

To Whom It May Concern

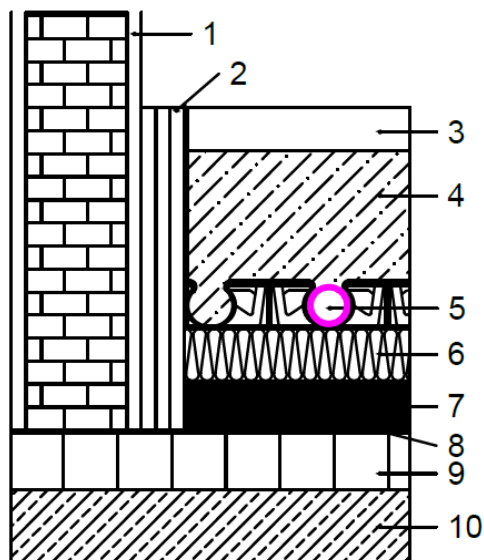
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REHAU In-Screed Planning Notes for the Australian and New Zealand Market

As one of the world-wide market leaders for Underfloor Heating (UFH) solutions we strive to provide the most accurate and up to date information to our customers. The information contained within this document is prepared for UFH Installers, Engineers, Architects and technically qualified and able parties and shows typical planning parameters of In-Screed systems using REHAU Studded Panel.

The recommendations in this document may refer to both Australian and European standards. Suitability of the advice provided must be assessed on a case-by-case basis.

1) Typical Floor Structure for an In-Screed System



1. Wall
2. REHAU Edge Insulation Strip
3. Floor Covering
4. Topping slab / Screed
5. REHAU PE-Xa pipe 16 mm
6. REHAU Studded Panel
7. Additional Insulation as required
8. Damp Proof Membrane
9. Structural Slab
10. Ground

Typical Floor Structure: Studded Panel

(general example only - not intended to satisfy the installation requirements for any particular project)
(In areas where a pipe spacing <50mm is required, ie in front of the manifold, use insulation panel without studs)

Figure 1: Typical Floor Structure with REHAU Studded Panel system in residential application

Note: The edge insulation shown in this diagram does not represent the perimeter edge insulation required in the NCC (National Construction Code) requirements; the primary purpose of the REHAU-edge insulation strip is to allow for axial expansion of the screed.

2) **Studded Panel Properties**

- EPS Panel Size: 1200 (L) x 800 (W) x 20 (H) mm
- Height of the EPS insulation layer: 20 mm
- Total Dimensions (from bottom of EPS panel to top of studs, and including a 50mm foil overlap on one long side and one short side): 1250 (L) x 850 (W) x 40 (H) mm
- Area covered: 0.96 m² per panel
- PS foil thickness (black colour): 0.8 mm
- EPS Density: 30 kg/m³
- Compressive strength: 240 kPa (at 10% deformation)
- Fire-retardant: Europe E Class
- Thermal Conductivity: 0.034 W/(m.k)
- Thermal Resistance R: 0.59 m² K/W
- Pipe diameter: 16 mm
- Distance between studs: 50 mm

As per DIN 18560-2, EPS boards can handle up to an area load of 5 kN/m² when installed in combination with screed requirements as per section 3) *Screed Thickness and Pipe Cover*.

3) **Screed Thickness and pipe cover**

Neither Australian nor New Zealand standards cover minimum screed thicknesses in combination with in-screed heating systems, as such this document will be referring to DIN 18560-2 based on *Floor Screeds and Heating Floor Screeds on Insulation Layers*.

The information below is provided by REHAU through extensive experience in the UFH market in European conditions. The information stated in this document does not hold any obligation to REHAU, a structural engineer must be consulted to accurately determine screed types and permissible loads.

The following points should be clarified at the planning stage with the architect, structural engineer, heating engineer, UFH installer, screed installer and floor covering installer:-

- Type and thickness of the screed and floor coverings
- Area of the screed, layout and shape of the expansion joints
- Positioning of pipe within the screed and the installation type (i.e. spiral, meander etc.)
- The number of joints at which the residual humidity is to be measured
- The underfloor heating must NOT be used to accelerate the curing of the screed and the floor must be cool when laying flooring
- The company responsible for the final floor covering e.g carpet, timber, vinyl must establish that the moisture content within the screed is suitable
- Allocation of a project timeline for the screed installation and curing time, typical curing time for cement screed is 21 days.

