SINTEF Technical Approval

TG 2466

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Valid until 01.11.2030

Provided listed on
www.sintefcertification.no

SINTEF confirms that

Roth Norge underfloor heating system

has been found to be fit for use in Norway and to meet the provisions regarding product documentation given in the regulation relating to the marketing of products for construction works (DOK) and regulations on technical requirements for building works (TEK), with the properties, fields of application and conditions for use as stated in this document

1. Holder of the approval

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2. Product description

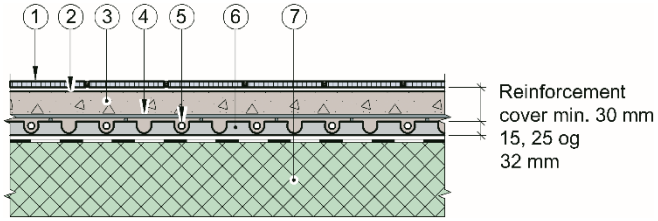
General

Roth Norge hydronic underfloor heating system consists of underfloor heating pipes, heat-distributing layers, and fastenings. Table 1 specifies the components included in the approval.

The underfloor heating pipes are supplied with hot water from an underfloor heating manifold consisting of manifolds, underfloor heating shunts, and control systems. The underfloor heating manifolds are not a part of the approval.

Embedded solutions

The underfloor heating pipes can be laid in a concrete screed or a self-levelling compound, as shown in figures 1 and 2.

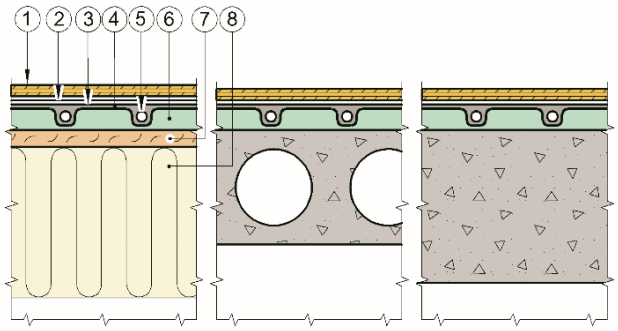


1	Floor tiles/ parquet	5	Roth clip rail
2	Tile adhesive/ underlay for parquet	6	Roth X-PERT S5® pipes/ Roth X-PERT S3 pipes
3	Concrete screed	7	Insulation
4	Reinforcement		

Fig. 1
Underfloor heating pipes embedded in concrete or a self-levelling compound, and fastened with Roth clip rails. The clip rails are placed at a spacing of approximately 1 m for 20 mm pipes and 0,5 m for 10,5 mm pipes.

