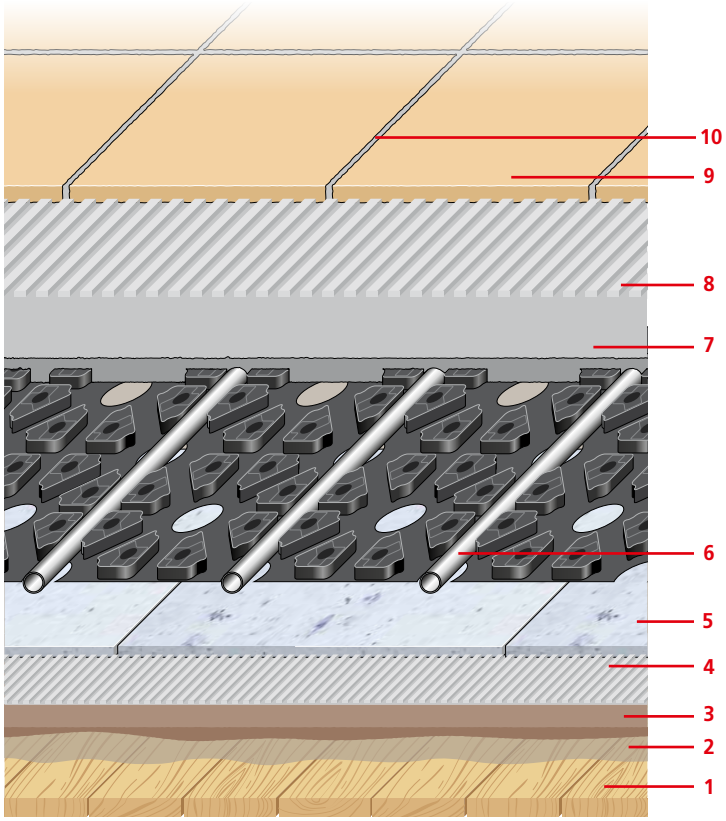
1 Substrate (existing tile covering, screed etc.)
2 Primer:
Absorbent substrate:
Sopro GD 749
Non-absorbent substrate:
Sopro HPS 673
3 Kermi x-net C15 slimline system
4 Flow-applied floor-levelling compound (Sopro FS 15 550, Sopro FAS 551)
5 Tile adhesive (Sopro's No.1, Sopro FKM XL 444, Sopro VF XL 413 etc.)
6 Tile
7 Sopro DF 10 flexible designer tile grout

Slimline hot-water floor heating

Installation on timber and critical substrates
Slimline hot-water floor heating systems are also suitable for installation on timber and other critical substrates (composite substrates, surfaces with hairline cracking etc.) that may be encountered on refurbishment projects.

Such substrates are stabilized and separated from the heating assembly through the incorporation of (min. 4 mm) Sopro FDP 558 tile insulation board.

As described in Section 5.1 "Timber substrates", the timber substrate is pretreated with Sopro HPS 673 bonding primer, levelled where necessary with Sopro FAS 551 fibre-reinforced self-levelling filler, and then covered with adhesive-fixed (min. 4 mm) Sopro FDP 558 tile insulation board. The insulation board is bonded using a rapid-set tile adhesive (Sopro's No. 1 rapid-set, Sopro FKM 600 etc.). The subsequent procedure is the same as described under "Installation on solid substrate".



1 Critical substrate (timber, surface with hairline cracking etc.)
2 Primer:
Sopro HPS 673
3 Where necessary, Sopro FAS 551/ Sopro VS 582 as levelling layer
4 Tile adhesive (Sopro's No.1 rapid-set, Sopro FKM 600 etc.)
5 Sopro FDP 558 tile insulation board (min. 4 mm) as stabilizing and separating layer
6 Kermi x-net C15 slimline system
7 Flow-applied levelling compound, e.g. Sopro FS 15 550, Sopro FAS 551
8 Tile adhesive, e.g. Sopro's No.1, Sopro FKM XL 444
9 Tile
10 Sopro DF 10 flexible designer tile grout

Slimline hot-water floor heating

Installation on timber and critical substrates
Application

1 Existing covering is removed to reveal critical timber substrate. Overcoat timber surface and any adhesive residue with Sopro HPS 673 bonding primer.