In accordance with DIN 18560-2, there are a number of potential screeds that can be used and as an indication table 3 has been extracted from DIN 18560-2.

Possible screed construction heights above the UFH pipe are shown in tables 3 to 7. These are REHAU's recommendations and must be checked with a structural engineer. The composition of the DIN 18560-2 screed types shown below may not be available in Australia, however similar compositions may be requested from the cement manufacturer.

Referring to Figure 1 on the first page of this document, **it is vital to note that the insulation underneath the screed does not provide a structural element to prevent the screed from cracking**, especially when higher than permissible point loads or area loads are applied. Greater loads should always be assessed by a structural engineer. Higher grades of insulation do however provide greater R-Values which can be utilised when meeting minimum BCA and NZBC flooring requirements.

Table 1: DIN 18560-2 Table 4 - Extract -

Nominal thickness and flexural strength / hardness of unheated screeds on insulation* for vertical loads

(Point loads[#] up to 4kN, Area Loads up to approximately 5kN/m²)

Screed	Hardness class acc. DIN EN 13813	Screed nominal thickness ^a mm With a compressibility of insulation ≤3mm	Flexural Strength β_{bz} MPA	
			Minimum Single Value	Average
Cement Screed CT	F4	≥75	≥2.0	≥2.5
	F5	≥65	≥2.5	≥3.5
Calcium Sulphate Screed CAF	F4	≥65	≥3.5	≥4.0
	F5	≥55	≥4.5	≥5.0
	F7	≥60	≥6.5	≥7.0

a. When insulation thickness ≤ 40mm (...), the screed thickness can be reduced by 5mm.

* The insulating layer may consist of one or more layers of a suitable type of screed insulation, the compressibility of the single layers are to be added.

Table 2: Definition of Area Loads in accordance with DIN 1055

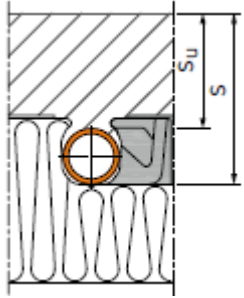
Application	Typical Area Load [#]
Living Rooms, hallways and attics in residential buildings, hotel rooms incl accompanying bathrooms. Office rooms, hallways, attics in office buildings, physicians' practices, waiting rooms in physicians' practices incl. the hallway. Retail Space with up to 50m ² floor space in residential and office buildings	2 kN/m ²
Hallways in hotels, convalescent homes, residential schools etc., treatment rooms incl. operating rooms without heavy equipment. Areas with tables; e.g. waiting rooms, lecture halls, classrooms, school rooms, dining halls, cafes, restaurants, reception rooms	3 kN/m ²
Areas with large congregations of people, e.g. hallways to lecture halls and classrooms, churches, theatres or cinemas	4 kN/m ²
Hallways in hospitals, convalescent homes, treatment rooms incl. operating rooms with heavy equipment. Convention halls, congregation rooms, waiting rooms, concert halls. Column-free areas, e.g museum areas, exhibition areas etc. and entrance areas in public buildings and hotels. Sports and recreation areas, e.g. dance halls, sports halls, gymnastics and weight rooms, stages. Areas in retails stores and warehouses	5 kN/m ²

[#] For the area where the concentrated load is applied, in general additional considerations are required. The same applies for dynamic stress.

4) Typical Screed Thickness and pipe cover for screed acc. to DIN 18560-2

The following tables show the construction height of the screeds based on area loads, pipe dimension and Studded Panel constructions referring to the European Screed types, this information has been derived from DIN 18560-2.