Table 1
The main components included in the Roth Norge underfloor heating system

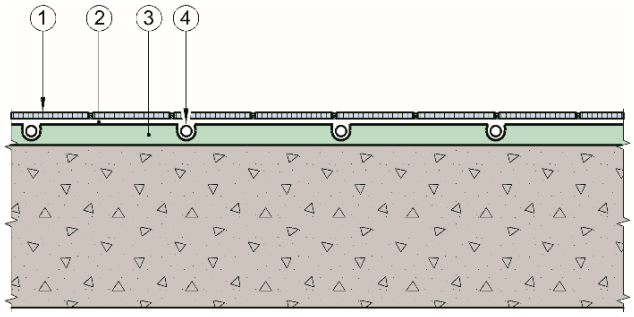
Component	Description
Roth X-PERT S5®	5-layer underfloor heating pipe. Pipe dimensions: 10,5 x 1,3 mm, 16 x 2,0 mm and 20 x 2,0 mm
Roth X-PERT S3	3-layer underfloor heating pipe for embedment. Pipe dimensions: 16 x 2,0 mm and 20 x 2,0 mm
Roth Alu-LaserPlus®	Underfloor heating pipe with laser-welded aluminium sheet. Pipe dimensions: 16 x 2,0 mm, 20 x 2,0 mm and 26 x 3,0 mm
Roth QuickTemp heat emission plates	Aluminium heat emission plate with thickness 0,5 or 0,7 mm and longitudinal grooves for 16 or 20 mm pipes.
Roth QuickTemp Universal panel EPS 30	30 mm hard EPS insulation panel with tracks and associated heat emission plates in aluminium for 16 and 20 mm pipes.
Roth QuickTemp ClimaComfort® system	Black plates of respectively PET or PP with integrated pipe clamps for 10,5 mm or 16 mm pipes.
Roth QuickTemp ClimaComfort® Flow	Self-levelling and fibre-reinforced filling compound.
Roth QuickTemp Compact® Basic 24/16	25 mm thick XPS plates with cast tracks and glued-on 0,22 mm aluminium plates. The turning plate is called Roth QuickTemp Compact® Basic 24/16 turning plate.
Roth QuickTemp Compact® system	High density polystyrene (EPS) plates with cast tracks and glued-on 0,5 mm thick aluminium plates. Build height is 14 mm with 10,5 mm pipes and 24 mm with 16 mm pipes.
Roth Original Tacker® System	25 or 30 mm thick EPS insulation panel with plastic layer for keeping pipes in place with Roth Tacker® attaching clips
Roth QuickTemp Universal Chipboard System	22 mm chipboard panels pre-grooved for underfloor heating pipes used together with Roth QuickTemp heat emission plates.
Roth clip rail and staple clips	PVC fixing materials
Roth QuickTemp Compact FLEX FIX	Cement based adhesive used for gluing of Roth QuickTemp Compact® system to the sub floor and as adhesive for tiles.



1	Parquet	5	Roth X-PERT S5® pipes
2	Underlay /Foam for parquet	6	Roth QuickTemp ClimaComfort® system
3	Vapour barrier	7	Particle board floor underlay
4	Roth QuickTemp ClimaComfort® Flow self-levelling compound	8	Stable subfloor of wood or concrete

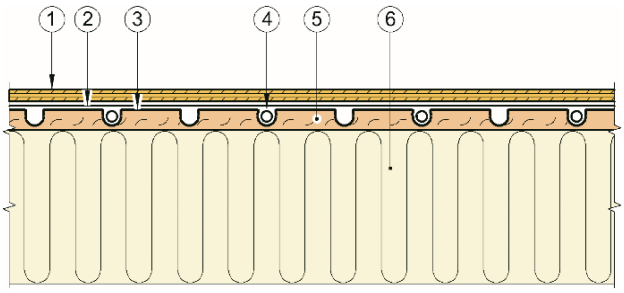
Fig. 2
The Roth QuickTemp ClimaComfort® system. The Roth QuickTemp ClimaComfort® system plate is attached to the floor and pipes are applied in the plates, and then covered with Roth QuickTemp ClimaComfort® Flow self-levelling compound.

Dry solutions
Roth X-PERT S5® and Roth Alu-LaserPlus® are laid in the aluminium heat emission plates. The heat emission plates are installed in pre-grooved plates or formwork made of XPS, EPS, chipboard, fibreboard or in slotted floors, as shown in figures 3–5.



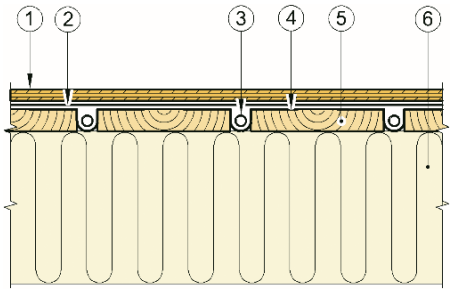
1	Tiles	3	Roth QuickTemp Compact® system-panels with cast tracks and glued-on 0,5 mm thick aluminium plates or Roth QuickTemp Compact Basic with cast tracks and glued-on 0,22 mm aluminium plates
2	Tile adhesive	4	Roth X-PERT S5® pipes

Fig. 3
The Roth QuickTemp Compact® system high density polystyrene (EPS) panels with cast tracks and glued-on 0,5 mm thick aluminium plate. Build height is 14 mm with Roth X-PERT S5® 10,5 mm pipes and 24 mm with 16 mm Roth X-PERT S5® pipes.



