fließestrich

Code of Practice

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Flowing calcium sulphate screeds on underfloor heating

Instructions and guidelines for planning and application of flowing calcium sulphate screeds

Code of Practice from the
Industriegruppe Estrichstoffe im
Bundesverband der Gipsindustrie e.V.,
Darmstadt, Germany and the Industrieverband
WerkMörtel e.V., Duisburg, Germany

Date 08/2008

Flowing calcium sulphate screeds on underfloor heating

Flowing calcium sulphate screeds (hereinafter referred to as flowing screeds) have proven themselves in indoor applications for decades thanks to their wide range of technical advantages.

Particularly suitable as heating floor screeds are flowing screeds due to their optimum enclosing of the heating tubes, the high thermal conductivity and the low layer thickness. The flowing screed rapidly absorbs the heat from the heating tubes and immediately transfers it onto the top surface and the room air. This results in a heated screed that is energy efficient and that reacts quickly to changes in temperature. Furthermore, the calcium sulphate flowing screed caters for heat up at an early stage after application and therefore speeds up the building phase.

It is essential that the heated floor construction is professionally designed and applied and that the screed is heated up correctly to check its construction and to provide controlled drying, to ensure problem-free usage.

1 Application

Heating floor screeds are applied as floating screeds. It is therefore essential that the requirements for floating screeds in accordance with DIN 18560-2 [1] are observed. Furthermore, there is a requirement that the compressibility (c) of the insulating layer does not exceed 5 mm, the edge insulation strips should not be less than 10 mm and a horizontal movement of at least 5 mm is facilitated.

Further information about the joints is available in Code of Practice No. 5 Joints in flowing calcium sulphate screeds [8], in the BEB information sheet for planning, application, assessment and treatment of the surfaces of calcium sulphate screeds[4] and the DIN 18560 part 2, section 5.3.3 Screed joints [1].

The building designer must specify the joint plan. If movement joints are not intended with flowing screed, the edge strips must be dimensionally thicker [4, 8]. Observe the guidelines of the manufacturer.

Due to the high bending tensile strength of flowing screeds, the nominal screed thickness can be reduced considerably in comparison to conventional screeds, provided that the minimum thickness or the tube covering in accordance with DIN 18560, part 2, tables 1-4 [1] are still observed.

(Flowing) screeds applied in significantly greater thicknesses than the planned construction require a drying time that is over-proportionally slower. This will broadly limit the benefits of quicker drying associated with flowing screeds. This should be considered in the planning phase. Refer also to Code of Practice No. 2.

The insulation materials and heating tubes have to be applied flush in order to achieve a uniform covering of the heating tubes. The heating tubes have to be checked for leaks and filled with water when the screed is applied. They have to be fastened accordingly to ensure that sound bridges do not arise and that floating of the tubes is not possible. If it is not possible to fasten the heating tubes of the heating system to prevent floating, it can be prevented in this exceptional case, for example, by the application of a second screed layer. The upper layer then serves as the load distribution layer and must be

of nominal thickness. It does not require a frictional connection to the lower layer.

The projection of the edge insulation strip has to be cut off after grouting the ceramic tiles or board layer covering, after laying the parquet flooring or after filling when applying elastic or textile coverings.

This avoids that filler compound, adhesive or jointing mortar seals the joints and causes stresses and sound bridges in the screed.

The top covering is applied on the unheated screed or in winter on the gently warmed heating floor screed. Elasticized adhesive mortar should be used in case of rigid coverings.

2 Heating-up

In accordance with DIN EN 1264-4 [3], the initial heating up and functional testing of the heating system must be performed and documented by the heating installer (functional heating / coverage-ready heating, see point 3), unless otherwise specified by the screed manufacturer's instructions. After functional testing, the screed has generally not achieved coverage-readiness. Therefore, further heating is required to achieve coverage-readiness (coverage-ready heating). This heating shall continue until the screed no longer dissipates moisture.

Deformation that results in conjunction with the drying process should be allowed to occur without being impaired by the covering. These deformations are completed when the screed has ceased to dissipate moisture, enabling the screed to accept rigid coverings without problems. The site management must give instructions regarding the implementation and documentation of the coverage-ready heating. A heating up protocol for documentation and confirmation of the coverage readiness and the drying test can be found on the last page of this Code of Practice.

The heating up protocol must be provided to the floor covering installer or contractor before they commence installation (detailed information is available in the *Coordination of trades with heated underfloor constructions* [5]).

Adequate ventilation must be provided during the heating up phase to ensure that the heated screed can dissipate its moisture in an reasonable time. Continuous closing of the windows to avoid heat loss will hinder drying of the screed. Tilting the windows is insufficient for correct drying of the heated floor screed (refer also to Code of Practice No. 2 Drying of flowing calcium sulphate screeds [7]).