Table 3: Cement Screed CT of Bending Tensile Strength Class F4 in acc. with DIN 18560-2

Area Load [kN/m ²]		RAUTHERM S 16 x 2.0mm	RAUTITAN Pink 16 x 2.2mm	Construction Plan
≤ 2	Cover	S _u = 45mm	S _u = 45mm	
	Screed height*	S = 61mm	S = 61mm	
≤ 3	Cover	S _u = 65mm	S _u = 65mm	
	Screed height*	S = 81mm	S = 81mm	
≤ 4	Cover	S _u = 70mm	S _u = 70mm	
	Screed height*	S = 86mm	S = 86mm	
≤ 5	Cover	S _u = 75mm	S _u = 75mm	
	Screed height*	S = 91mm	S = 91mm	

*Total construction height = Screed height S + 20mm thickness of EPS board

Table 4: Cement Screed CT of Bending Tensile Strength Class F5 in acc. with DIN 18560-2

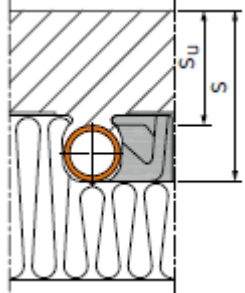
Area Load [kN/m ²]		RAUTHERM S 16 x 2.0mm	RAUTITAN Pink 16 x 2.2mm	Construction Plan
≤ 2	Cover	S _u =40mm	S _u =40 mm	
	Screed height*	S =56mm	S =56 mm	
≤ 3	Cover	S _u =55mm	S _u =55 mm	
	Screed height*	S =71mm	S =71 mm	
≤ 4	Cover	S _u =60mm	S _u =60 mm	
	Screed height*	S =76mm	S =76 mm	
≤ 5	Cover	S _u =65mm	S _u =65 mm	
	Screed height*	S =81mm	S =81 mm	

Table 5: Calcium Sulphate Liquid Screed CAF of Bending Tensile Strength Class F4 in acc. with DIN 18560-2

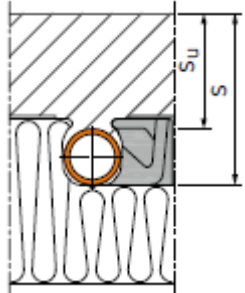
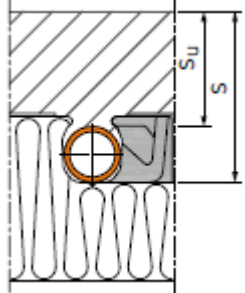
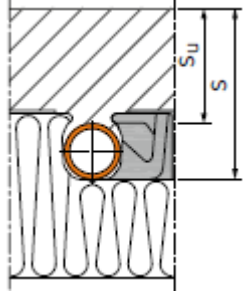
Area Load [kN/m ²]		RAUTHERM S 16 x 2.0mm	RAUTITAN Pink 16 x 2.2mm	Construction Plan
≤ 2	Cover	S _u =40 mm	S _u =40 mm	
	Screed height*	S =56 mm	S =56 mm	
≤ 3	Cover	S _u =50 mm	S _u =50 mm	
	Screed height*	S =66 mm	S =66 mm	
≤ 4	Cover	S _u =60 mm	S _u =60 mm	
	Screed height*	S =76 mm	S =76 mm	
≤ 5	Cover	S _u =65 mm	S _u =65 mm	
	Screed height*	S =81 mm	S =81 mm	

Table 6: Calcium Sulphate Liquid Screed CAF of Bending Tensile Strength Class F5 in acc. with DIN 18560-2

Area Load [kN/m ²]		RAUTHERM S 16 x 2.0mm	RAUTITAN Pink 16 x 2.2mm	Construction Plan
≤ 2	Cover	S _u =35 mm	S _u =35 mm	
	Screed height*	S =51 mm	S =51 mm	
≤ 3	Cover	S _u =45 mm	S _u =45 mm	
	Screed height*	S =61 mm	S =61 mm	
≤ 4	Cover	S _u =50 mm	S _u =50 mm	
	Screed height*	S =66 mm	S =66 mm	
≤ 5	Cover	S _u =55 mm	S _u =55 mm	
	Screed height*	S =71 mm	S =71 mm	

*Total construction height = Screed height S + 20mm thickness of EPS board

Table 7: Calcium Sulphate Liquid Screed CAF of Bending Tensile Strength Class F7 in acc. with DIN 18560-2