1	Parquet	4	Roth X-PERT S5® pipes
2	Underlay /Foam for parquet	5	Roth Universal chipboard
3	Roth heat emission plate	6	Insulated wooden subfloor

Fig. 4
Roth underfloor heating pipes placed in Roth heat emission plates and Roth QuickTemp Universal chipboard. When using laminate flooring, a subfloor must be installed on the top of the chipboard.



1	Parquet	4	Roth heat emission plates
2	Underlay /Foam for parquet	5	28 mm adjusted timber
3	Roth X-PERT S5® pipes	6	Insulated wooden subfloor

Fig. 5
Roth underfloor heating pipes placed in slotted floor.

3. Fields of application
Roth Norge underfloor heating system is used for heating purposes in residential, office and commercial buildings. Unless specific assessments are made in each individual construction project, the use of the floor structures is limited to:

- Floors with design loads in category A or B according to NS-EN 1991-1-1
- Buildings in risk class 1–6 in fire class 1, 2, and 3, provided that the constructions are carried out as specified in section 6 *Conditions for use*.

4. Properties
Underfloor heating pipes
The Roth X-PERT S5® and X-PERT S3 have the following physical properties:

- Maximum operating pressure: 6 bar
- Maximum short-term operating temperature: 95 °C
- Maximum permissible operating temperature: 70 °C

The Roth Alu-LaserPlus® has the following physical properties:

- Maximum operating pressure: 10 bar
- Maximum short-term operating temperature: 95 °C
- Maximum permissible operating temperature: 70 °C

All pipe types are oxygen diffusion resistant in accordance with DIN 4726.

Levelling compound
Roth QuickTemp ClimaComfort® Flow has a thermal conductivity of 0,94 W/(m·K) and a fire class A1 in accordance with EN 13501-1.

Heat Emission
The heat emission from a hydronic underfloor heating system is typically around 20–80 W/m². The flow water temperature is usually 35–55 °C with a temperature drop across the floor surface (ΔT) of 5 °C. The heat emission depends on the thermal resistance in the floor structure, the chosen pipe diameter and spacing, water temperature, and the temperature difference in the water.

Reaction to fire
Reaction to fire classifications according to EN 13501-1 for products included in Roth Norge underfloor heating system, used as given in the approval, are:

- Roth QuickTemp heat emission plate: A1
- Roth QuickTemp ClimaComfort® Flow self-levelling compound: A1
- Roth Original Tacker® 25/30: E
- Roth QuickTemp Universal Chipboard System : D_{fl}-s1

The classification is valid for the way the product is used in this building system. Other components are not classified

Sound insulation
The properties of airborne and impact sound insulation depend on floorings, thickness of the screed, type of flooring underlayment and supporting structure, and are not covered by the approval.

Thermal insulation
The insulation boards included in Roth Norge underfloor heating system have properties according to Table 2.

Table 2
Thermal conductivity

Component	Thermal conductivity[1)] W/(m·K)
Roth QuickTemp Universal panel EPS 30	0,033
Roth Original Tacker® 25/30	0,040–0,045
Roth QuickTemp Compact Basic 24/16	0,032

[1)] Declared value in the manufacturer's declaration of the performance (DoP)

Durability
Roth Norge underfloor heating system's durability has been assessed as satisfactory for the intended application based on the properties of the materials the system is made of.

5. Environmental aspects

Substances hazardous to health and environment
Roth Norge underfloor heating system contains no hazardous substances with priority in quantities that pose any increased risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances.

Effect on indoor environment
Roth Norge underfloor heating system is evaluated according to SINTEF Technical Approval – Health and Environmental Requirements version 09.09.2024. The product is not regarded as emitting any particles, gases or radiation that have a perceptible impact on the indoor climate, or to have any significant impact on health. The product meets the requirements in BREEAM-NOR v6.1, Emissions from building products according to Hea 02 Indoor air quality.

