



## REHAU (UK) Limited

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**Agrément  
Certificate  
No 99/3654**

Designated by Government  
to issue  
European Technical  
Approvals

## REHAU UNDERFLOOR HEATING SYSTEM

Système de tuyaux pour chauffage sous planchers  
Beheizung unter Decke

### Product



- THIS CERTIFICATE RELATES TO THE REHAU UNDERFLOOR HEATING SYSTEM, COMPRISING CROSS-LINKED POLYETHYLENE PIPES, MANIFOLDS AND ANCILLARY COMPONENTS (SEE SECTION 5).

- The products are for use in conjunction with a source of heated water and appropriate manifolds to provide a space heating system in domestic, commercial or public buildings where the system is designed in accordance with the guidelines of REHAU (UK) Limited.

- The REHAU piping system is for use in new or existing floors as described in section 4 of this Certificate.

- This Certificate does not cover the boiler, pumps, or controls necessary to complete the heating system, which are assumed to be conventional items.

## Regulations, Legislation and Byelaws

### 1 The Building Regulations 1991 (as amended) (England and Wales)



The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of cross-linked polyethylene pipes with the Building Regulations. In the opinion of the BBA, the REHAU Underfloor Heating System is not subject to these Regulations.

### 2 The Building Standards (Scotland) Regulations 1990 as amended



In the opinion of the BBA, the use of the REHAU Underfloor Heating System is not subject to these Regulations.

### 3 The Building Regulations (Northern Ireland) 1994 (as amended)



In the opinion of the BBA, the use of the REHAU Underfloor Heating System is not subject to these Regulations.

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## 4 Water Supply (Water Fittings) Regulations, England and Wales, Water Byelaws, Scotland and the Water Regulations, Northern Ireland

### England and Wales

In the opinion of the BBA, the REHAU Underfloor Heating System satisfies the requirements of the Water Byelaws.

### Scotland

In the opinion of the BBA, the REHAU Underfloor Heating System satisfies the Water Byelaws issued by the Regional Authorities.

### Northern Ireland

In the opinion of the BBA, the REHAU Underfloor Heating System satisfies the Water Regulations (Northern Ireland) 1991.

## Technical Specification

### 5 Description

#### General

5.1 The REHAU Underfloor Heating System comprises:

REHAU pipe  
REHAU manifold.

5.2 Other ancillary items used with the system but not covered by this Certificate are:

REHAU corrugated sleeve  
REHAU Railfix  
REHAU polythene membrane edging strip  
REHAU heat diffusion plates  
compression sleeve connector system<sup>(1)</sup>.

(1) Conforms to DIN 18380 : 1992 and the 16 mm has been tested in accordance with BS 7291 : Part 1 : 1990, Class 'S'.

5.3 The basic REHAU pipe (see Figure 1) comprises a base cross-linked polyethylene (PE-X) pipe of nominal diameter 16 mm or 20 mm with a wall thickness of 1.5 mm and 1.9 mm, and a coextruded oxygen diffusion barrier. The oxygen diffusion barrier is an ethylene vinyl alcohol (EVAL) copolymer resin. The pipe also has a heavily pigmented adhesive red opacity barrier, which is used to fix the EVAL barrier in place.

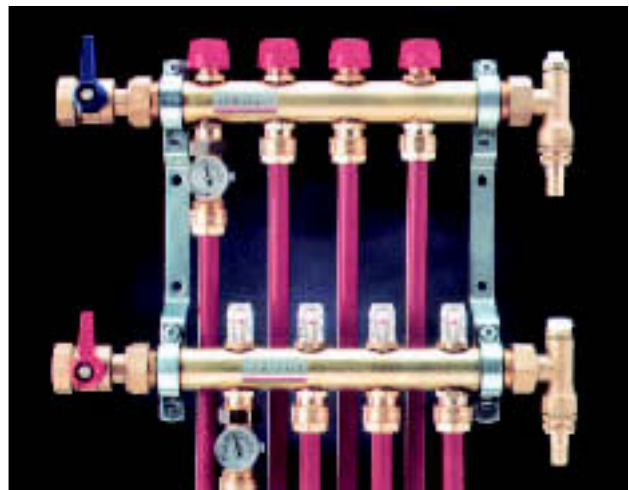
Figure 1 REHAU pipe



#### Manifolds

5.4 The REHAU manifolds (see Figure 2) are vital to the system as they control the flow of heated water through the underfloor pipe circuits. These are cast from dezincification resistant brass and mounted on galvanized brackets. The manifold options available range between two- to 12-port connections, and compression couplings are used for jointing from the pipe to the manifold. The length of pipe from the manifold to the exit of the floor is protected using REHAU corrugated sleeve.