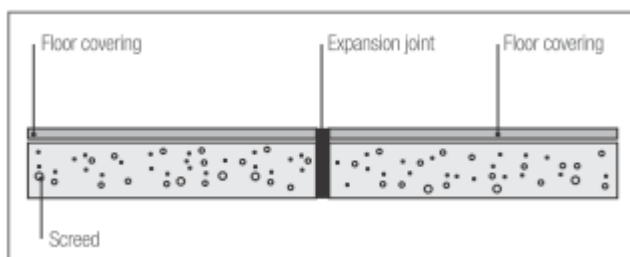
Area Load [kN/m ²]		RAUTHERM S 16 x 2.0mm	RAUTITAN Pink 16 x 2.2mm	Construction Plan
≤ 2	Cover	S _u =35 mm	S _u =35 mm	
	Screed height*	S =51 mm	S =51 mm	
≤ 3	Cover	S _u =40 mm	S _u =40 mm	
	Screed height*	S =56 mm	S =56 mm	
≤ 4	Cover	S _u =45 mm	S _u =45 mm	
	Screed height*	S =61 mm	S =61 mm	
≤ 5	Cover	S _u =50 mm	S _u =50 mm	
	Screed height*	S =66 mm	S =66 mm	

*Total construction height = Screed height S + 20mm thickness of EPS board

5) Expansion Joints

The below information is derived primarily from DIN 18560-2:

- Expansion joints are required around the perimeter of the heated area. Use REHAU *edge insulation strip* and attach it to the walls.
- Structural reinforcement should not cross joints
- Expansion joints are also required between a heated screed and an unheated screed slab, between the doors separating rooms. Joints in the screed/slab should be located so to coincide with structural joints. Use REHAU *expansion joint profile*.

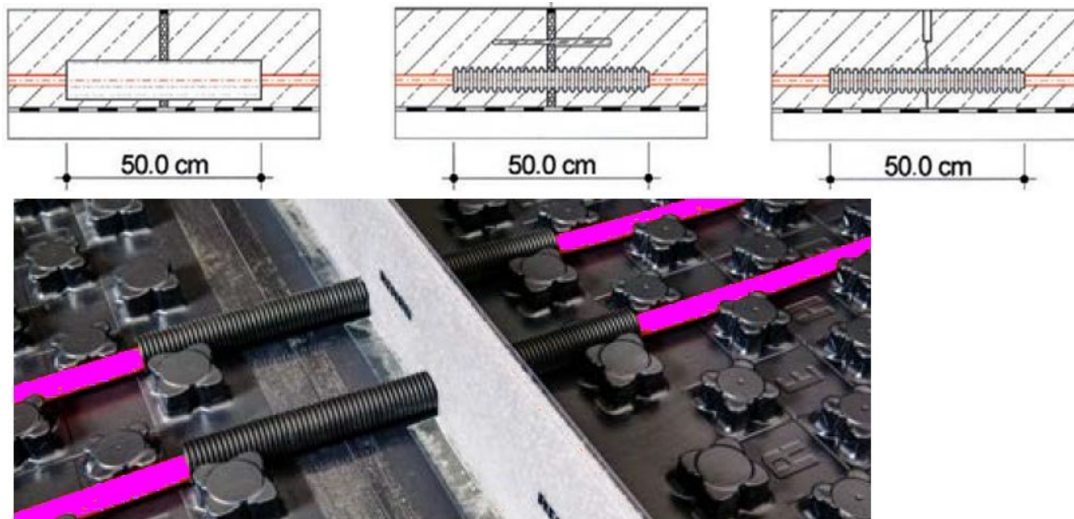


Incorrect expansion joints are the most common cause of damaged floor screeds.