Waste treatment/recycling
The product must be sorted at source as residual waste, metal, wood, and other relevant waste fractions when disposed of. The product shall be delivered to an authorized waste treatment plant for energy and material recovery.

Environmental declaration
An environmental product declaration (EPD) has been prepared for Alu-LaserPlus in accordance with EN 15804. For the full environmental declaration, see EPD no. NEPD-4935-4278, www.EPD-norge.no.

6. Special conditions for use and installation

Design considerations
Underfloor heating systems shall be designed based on the specific conditions of the building. Suitability shall be evaluated for each individual building project. Thermal dimensioning shall be performed for each individual building. The QuickCalc calculation program is used to calculate heat emission and the maximum pipe length per pipe loop. See SINTEF Building Research Guide 553.117 *Pipe-in-pipe systems for water supply* and 552.111 *Hydronic Underfloor Heating Systems and Design*.

Floor coverings and surface temperature
Parquet, solid wood flooring, laminate, tiles, or sheet flooring can be laid over the underfloor heating system. Floor coverings and flooring underlayers should have the lowest possible thermal resistance to maximize heat transfer to the room.

The surface temperature of the floor must be adjusted according to the room's intended use and the type of floor covering. For floors with parquet or solid wood coverings, the surface temperature should be limited to 26–27 °C to prevent cracking. For gypsum boards in direct contact with the underfloor heating pipes, the water temperature should not exceed 40 °C. The manufacturer's instructions shall be followed.

Substrate for floor coverings on pre-routed panels
The substrate must be sufficiently rigid to prevent floor coverings from cracking. In the case of thin floor coverings, it is often necessary to use a load-distributing plate atop the pre-routed panels to ensure even load distribution. See examples in Figure 6.

Installation of underfloor heating pipes
Underfloor heating pipes shall be laid in continuous lengths in the floor without joints and installed such that fixings don't damage the pipes. The pipes are pressed into the pre-routed panels according to the designed layout from installation drawings. When embedded in concrete, the pipes can also be directly attached to the thermal insulation or impact sound plates with clips, laid in rails attached to the substrate, or secured with binding wire or cable ties to the reinforcement mesh.

To detect potential leaks, the pipes must undergo an air- or liquid-leak testing before they are covered. The leak testing shall be performed in accordance with the manufacturer's instructions, and the results of the test shall be documented.

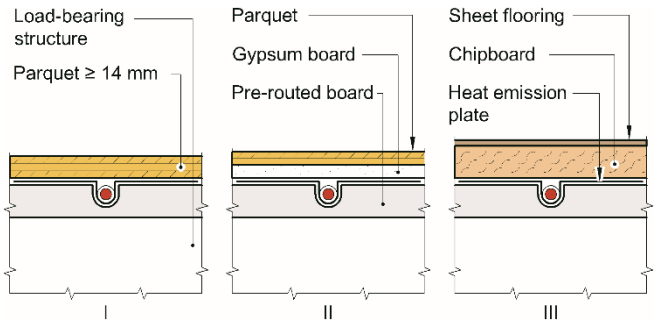


Fig. 6
Examples of various floor coverings and necessary substrates when using pre-routed panels:
I. Parquet with a thickness of 14 mm or more
II. Coverings that require support, such as laminate or parquet less than 14 mm
III. Sheet flooring on load-distributing 22 mm chipboard

Embedding underfloor heating pipes in cast concrete
The screed or self-levelling compound is applied according to the guidelines in SINTEF Building Research Guide 541.201 *Screeds and floor finishing on floors* and 572.231 *Floor levelling compounds: Types, Properties, and Execution.*

A self-levelling compound with thermal conductivity $\lambda \geq 0{,}6$ W/(m·K) shall be used. To ensure effective heat transfer, the pipes shall be fully embedded in cast concrete.

The screed shall have a thickness of 50–70 mm with a minimum coverage of the heating pipes of 30 mm. When using self-levelling compound, the thickness of the concrete screed can be reduced to 30–40 mm with a minimum coverage of the heating pipes of 10–15 mm. If the coverage of underfloor heating pipes is further reduced, fire safety shall be documented for each individual building project.