2 Even out any irregularities in existing floor with flow-applied surface filler (Sopro FS 15 550 floor-levelling compound or Sopro VS 582 self-levelling filler).

3 To prevent transmission of stresses and deformation from substrate to heating assembly, install 4 mm or 7 mm Sopro FDP 558 tile insulation board as separating layer. Bond Sopro FDP 558 with flexible tile adhesive (e.g. Sopro's No. 1 rapid-set).

4 Install Kermi x-net C15 slimline system directly on top of separating layer.

5 When heating system is in place, apply self-levelling filler (Sopro FS 15 550 floor-levelling compound) so as to cover pipes.

6 Tilelaying can commence immediately after floor-levelling compound has cured (on next day).

Electric floor heating
Additional thermal insulation

Sopro FDP 558 board is suitable not only for sound insulation and as a separating layer, but can also double up as **thermal insulation**.

When incorporated as thermal insulation in elements in contact with the ground (e.g. basements and uninsulated screeds) that are to receive a (ceramic) tile covering, Sopro FDP 558 serves to enhance **underfoot comfort**.

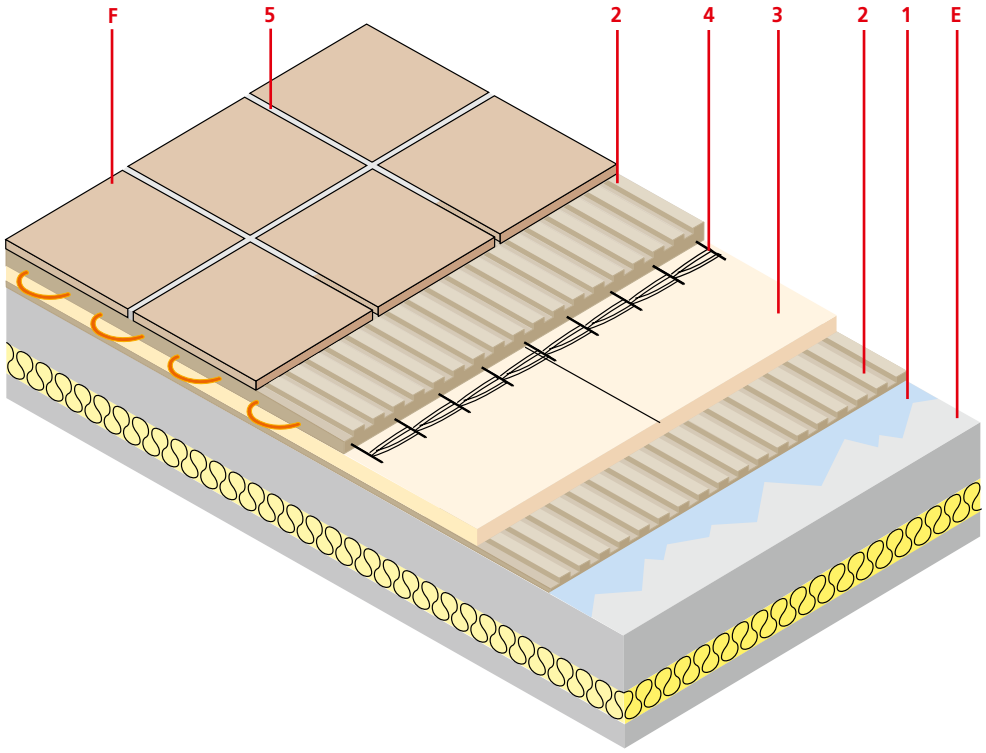
This is because Sopro FDP 558 helps to diminish the "cold tile" effect.

Heated floors are a popular choice on both new-build and refurbishment projects. Technical constraints sometimes prohibit the retrofitting of hot-water floor heating systems or may unreasonably inflate construction costs.

Electric floor heating offers a useful alternative in such cases.