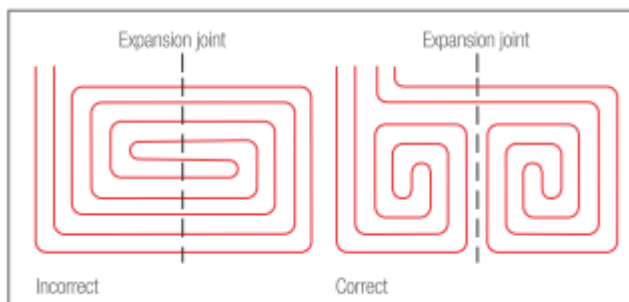
- Further Expansion joints are required if one of the following apply:
 - The screed surface is in excess of 40m²
 - The side lengths are in excess of 8m
 - The ratio of the sides is greater than half

In those cases, Expansion joints must be provided to divide the area into smaller areas not exceeding the above limitations. Use REHAU *expansion joint profile*.
- Connecting lengths may cross through expansion joints, but must be protected using the REHAU expansion joint profile and the REHAU *corrugated sleeve*, extending to at least 250

mm either side of the joint.



- In screed/topping slab applications, dummy joints (i.e. saw-cut joint) may be formed to subdivide further the screed/topping slab bays defined by the movement joints. After the screed/topping slab has hardened and dried, these joints shall be filled with a sealant (eg. epoxy resin). Dummy joints made and sealed in this way need not be taken into consideration when the flooring is laid, i.e. they do not need to be carried through to the flooring.
- A plan should be prepared to define the location and type of the joints to be formed, this should be prepared by the technically capable party (i.e. Structural Engineer). All planned joints must be marked on the architects drawing and then submitted to the underfloor heating designer / installer as part of their works schedule
- In the case of heated slab/screed movement and edge joints shall only be crossed by connecting pipes and only in one plane. In such cases, the pipe work shall be provided with a flexible sheath with suitable openings.
- Manifold positions and underfloor heating circuits shall be planned and positioned to avoid routing through expansion joints:



6) Floor Coverings

Floor coverings that have a low R-Value such as polished concrete, tiles or stone are recommended. Carpets and insulating layers such as rubber underlays retard the heat travelling upwards and this in practicality reduces the performance of the UFH system.

Floor coverings when used in conjunction with expansions joints should be discussed and agreed at the planning stage with the company responsible for laying the final floor covering. Expansion joints should continue through the screed slab and should be level with the upper most part of the final floor covering e.g. hard coverings (ceramic and wood) and soft coverings (i.e. plastic and textile).

7) Installation and Commissioning

Refer to REHAU's Technical Information Underfloor Heating/Cooling, available as download on www.REHAU.com.au/UFH

- All internal walls shall be installed (or at least provided to a height of minimum 100mm). Fix REHAU *edge insulation strip* around all walls and door frames to avoid contact between the screed and the building structure (=provision of thermal expansion for the heated screed, restriction of sound transmission from the screed into the building structure).
- Lay REHAU *Studded Panel* against the *edge insulation strip* and fix the PE foil of the edge insulation strip onto the Studded panel.
- Overlap the foil on *Studded Panel* to prevent ingress of moisture. Where two adjoining panels have no foil overlap, install a strip of PE foil across the joint.
- After installation of pipe work in accordance with the design*, install REHAU *corrugated pipe* and REHAU *expansion joint profile* where required (refer to point 5).
- AFTER the final floor finish is completed, cut the *edge insulation strip* and *expansion joint profile* to align it with the finished floor level. Fill gap with flexible sealant, ie silicone.

Studded Panel may compress under load by up to 3mm. Any joints between screed and walls therefore shall be flexible. In rooms with UFH circuits, the **insulation layer shall cover the entire floor area, including unheated areas (ie under a kitchen bench), to avoid screed damages.**

RAUTITAN fittings in screeds are approved and warranted if wrapped and protected from contact with the screed in accordance to the REHAU Technical Information.

**REHAU offers a detailed design service with performance calculation, hydraulic balancing information, CAD drawing and Bill of Material. Refer to hydronic.rehau.com.au for further details.*

Disclaimer:

The information provided within this document has been made using European standards and hence is only provided as a general guideline. The suitability for use in Australia and NZ, as well as applied area and point load conditions must be assessed by the user on a case-by-case basis. This technical information is not intended to be used as final drawings or specifications. The applicable architect/engineer shall be responsible to convert this technical information into a final specification that meets the functional and aesthetic needs of its client, as well as complying with all applicable codes and local climate conditions. No representations, warranties, or guarantees are made regarding the suitability of the technical information to meet code requirements for any particular project, nor regarding the accuracy of the costing of any project based upon this information.