Figure 2 REHAU manifold



#### Manufacture

5.5 The cross-linked polyethylene base pipe is produced by an extrusion process. The polyethylene layer and oxygen diffusion barrier layer are coextruded, and a red adhesive opacity barrier added to fix the EVAL barrier in place. Continuous quality control is carried out during manufacture, including checks on dimensional accuracy, degree of cross-linking, heat reversion.

5.6 Manifolds and brass components are manufactured using conventional techniques and bought in by REHAU (UK) Limited, to an agreed specification.

## 6 Delivery to site and storage

6.1 The REHAU pipe is supplied in coils of length up to 240 metres for the 16 mm diameter pipe or 200 metres for the 20 mm diameter pipe. The pipe bears a continuous mark showing the manufacturer's trade mark, dimension, maximum operating temperature and pressure, manufacturing code, year and week of production. The coils bear a label showing the BBA identification mark incorporating the number of this Certificate and are supplied in cardboard packaging.

6.2 The REHAU manifolds, termination boxes and other small components are supplied in cardboard packaging.

6.3 All components should be stored under cover until required, to prevent UV exposure and site damage.

## Design Data

### 7 General

7.1 The REHAU Underfloor Heating System is suitable for use in domestic, commercial or public buildings, in underfloor heating systems.

7.2 The REHAU technical literature contains data useful to the designer.

7.3 The system can be readily installed in new buildings and suspended floors in existing buildings.

### 8 Design procedure

#### Heating design

8.1 The procedures for system design based on DIN EN 1264 : 1997 and REHAU's experience in this field are outlined in REHAU (UK) Limited's technical manual 864.680E (dated February 1999).

8.2 The heating demands for particular rooms are evaluated in the manner detailed in the CIBSE Guide 1980, Part A *Structural Design*.

8.3 Floor constructions must be designed to comply with the relevant technical specifications selected from:

BS 8110 : Part 1 : 1985

BS 5268 : Part 2 : 1988

the national Building Regulations:

#### *England and Wales*

Approved Document A 1/2, Section 1, Part B

#### *Scotland*

Regulation 11 *Structure*, Standard C2.2

#### *Northern Ireland*

Part D *Structure*.

## 9 Safe working temperatures and pressures

The safe operating pressure and maximum temperature rating for the REHAU pipe is 6 bar at 90°C. The pipe can operate at 3.5 bar at 110°C for a limited period without damage. There is an adequate safety factor to ensure that damage to the pipe will not occur in the event of boiler thermostat or other control failure.

## 10 Practicability of installation

The REHAU Underfloor Heating System is installed easily under normal site conditions.

## 11 Chemical resistance

The cross-linked polyethylene of the REHAU pipe will be unaffected by soft, hard or aggressive potable water.

## 12 Effect on water quality

The REHAU pipe and fittings are listed by the United Kingdom Water Fittings Byelaws Scheme (UKWFBS).

## 13 Properties in relation to fire

Where the REHAU pipe passes through an element of structure or cavity barrier the opening should be fire-stopped in a way that will permit thermal movement.

## 14 Maintenance

14.1 The system as assessed, does not require special maintenance. Items such as flow valves and control equipment are outside the scope of this Certificate but may require routine maintenance.

14.2 The EVAL barrier in the REHAU pipe virtually eliminates the diffusion of oxygen into the heating system provided the system is completely sealed. The checking and addition of a corrosion inhibitor is recommended on a yearly basis.

## 15 Durability

15.1 The system has been widely used in other European countries for 25 years. Experience with the system has been favourable.

15.2 In addition Avis Technique 15/95-217 issued by CSTB<sup>(1)</sup> gives a 50-year life for this product for underfloor heating.

(1) Centre Scientifique at Technique du Bâtiment (French Agrément Authority).

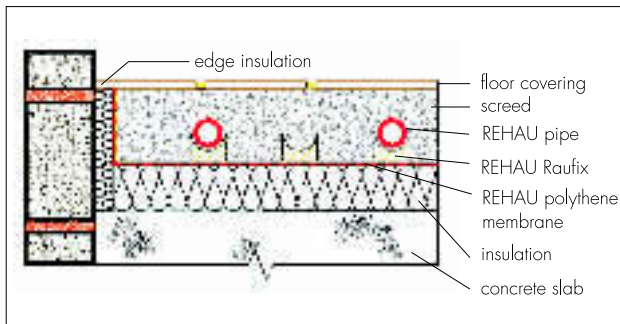
15.3 The REHAU manifolds and couplings are produced from materials known to be durable in plumbing applications. They may require replacement within the life of the REHAU pipe.

## Installation

### 16 General

16.1 Installation of REHAU Underfloor Heating System must be carried out in accordance with the manufacturer's instructions and BS 6700 : 1987. General installation details are shown in Figure 3.

