



**BRANZ Appraised**

Appraisal No.762 [2011]

BRANZ Appraisals

Technical Assessments of products  
for building and construction

**BRANZ  
APPRAISAL  
No. 762 (2011)**

**RADIANT PE-X  
HEATING PIPES AND  
FITTINGS**

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## Product

1.1 Radiant PE-X Heating Pipes and Fittings consist of PE-Xb/EVOH and PE-X/Al/PE-X Pipes and associated fittings designed to supply hot water for hydronic heating systems such as embedded floor heating systems for buildings with new concrete slab-on-ground or suspended concrete floors.

1.2 Pipes and fittings can also be installed when protected from light, in wall and floor cavities to supply hydronic panel radiators.



## Scope

2.1 Radiant PE-X Heating Pipes and Fittings have been appraised for use within the following scope:

- PE-Xb EVOH pipes and fittings operating at 1MPa and at a maximum temperature of 60°C for cast-in heating elements in concrete floors; and,
- PE-X/AL/PE-X pipes and fittings operating at 1MPa and at a maximum temperature of 80°C for cast-in heating elements in concrete floors and for use in wall and floor cavities to supply hydronic radiant heating panels; and,
- Radiant PE-X Heating Pipes must be protected from UV light.

## Building Regulations

3.1 In the opinion of BRANZ, Radiant PE-X Heating Pipes and Fittings if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet, or contribute to meeting, the following provisions of the New Zealand Building Code (NZBC):

**Clause B2 DURABILITY:** Performance B2.3.1(a) at least 50 years, and B2.3.1(b) 15 years. Radiant PE-X Heating Pipes and Fittings meet these requirements. See Paragraphs 8.1 - 8.3.

**Clause F2 HAZARDOUS BUILDING MATERIALS:** Performance F2.3.1. Radiant PE-X Heating Pipes and Fittings will not present a health hazard to people.

**Clause G10 PIPED SERVICES:** Performance G10.3.1(a). Radiant PE-X Heating Pipes and Fittings contribute to meeting this requirement.

3.2 This Appraisal assesses an **Alternative Solution** in terms of New Zealand Building Code compliance.

## Technical Specification

### Description

4.1 Pipes are supplied in the following nominal sizes and coil lengths:

#### PE-Xb with EVOH for underfloor heating

- 16 x 2.0 mm, 300 m coils
- 20 x 2.0 mm, 300 m coils

#### PE-X/Al/PE-X for both underfloor heating and radiator panels

- 16 x 2.0 mm, 300 m and 100 m coils
- 20 x 2.0 mm, 50m coils
- 25 x 2.5 mm, 50 m coils
- 32 x 3.0 mm, 50 m coils

4.2 Radiant PE-X brass press-fit or compression fittings in suitable sizes are designed for and must be used with the above listed pipes.

4.3 The PE-Xb(EVOH) and PE-X/Al/PE-X pipes are continuously marked along their length, every metre, with information including the name of the pipe, its size, pipe-type, the standards that it complies with, date and time of manufacture and distance from the end of the coil.

### Handling and Storage

5.1 Radiant PE-X Heating Pipes and Fittings should be handled with care to prevent damage. The pipes must be stored where they will not be exposed to sunlight.

## Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for Radiant PE-X Heating Pipes and Fittings. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

## Design Information

### General

7.1 Radiant PE-X Heating Pipes and Fittings are components of hot water-based underfloor heating systems which are installed in buildings such as housing, communal residential and non-residential, commercial and industrial structures. Pipes can be embedded in new concrete slab-on-ground or in suspended concrete floors, and in walls, ceilings, and under floors to supply hydronic radiant heating panels.

7.2 Once concrete is poured, the pipework exiting the slab to the control panel connection must be protected from UV sunlight. Likewise when PE-X/Al/PE-X is installed in walls, floors or ceilings for the purpose of supplying Hydronic Radiators, pipework runs must be protected from sunlight.

7.3 Radiant PE-X/Al/PE-X Heating Pipes and Fittings have been appraised for use at temperatures up to 80°C and pressures of 1 MPa. Radiant PE-Xb Pipe has been appraised for use at temperatures up to 60°C and pressures of 1 MPa. Most embedded heating systems run at significantly lower temperatures and pressures than this, and do not run continuously when in service.

7.4 Details on the advantages, limitations, design, installation and use of embedded floor heating systems are given in BRANZ Bulletin No. 491, and are relevant to the use and installation of Radiant PE-X Heating Pipes and Fittings.

7.5 Heat sources and components such as pumps, valves and thermostats, have not been assessed and are outside the scope of this Appraisal.