If cracks arise during the heating-up phase even though the screed has been properly applied, the cracks must be frictionally bonded with a synthetic resin. Crack sealing is performed on dry screed that is cooled to approx. 18°C. Subsequently, the screed must be briefly heated up to the maximum flow temperature. If no further cracks are evident, the heating floor screed is classified as technically free of defects and is coverage-ready.

3 Functional test of the heating system and coverage-readiness of the screed

Proceed as follows for functional testing and to achieve coverage-readiness.

In case of calcium sulphate screeds, heating up can commence just a few days after the screed is applied (refer to the manufacturers' specifications).

Functional heating:

- Unless otherwise specified in the manufacturers specifications, functional heating is performed in accordance with DIN EN 1264-4 [3]. The initial heating phase commences with a flow temperature of 25°C, which is maintained over a 3 day period. The maximum flow temperature is then set and maintained for a further 4 days. The screed surface must be protected against draughts and rapid cooling when the underfloor heating is switched off.

Coverage-ready heating:

- The flow temperature is set for one day to 25°C and then the temperature is increased to the maximum flow temperature (without automatic temperature control and without night time reduction of the temperature). Phased heating up may be recommendable acc. to the manufacturer's recommendations.

- The rooms should be well ventilated (see Code of Practice No. 2 Drying of flowing calcium sulphate screeds [7]).

- The screed should be heated up and dried at the maximum flow temperature as specified by the manufacturer of the mortar. However, the flow temperature may not exceed 55°C.

- Testing of the drying at the maximum flow temperature is undertaken during heating operation by placing a film of approx. 50 cm x 50 cm in diameter on the screed above the heater coil. The edges must be taped down using ad-

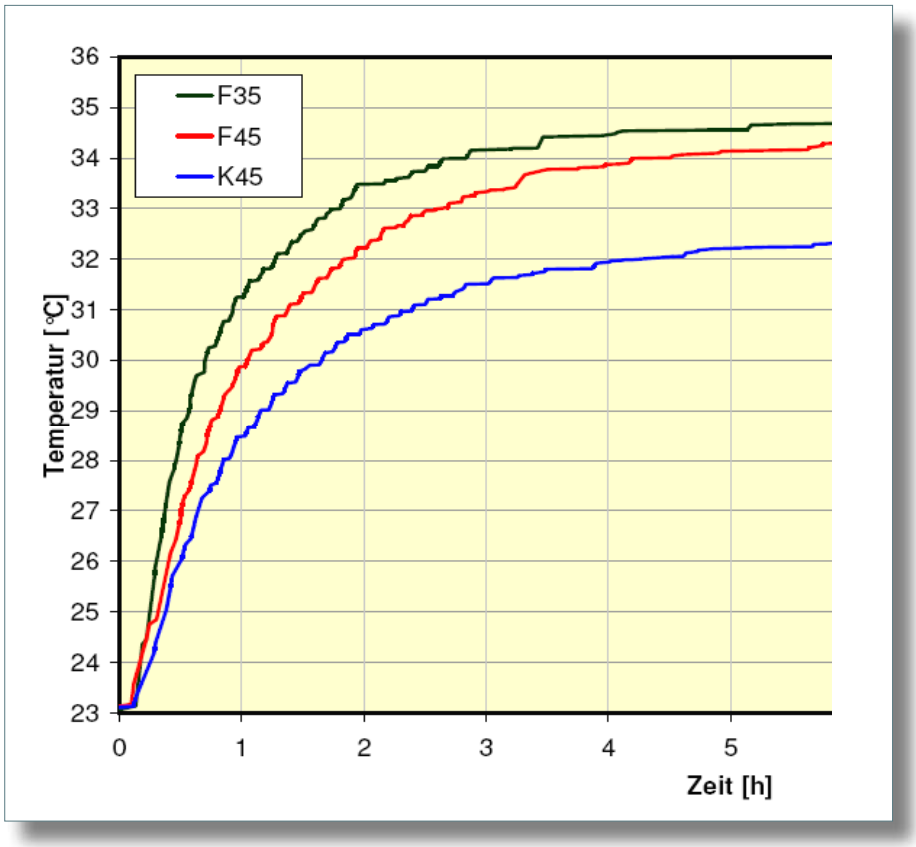
hesive tape. The rooms still have to be well ventilated. If there are no traces of moisture below the sheet within 24 hours, the screed is dry and the surface temperature can be reduced to approx. 18°C. Depending on manufacturer's specifications, phased lowering of the flow temperature may be advisable. Generally, coverage-readiness is now achieved. However, before the covering is applied to the screed, a CCM test is still required in accordance with the current regulations.