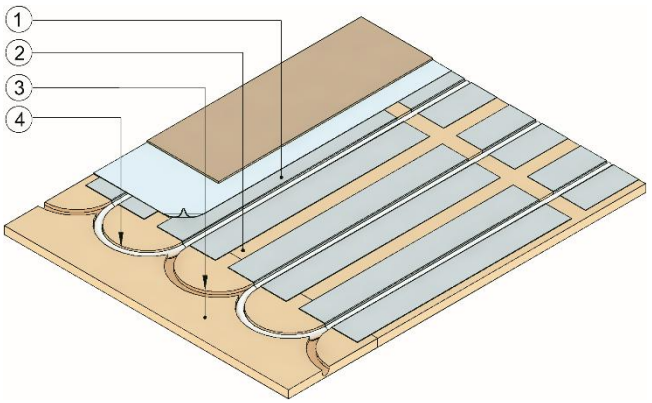
The manufacturer's instructions shall be followed.

Installation of heat emission plates
Roth QuickTemp Heat emission plates can be installed in pre-routed panels made of EPS, wood fibre, wood chips, or in grooved floors. To prevent creaking, heat emission plates shall not overlap, as shown in Figure 7. The manufacturer's instructions shall be followed.

Pre-routed chipboards can be used as a load-bearing subfloor on timber joists. Porous wood fibreboards and EPS boards are not loadbearing and require a supporting board when laid on timber joists.

shutdown. See SINTEF Building Research Guide 553.117 *Pipe-in-Pipe Water Supply Systems* and 553.135 *Leakage Stoppers.*

Thermal insulation
The required thermal insulation for underfloor heating, as well as the placement and necessary thickness of the insulation, depend on the floor construction and whether the floor is located between heated rooms, on the ground, or against an unheated area.



1	Roth QuickTemp heat emission plates	3	Pre-routed turn plate
2	Pre-routed panel	4	Roth heating pipes

Fig. 7
Roth heat emission plate installed in pre-routed panels made of wood chip, wood fibre, or EPS.

The minimum required thickness of thermal insulation layer for underfloor heating can be calculated in accordance with EN 1264-4. Uninsulated concrete slabs between heated rooms shall always have insulation beneath the underfloor heating pipes to prevent heat transfer to the floor below. In insulated timber floors, additional insulation is usually not necessary. The insulation material must be rigid enough to withstand point loads and avoid bending or cracking in the screed, parquet floors, and similar surfaces. Floor insulation under the screed should have a minimum compressive strength class of CS(10)60 according to EN 13163 (60 kPa).

Along walls, columns, and other vertical fixed structures, edge insulation must be installed to absorb movements in the screed and prevent sound transmission between flanks. Cracks, movements, and vibrations can be countered by placing edge supports along walls, doors, and heavy fixed fixtures such as in kitchens.

Edge support is particularly important when working with thin screeds, less than 35 mm, in combination with soft acoustic insulation boards.

Safety in case of fire
Roth underfloor heating system with Roth Universal Board EPS 30, Clima Comfort System, Compact System, Original Tacker®, Roth QuickTemp Compact Basic 24/16 with a thickness of up to 36 mm, or Universal Chipboard System, covered with wooden construction boards, floor gypsum boards, or parquet with a minimum classification of $K_2$10 Dfl-s1 on the relevant substrate, can be used in both combustible and non-combustible floor constructions in buildings of risk classe 1–6 in fire classe 1, 2, and 3. Examples of construction boards that meet this classification are provided in SINTEF Building Research Guide 520.339 *Use of Combustible Insulation in Buildings*.

Roth underfloor heating system with Roth Universal Board EPS 30, Clima Comfort System, Compact System, Original Tacker® or Roth QuickTemp Compact Basic 24/16 with a thickness of up to 36 mm, or Universal Chipboard System, covered with screed or self-levelling compound as described in the approval, can be used in combustible and non-combustible floor structures in buildings of risk classe 1–6 in fire classe 1, 2, and 3.