7.6 The minimum bending radius for the Radiant pipes is 5 times the pipe diameter.

7.7 The hot water heating system must not be connected to the potable water supply system. Potable clean water only must however be used to fill the heating system and pipe-work.

7.8 The system must be designed so that no joints in the pipe are cast within the concrete. Pipework should not be laid under walls or closer than 150 mm to external walls, internal walls, or positions where heavy items such as machinery or storage racks will be permanently located.

7.9 Plumbing and electrical services may be installed above or below pipe-work, however layouts should be designed to avoid this if possible.

7.10 Successful installation of cast-in concrete pipe-work will involve the co-operation of various trades people to avoid damage during worksite operations.

### Heating Design

7.11 The heating system design, including the layout of the pipe, must be carried out by a suitably qualified heating installer.

### Floor Design

7.12 Specific flooring design must be in accordance with AS/NZS 1170 and NZS 3101: Part 1. Non-specific flooring design must be in accordance with NZS 3604 or NZS 4229. Construction must be in accordance with NZS 3109.

7.13 Concrete cover above the top of pipe-work should optimally be 30-50 mm.

### Damp-Proof Membrane

7.14 A damp-proof membrane must be placed between the granular fill and the insulation under concrete slab-on-ground floors in compliance with NZS 3604 paragraph 7.5.4.

### Insulation

7.16 In housing, the building envelope must be designed to meet the requirements of NZBC Clause H1 Energy Efficiency. If the Schedule Method of NZBC Acceptable Solution H1/AS1 is used as a means of compliance, a heated floor slab must have a minimum R-value of R1.9 in all climate zones.

7.17 In order to conserve energy, it is recommended that design and insulation of non-residential buildings be carried out in accordance with NZS 4243.

### Floor Coverings

7.18 Floor coverings should be selected so that they offer the minimum resistance to the upward flow of heat. Floor coverings such as carpet or cork, will reduce the efficiency of heated floors. Refer to BRANZ Bulletin No. 491 for further details.

### Durability

8.1 The Radiant PE-X Heating Pipes will provide a serviceable life of at least 50 years.

8.2 The brass fittings for use with the Radiant PE-X Heating Pipes will provide a serviceable life of at least 15 years.

8.3 Radiant PE-X Heating Pipes must not be left unprotected from sunlight for a prolonged time as UV radiation will cause rapid deterioration to the pipe. See paragraph 7.2.

### Maintenance

8.4 The Radiant PE-X Heating Pipes as assessed do not require any special maintenance.

## Fire

9.1 When Radiant PE-X Heating Pipes are used as a component in an underfloor heating system intended for use with fire resistant rated (FRR) suspended floor construction, an appropriate consultant should be engaged to ensure compliance with NZBC requirements.

## Water Supplies

10.1 Heating systems incorporating Radiant PE-X Heating Pipes must be isolated from potable water systems.

## Installation Information

### General

11.1 Installation of the pipe and the fittings must be in accordance with this Appraisal and the Technical Literature.

11.2 The damp-proof membrane is placed on top of the granular base fill and the floor insulation is placed on top of the damp-proof membrane. The position of all plumbing and electrical work must be established before laying and fixing the pipe in place.

11.3 The building floor plan must be marked out showing all saw cuts, construction joints, walls, doorways, floor fixings (e.g. for cabinetry) before pipework is laid. Zoned areas, control panel locations and heat source locations should also be determined and marked on the plan prior to pipework installation. This is to be carried out by others.

11.4 After pipework has been installed, photographs must be taken of all areas prior to the pouring of concrete. Photographs should be filed with the floor plan of the building for the use of subsequent contractors completing work on the site such as slab cutting, and the placement of fasteners or services.

11.5 Pipework is tied using cable ties or reinforcing bar ties to the reinforcing steel mesh of the concrete slab.

11.6 Concrete should be placed within two to three days of installation of the pipework. Care must be taken to ensure the concrete is well-compacted around the pipework. Voids can reduce the efficiency of the system.

11.7 Pumping, rather than barrowing, is the preferred method of concrete placement as tipping concrete from barrows is more likely to displace or damage pipes. If wheel barrows are used for concrete placement they should be limited to runways which are placed clear of pipework.

11.8 If a pipe is damaged then this should be repaired before concrete is placed. Radiant Central Heating Ltd should be contacted for information on repair techniques. The jointing of pipes in the concrete has not been assessed and is outside the scope of this Appraisal.