- It is not possible to omit coverage-ready heating with a heating floor screed. Even when a dried heating floor screed has dried under normal conditions (without heating up), it must be heated up before a covering is applied to check for its coverage-readiness.

In order to speed up the construction phase, combining the functional heating and coverage-ready heating to prepare the floor for covering in conjunction with the heating installer has proven to be a satisfactory solution. In this process, the screed is heated up after application as described above and heated without interruption or reduction of the temperature at night time achieve coverage-readiness.

In order to test the level of residual moisture with the CCM device, three measuring points must be specified per area of 200 m² or per residential unit (DIN EN 1264-4 [3]). The measuring points are intended to avoid damage to the heating tubes when sampling is performed before the covering is applied.

The measuring points must take areas into consideration, which are unfavourable for drying (e.g. greater screed thicknesses). Sampling for the CCM test must be performed over the entire screed cross-section and the samples should not be less than 50 g. Marking of the measuring points has to be co-ordinated with the site manager by the tradesperson who applies the insulation layer and who is thus responsible for testing the substrate. Generally, this is the heating installer.



Development of the surface temperature on screed samples

K 45 = conventional (cementitious) screed,
F 45 = flowing screed of same nominal thickness,
F 35 = flowing screed with reduced nominal thicknesss
(Result of a series of laboratory tests performed by the MPA Stuttgart)

4 Response flexibility of underfloor heating with flowing screed

The good thermal conductivity of flowing screed and its optimum encapsulation of the heating tubes has a favourable effect on the response flexibility of heated floor screed structures. The diagram illustrates how the setpoint temperature of the screed surface (e.g. 29 °C) is achieved notably sooner with flowing screed than with conventional cementitious screeds.

Literature
Internet research

[1] DIN 18560 – Floor screeds in building construction, Parts 1 to 7

[2] ATV DIN 18353 – Laying of floor screed

[3] DIN EN 1264-4 Floor heating systems and compionents - Part 4: Installation

[4] Hinweise zur Planung, Verlegung und Beurteilung sowie Oberflächenvorbereitung von Calciumsulfatestrichen *[Instructions for planning, application and evaluation as well as surface preparation of calcium sulphate screeds]*; April 2004 (Published by Bundesverband Estrich und Belag (BEB) e. V., Troisdorf, Germany)

[5] Schnittstellenkoordination bei beheizten Fußbodenkonstruktionen *[Coordination of trades with heated underfloor constructions]*, Edition 2006 (Published by Bundesverband Flächenheizungen und Flächenkühlungen (BVF) e. V., Hagen, Germany)

[6] Flowing calcium sulphate screeds in areas of high humidity – Code of Practice No. 1 2011 (Published by IGE and IWM)

[7] Drying of flowing calcium sulphate screeds – Code of Practice No. 2, 2011 (Published by IGE and IWM)

[8] Joints in flowing calcium sulphate screeds – Code of Practice No. 5, 2011 (Published by IGE and IWM)

[9] Assessment and treatment of the surfaces of flowing calcium sulphate screeds – Code of Practice No. 4; 2011 (Published by IGE and IWM)

[10] Austrocknungsverhalten von Calciumsulfat-Fließestrichen *[Drying behaviour of calcium sulphate flowing screeds]*; Schießl P. und Wiegrink K.-H. in ZKG International, issue 12-2004

[11] Spannungen und Verformungen in Calciumsulfat-Fließestrichen (Teile 1 und 2) *[Stresses and deformation in calcium sulphate flowing screeds (Parts 1 and 2)]*; Schießl P. and Wiegrink K.-H. in ZKG International, issues 4-2005 and 5-2005

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Text printed in square brackets and italics signifies a translation of the original German title provided for your conveniece, as an English edition was not available at the time this Code of Practice was issued

Published by:

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Heating up protocol for heating coverage-readiness of calcium sulphate-based heating floor screeds

Investor	
Building site	
Heating installer	
Site manager	

Fill in every change of flow temperature during the heating up process and during reduction of temperature exactly to 5 K*. Every drying test should be documented..

Heating system	
Screed applied on	

1. Heating (coverage-ready heating)

Datum	Flow temperature in °C	Signature

2. Drying (foil test)**

Date	Dry yes/no	Signature

3. Lowering of flow temperature

Datum	Flow temperature in °C	Signature

4) Coverage-ready heating completed

Date	Outdoor air temperature in °C	Signature

Place, date **Signature (Site manager)**

* K = Kelvin; Kelvin is the scientific unit of temperature. A temperature increase of 5 K is commonly an increase of 5°C.
** Does not replace CCM measuring before covering.