The application of the product in risk classe and fire classe other than those specified here is not covered by the approval and shall be documented separately by the responsible enterprise for each individual building project. Before selecting the Roth underfloor heating system for use in a building project, it shall also be verified whether the project requires stricter or different performance criteria than the pre-accepted ones.

Combustible insulation used as a substrate for floor coverings must be interrupted at all fire-rated constructions and covered at all transitions and perimeter zones, stairs, penetrations, etc. It is particularly important not to have exposed surfaces of combustible insulation facing a shaft in order to prevent fire spread.

The solutions shall otherwise be constructed as shown in SINTEF Building Research Guide 520.339 *Use of Combustible Insulation in Buildings*. For further information on hydronic underfloor heating, see SINTEF Building Research Design Guide 552.122.

Heat Distribution System
The underfloor heating pipes are to be connected to the Roth underfloor heating manifolds and Roth shunts. The Roth shunts are delivered complete with pump, thermostat valve, weather compensation system, pre-setting key, and thermometer.

Manifolds and shunts should be installed within a manifold cabinet with a waterproof bottom and drainage capability. In cases where it is not technically possible to have an overflow to a drain, a manifold cabinet with a waterproof bottom can be used in combination with a water leakage detector and automatic pump. Examples are provided in SINTEF Building Research Guide 553.117 *Pipe-in-pipe systems for water supply* and 553.135 *Leak stoppers*.

Completion
Prior to handover, the system must undergo a water pressure test, be cleaned, purged of air, activated and adjusted in accordance with the instructions provided by Roth Norge.

Documentation and marking of underfloor heating circuits
The underfloor heating circuits should be marked with numbers. Label/mark clips that are attached to the pipes may be used. A circuits layout should be prepared, including essential information for each underfloor heating circuit: room number (name), circuit length, pipe dimension, and water flow rate. Documentation in Norwegian or another Scandinavian language should be available during the final inspection and handover of the facility.

Operation and Maintenance
In a waterborne floor heating system, following checks are advisable to be performed regularly:

- If the water pressure is stable. The pressure in the system varies depending on the water temperature.
- If the pressure in the expansion tanks is as designed or in accordance with the manufacturer's instructions.
- If the water temperature follows the outdoor temperature when the system is weather-compensated.
- If the connections are adequately tight (visual inspection), and if there are unusual sounds in the system (acoustic inspection).

Transport and storage
The Roth Norge underfloor heating pipes must not be stored or installed in a way that exposes them to direct sunlight.

7. Factory production control

The components of Roth Norge underfloor heating system are produced in Germany for Roth North Europe A/S.

The holder of the approval is responsible for maintaining the factory production control to ensure that Roth Norge underfloor heating system is produced in accordance with the preconditions applying to this approval.

The manufacturing of Roth Norge underfloor heating system is subject to continuous surveillance of the factory production control in accordance with the contract regarding SINTEF Technical Approval.

The manufacturer´s quality system and environmental management system are certified in accordance with ISO 9001 and ISO 14001.

The floor construction on site must be controlled in each building project as a part of the building control.

8. Basis for the approval

The product's performances are documented in reports issued by independent bodies. The technical documentation serves as the basis for SINTEF's product assessment with respect to the guidelines for SINTEF Technical Approval, and recommendations as outlined in SINTEF Building Research Design Guides.

9. Marking

All components included in Roth Norge underfloor heating system shall be labelled with the manufacturer's product designation and/or name, product name and date of production.

Roth QuickTemp ClimaComfort® and Flow is CE-marked in accordance with NS-EN 13813. Roth QuickTemp Universal plate EPS 30, RothCompact® system and Roth Original Tacker® insulation plates are CE- marked in accordance with NS-EN 13163.

The approval mark for SINTEF Technical Approval TG 2466 may also be used.

7. 10. Liability

The holder/manufacturer has sole product liability according to current law. Claims can only be made against SINTEF under general law or other special grounds.

for SINTEF



Hans Boye Skogstad
Approval Manager