To boost the performance of the electric floor heating elements, 7 mm or 9 mm Sopro FDP 558 tile insulation board is recommended as an underlay.

1 Sopro GD 749 primer
2 Flexible Sopro thin-bed adhesive
3 Sopro FDP 558 tile insulation board
4 Electric floor heating system
5 Sopro FL plus flexible tile grout
E Substrate/screed etc.
F Tile



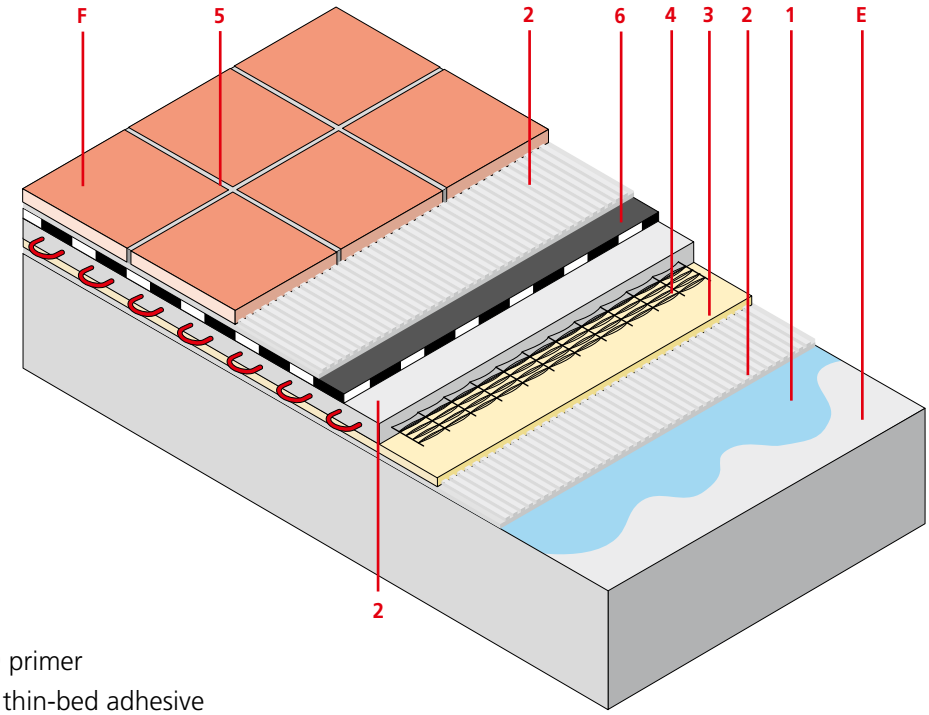
Please note:

Electric floor heating systems are not only for use in conjunction with ceramic and natural stone coverings. They represent an equally viable solution below PVC, carpet or parquet flooring (manufacturer's specifications shall be observed). Floor heating systems can be operated using a control unit – upwards of a certain floor area, provision of a contactor relay in the control circuit is required. Electric floor heating systems shall always be connected up by an electrician.

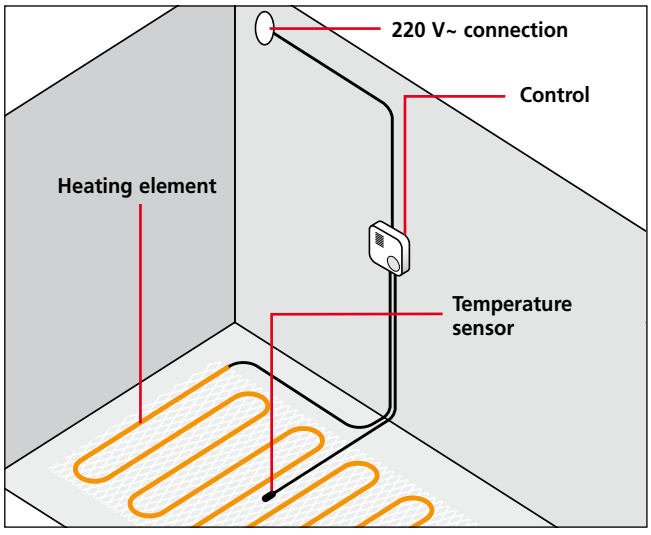
Electric floor heating
Additional thermal insulation

Electric floor heating in wet spaces (domestic bathrooms)

In wet spaces (bathrooms), the installation of a waterproof membrane over electric floor heating systems is required prior to tiling. For safety reasons, a check is required as to whether installation of the particular heating system is permissible at locations subject to direct splashing (standing area of tiled walk-in showers). The manufacturer's specifications shall be consulted in this regard.