Figure 3 Typical screed solid floor installation



16.2 Prior to installation, the REHAU pipe should be kept in a warm room (at approximately 20°C) to improve its workability.

16.3 If a joint beneath the floor is unavoidable, eg due to local damage, a compression fitting<sup>(1)</sup> designed and supplied by REHAU (UK) Limited must be used for the purpose.

(1) This fitting is outside the scope of this Certificate.

### 17 Procedure

17.1 The procedures are detailed in the REHAU installation manual 864:864E (dated June 1999). A summary is given in sections 17.2 to 17.7.

#### Solid concrete floor (see Figure 3)

17.2 Edging strip is positioned around the perimeter of the room. Expanded polystyrene is laid onto the concrete sub-base and covered with REHAU polyethylene membrane. REHAU Railfix system is recommended to secure the REHAU pipe in standard installations.

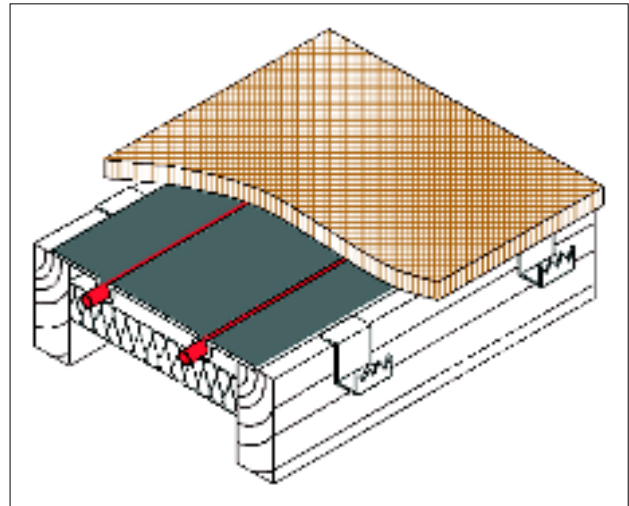
17.3 The system should be pressure tested before the concrete screed or sand/cement is laid over the pipe. Should pressure testing take place in sub-zero temperatures, or if the system is to be left after pressure testing in sub-zero temperatures, all necessary precautions should be taken to avoid frost damage to the pipework. The thickness of the screed will be dependent upon the loading requirements of the floor, but the cover to the pipe must not be less than 50 mm. The screed should be laid in accordance with the relevant requirements of BS 8204 : Part 1 : 1987.

#### Suspended wooden floor (see Figure 4)

17.4. The system can be used for suspended floors by fitting REHAU heat diffusion plates across onto the joists, under the floor covering. Downward heat loss is minimised by placing close-fitting insulation. Some carpentry will be necessary to fit this system.

Structural timbers should be notched only with the permission of the architect or structural engineer, and in accordance with BS 6700 : 1987, clause 13.7.9. The system should be pressure tested before nailing down the floor deck.

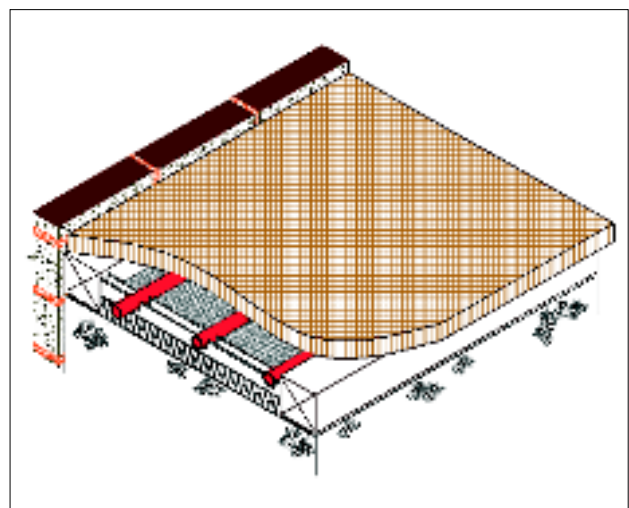
Figure 4 Suspended wooden floor



#### Sprung wooden floor (see Figure 5)

17.5 Each system has to be designed based on the construction detail of the sprung floor. A raised timber framework is constructed over the floor area creating a series of channels. The timber sections are positioned with lengths running along the longest room axis. The REHAU pipe is fixed in position using the REHAU Railfix system, secured to the insulation.