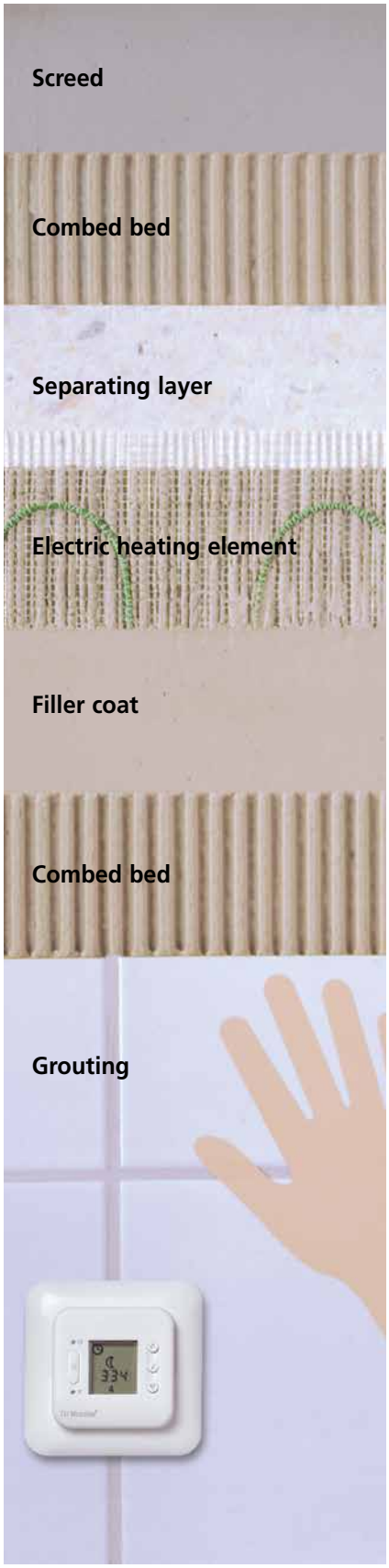
1 Sopro GD 749 primer
2 Flexible Sopro thin-bed adhesive
3 Sopro FDP 558 tile insulation board
4 Electric floor heating system
5 Sopro FL plus flexible tile grout
6 Two-coat waterproof membrane
E Substrate/screed etc.
F Tile



Electric floor heating system embedded in Sopro's No.1 flexible tile adhesive.

Electric floor heating
Additional thermal insulation

System composition



Product recommendation

Sopro GD 749

Sopro VF 419

Sopro FDP 558

Sopro FS 15 550

Electric floor heating system (example)

Sopro's No.1

Sopro FKM XL 444

Sopro's No.1 rapid-set

Sopro DF 10

Sopro FL plus

Electric floor heating control (example)

Electric floor heating
Additional thermal insulation

Application (example)

1 Unroll heating mat over substrate to prepare layout drawing and determine required position of temperature sensor. Make cuts in base fabric and adapt heating mat(s) if necessary. Note: Sensor must not be positioned directly below heating conductor!

2 Hack away substrate at required position to create recess for sensor sleeve. Note: Heating performance can be optimized through incorporation of Sopro FDP 558 tile insulation board as this reduces loss of thermal energy to screed substrate.

3 Insert temperature sensor into conduit and run cable to switch box. **Note: Arrange for electrician to test insulation resistance of heating element! Ensure that measurement results are recorded.**

4 Overcoat temperature sensor and conduit with tile adhesive (e.g. Sopro FKM XL 444 XL multi-purpose eXtraLight flexible tile adhesive or Sopro's No.1 flexible tile adhesive), then apply combed bed.

5 Unroll heating mat in required position on freshly applied combed bed and work over with smooth face of trowel, taking care to avoid damage to (orange) heating conductors.

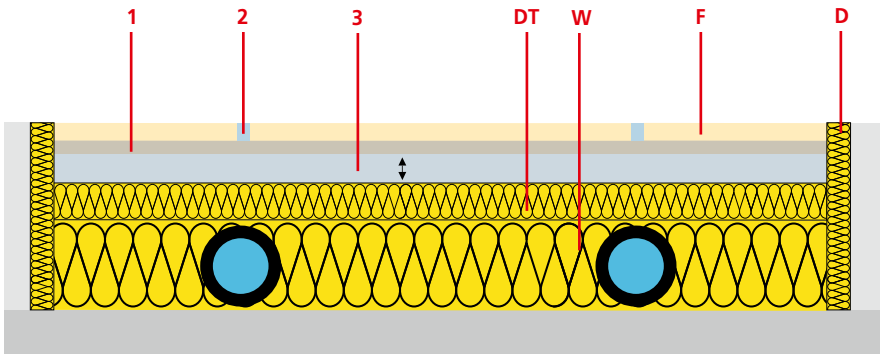
6 Embed heating element in uniformly thick coat of Sopro flow-applied floor-levelling compound or Sopro thin-bed adhesive. Covering may be installed using Sopro flexible thin-bed adhesive as soon as mortar bed has set.

Extra-thin load-spreading layers

Refurbishment schemes are generally subject to constraints with regard to levels (door frames, existing floors etc.).

Both new and retrofitted assemblies (sheeting, insulation etc.) that are now usually incorporated in the floor construction are not always able to meet the minimum installed thickness prescribed by DIN standards for floating screeds.

The use of reaction resin binders in screeds is now covered by the amended **DIN 18560** and European standard **DIN EN 13813**. Given their high compressive and flexural tensile strengths, these binders can be used to produce thin-layer floating and unbonded screeds capable of durably accommodating the incident live loads. A suitably proportioned resin/silica sand mix (Sopro EE 771 epoxy mortar) lends itself to the production of 2.5 cm thick load-spreading layers.



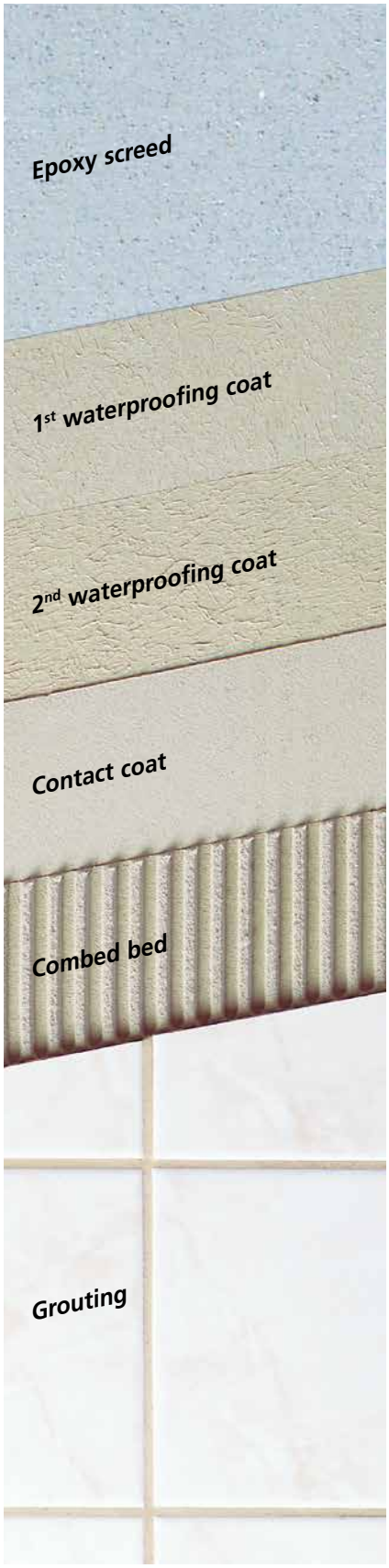
1 Flexible Sopro thin-bed adhesive
2 Sopro FL plus flexible tile grout
3 Sopro EE 771 epoxy mortar
W Thermal insulation
D Insulation/perimeter insulation strip
F Tile
DT Impact sound insulation/ cover layer

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

2.5 cm thick epoxy resin-bound layer over soft insulation subject to high loads.