Figure 5 Sprung wooden floor

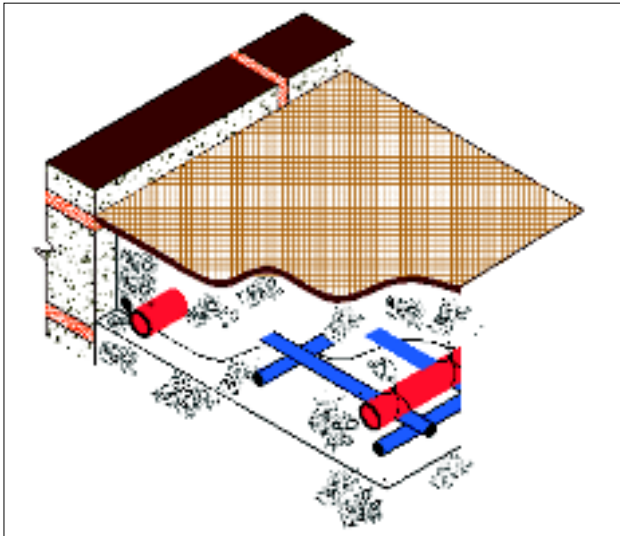


#### Structural floor slabs (see Figure 6)

17.6 The system can be installed directly into structural floor slabs. The pipe circuits are usually fitted to the lower cage of the reinforcing steel using plastic ties.

17.7 The system should be pressure tested before the concrete is poured over the pipes. The pipe circuits should remain pressurised for 28 days after pouring the concrete, during curing.

Figure 6 Structural floor slabs



## Charging and pressure testing

17.8 Prior to screeding, the system must be flushed with water so that all the heating circuits are free from air. This is carried out circuit by circuit (ie with the valves for the other circuits remaining closed). When all air is bled from the pipe and manifolds, the system can be pressure tested. The system should be tested to 6 bar, but may require five or six applications of the pressure to achieve stability, as the pipe will expand slightly as it is pressurised. The pressure must remain stable at between 3.5 bar and 4.5 bar for a minimum of 24 hours before the system has settled and is functioning satisfactorily. Special precautions are necessary if the pressure testing is to take place in sub-zero temperatures.

## Commissioning

17.9 Heat must not be applied until the screed has cured for 28 days. When cured, water at 20°C is introduced into the system and maintained for 24 hours, increasing by 5°C every 24 hours thereafter until the maximum flow temperature is reached. The system is allowed to cool until the working temperature is acquired.

## Technical Investigations

The following is a summary of the technical investigations carried out on the REHAU Underfloor Heating System.

## 18 Tests

Test evidence was examined relating to:

- dimensional accuracy
- effect of thermal cycling on pipes and fittings
- oxygen diffusion
- long-term hydrostatic pressure resistance of pipe<sup>(1)</sup>
- hydrostatic pressure resistance of fittings<sup>(1)</sup>
- degree of cross-linking<sup>(2)</sup>.

(1) To BS 7291 : Part 1 : 1990.

(2) To BS 7291 : Part 3 : 1990.

## 19 Other investigations

19.1 An examination was made of data relating to:

- thermal stability of oxygen diffusion barrier
- chemical resistance
- practicability of installation
- durability
- opacity.

19.2 The REHAU design and installation method was examined and compared to conventional practice in the UK.

19.3 The factory production control was examined and found to be in accordance with the guidance on quality control testing given in BS 7291 : Part 3 : 1990.

## Bibliography

- BS 5268 : *Structural use of timber*  
Part 2 : 1988 *Code of practice for permissible stress design, materials and workmanship*
- BS 6700 : 1987 *Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*
- BS 7291 : *Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings*  
Part 1 : 1990 *General requirements*  
Part 3 : 1990 *Specification for crosslinked polyethylene (PE-X) pipes and associated fittings*
- BS 8110 : *Structural use of concrete*  
Part 1 : 1985 *Code of practice for design and construction*
- BS 8204 : *Screeds, bases and in-situ floorings*  
Part 1 : 1987 *Code of practice for concrete bases and screeds to receive in-situ floorings*
- DIN 18380 : *Contract procedure for building works*  
Part C : 1992 *General technical specifications for building works; systems for heating and central water heating*
- DIN EN 1264 : 1997 *Hot water floor heating systems*

## Conditions of Certification

### 20 Conditions

20.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (d) is copyright of the BBA.

20.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

20.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked by the BBA or its agents; and

(c) are reviewed by the BBA as and when it considers appropriate.

20.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of any patent or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

20.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, the REHAU Underfloor Heating System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 99/3654 is accordingly awarded to REHAU (UK) Limited.

On behalf of the British Board of Agrément

Date of issue: 7th December 1999

A handwritten signature in black ink, appearing to read 'P. C. Hewitt'.

Chief Executive



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For technical or additional information, contact the Certificate holder (see front page).  
For information about the Agrément Certificate, including validity and scope, tel: Hotline 01923 665400, or check the BBA website.