Extra-thin load-spreading layers

System composition



Product recommendations

Sopro EE 771 epoxy mortar

(optionally for wet spaces)

Sopro DSF 523

Sopro DSF 623

Sopro TDS 823

Sopro's No.1

Sopro FKM XL 444

Sopro VF XL 413

Sopro DF 10

Sopro FL plus

Critical substrates

Specifically on refurbishment schemes, neither designers nor contractors are able to influence the substrate condition. The existing substrates are often used as the base for a new finish. This necessitates a determination of their strength and selection of a suitable construction.

The fact that such substrates tend to vary widely in terms of their adhesion behaviour necessitates the development of project-specific product system solutions.

Substrate: strong existing tile covering

Product recommendation

For outdoor and wet spaces
(see Sections 3.1 to 3.4)

Sopro DSF 523

Sopro TDS 823

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413
Cementitious thin- and floating-bed tile adhesive, for floors

Sopro MEG 666 and Sopro MEG 1567 dispersion
Highly flexible, waterproof, two-component, cementitious thin-bed adhesive

Product recommendation

For indoor and dry spaces
(e.g. corridors, living rooms)

Sopro HPS 673
Adhesion promoter for non-absorbent substrates

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro FKM XL 444
Multi-purpose, extra-light, extra-high-coverage, low-dust flexible tile adhesive

Sopro VF XL 413
Cementitious thin- and floating-bed tile adhesive, for floors

Critical substrates

Substrate: board subfloors, gypsum plasterboard/fibreboard

Product recommendation

Sopro GD 749
Synthetic resin-based dispersion for absorbent substrates

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413
Cementitious thin- and floating-bed tile adhesive, for floors

Substrate: carpet adhesive/PVC adhesive residue

Sopro HPS 673
Adhesion promoter for non-absorbent substrates

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413
Cementitious thin- and floating-bed tile adhesive, for floors

Substrate: mastic asphalt screed*

Sopro HPS 673
Adhesion promoter for non-absorbent substrates

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413 Cementitious thin- and floating-bed tile adhesive, for floors

* For details on how to level mastic asphalt screeds, see Section 11.

Critical substrates

Substrate: low-density magnesite screed

Product recommendation

Sopro EPG 522 with silica sand blinding
Adhesion promoter and sealer

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413
Cementitious thin- and floating-bed tile adhesive, for floors

Substrate: old lacquer/varnish coatings, oil paint

For dry spaces

Sopro HPS 673
Adhesion promoter for non-absorbent substrates

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413
Cementitious thin- and floating-bed tile adhesive, for floors

For wet spaces

Sopro DSF 523
Adhesion promoter and waterproof membrane

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413
Cementitious thin- and floating-bed tile adhesive, for floors

Critical substrates

Substrate: oil-contaminated surface

Product recommendation

Sopro ESG 868

Sopro's No.1

Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413

Cementitious thin- and floating-bed tile adhesive, for floors

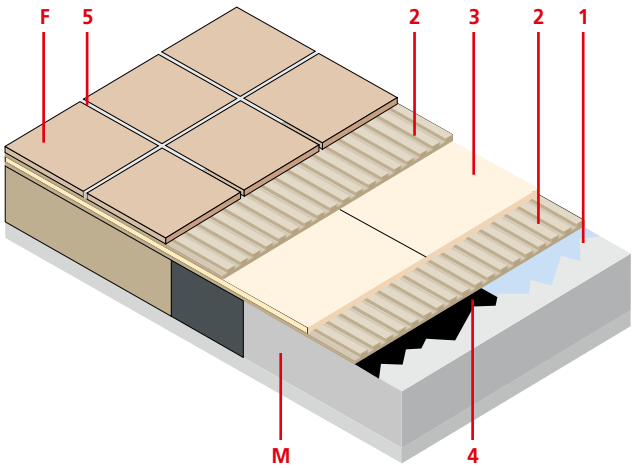
Substrate: polymer-coated pool

Sopro FEP

Epoxy grout and adhesive

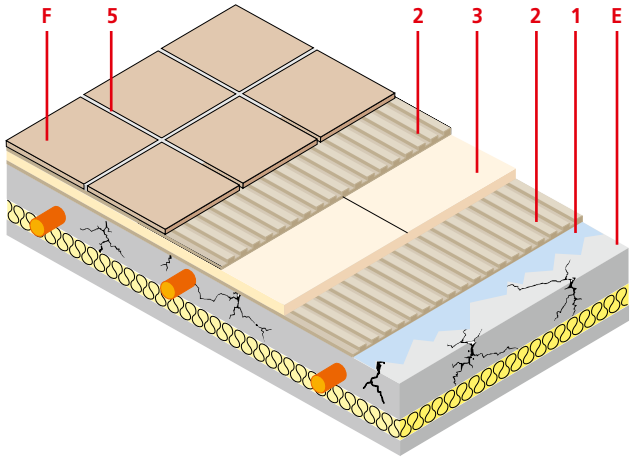
Critical substrates

Composite substrates



Due to their varying deformability, expansion and general structural discontinuity, composite assemblies constitute critical substrates that are frequently vulnerable to cracking. The incorporation of 4 mm, 7 mm, 9 mm or 12 mm Sopro FDP 558 tile insulation board prevents transmission of substrate stresses to the ceramic or natural stone covering.

Screed with hairline cracking



Cracks that originally form in critical substrates – e.g. heated screeds with inadequate cover over pipes – may extend into ceramic or natural stone coverings. Such cracking may be prevented through installation of a 4 mm Sopro FDP 558 separating layer. At the same time, the low thickness of the insulation board will not compromise the performance of the floor heating system.

1 Sopro GD 749 primer (absorbent substrates)
2 Flexible Sopro thin-bed adhesive
3 Sopro FDP 558 tile insulation board
4 Sopro HPS 673 bonding primer (non-absorbent substrates)

Product recommendation

Sopro HPS 673
Adhesion promoter for non-absorbent substrates

Sopro GD 749
Synthetic resin-based dispersion for absorbent substrates

Sopro's No.1
Flexible, cementitious thin-bed tile adhesive with 4-in-1 formulation, for walls and floors

Sopro VF XL 413
Cementitious thin- and floating-bed tile adhesive, for floors

Sopro FKM XL 444
Multi-purpose, extra-light, extra-high-coverage, low-dust flexible tile adhesive

Sopro FDP 558

Sopro FL plus

Sopro Brillant®

Sopro DF 10

5 Sopro FL plus flexible tile grout/
Sopro Brillant® water-repellent tile grout/
Sopro DF 10 flexible designer tile grout
E Screed with hairline cracking
F Tile
M Composite substrate (absorbent and non-absorbent)

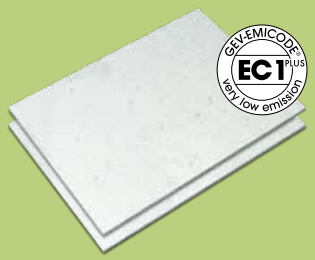
Sopro product systems for sustainable construction

Schematic system composition

Low-emission separating and insulation board/mats*

Tile insulation board
FDP 558

DGNB: Top quality level 4, Line 40, based on DGNB (German Sustainable Building Council) criterion "ENV1.2 Local Environmental Impact" (2018 version)



Impact sound insulation board
TDP 565

DGNB: Top quality level 4,
Line 40**

Membrane
Sopro AEB plus 639

DGNB: Top quality level 4,
Line 9**

*For details of all relevant Sopro products, please consult our sustainability brochure.