11.9 A sleeve must be fitted around Radiant PE-X Pipe where it crosses any construction joint.

11.10 The concrete floor must be allowed to cure for at least four weeks before the system is commissioned by the installer.

11.11 Low levels of heating should be used initially to assist the concrete slab to dry out prior to laying floor coverings. Refer to BRANZ Bulletin No. 491.

11.12 The relative humidity of concrete substrates must be 75% or less before the application of membranes. The concrete can be checked for dryness by using a hydrometer as set out in BRANZ Bulletin 424. It should be noted that the manufacturers of sheet vinyl or ceramic tile adhesives, or floor sealers and paints, may recommend lower concrete moisture levels for their products, in which case these should take precedence.

## Charging and Pressure Testing

12.1 All circuits in the system must be flushed with clean potable water so that they are free from trapped air.

12.2 The system should be tested to 600 kPa at ambient temperature. The pressure must remain stable at between 350 kPa and 450 kPa for a minimum of 24 hours.

## Basis of Appraisal

The following is a summary of the technical investigations carried out.

### Tests

13.1 Type testing was carried out on PE-Xb pipes to SKZ test specification HR3.2 by SKZ, Wurtzburg, Germany in support of SKZ A362 Certification. Type Testing was also carried on PE-X/AL/PE-X pipes to SKZ test specification HR3.12 in support of SKZ A386 Certification. The test results were reviewed by BRANZ experts and found to be satisfactory.

13.2 Radiant PE-X Heating Pipes and Fittings were evaluated to AS/NZS 2492: 2007 – Cross-linked polyethylene (PE-X) pipes for pressure applications, and the Fittings evaluated to AS 2537: 1994 – Mechanical jointing fittings for use with cross-linked polyethylene (XLPE) pipes for hot and cold water applications, for the granting of Watermark Certificate of Conformity - Level 1, by SAI Global. Certificate Nos: WMKA021344 and WMKA21740.

13.3 The Foshan Rifeng PE-X/AL/PE-X pipes and fittings have been granted a StandardsMark License No: SMK02564 for manufacture to AS 4176: 1994 and ATS 5200.478: 2006 where appropriate, covering a wide range of physical properties for both pipes and fittings. Review of data by BRANZ was found to be satisfactory.

### Other Investigations

14.1 An assessment was made of the durability of Radiant PE-X Heating Pipes by BRANZ technical experts.

14.2 The Technical Literature has been reviewed by BRANZ and found to be satisfactory.

### Quality

15.1 Radiant PE-X Heating Pipes and Fittings are manufactured by Foshan Rifeng under an ISO 9001:2008 Quality Management System. (TUV Rheinland Certification Certificate No. 01 100 009308.)

15.2 Radiant Central Heating Ltd is responsible for the quality of the product supplied.

15.3 Quality of installation on site is the responsibility of the installer.

## Sources of Information

- AS 2492: 2007 Cross-linked polyethylene (PE-X) pipes for pressure applications.
- AS 2537: 1994 - Mechanical jointing fitting for use with cross-linked polyethylene (XLPE) pipes for hot and cold water applications.
- AS 4176: 1994 Polyethylene/aluminium and cross-linked polyethylene/aluminium macro-composite pipe systems for pressure applications.
- AS/NZS 1170 Structural Design Actions.
- ATS 5200.478: 2006 PE-X/Al/PE-X Pipes and fittings.
- BRANZ Bulletin No. 491 Embedded floor heating, October 2007.
- BRANZ 'Good Concrete Floors and Basements Practice', March 1998.
- NZS 3101 Part 1:2006 Concrete Structures Standard.
- NZS 3109:1997 Concrete construction.
- NZS 3604:2011 Timber framed buildings.
- NZS 4218:2004 Energy efficiency - Small building envelope.
- NZS 4229:1999 Concrete masonry buildings not requiring specific design.
- NZS 4243.1:2007 Energy efficiency - Large buildings - Building thermal envelope.
- New Zealand Building Code Handbook Department of Building and Housing, Third Edition (Amendment 12, 10 October 2011).
- The Building Regulations 1992.



**BRANZ**

**In the opinion of BRANZ, Radiant PE-X Heating Pipes and Fittings are fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided they are used, designed, installed and maintained as set out in this Appraisal.**

**The Appraisal is issued only to Radiant Central Heating Ltd, and is valid until further notice, subject to the Conditions of Appraisal.**

### Conditions of Appraisal

1. This Appraisal:
  - a) relates only to the product as described herein;
  - b) must be read, considered and used in full together with the technical literature;
  - c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
  - d) is copyright of BRANZ.
2. [Radiant Central Heating Ltd](#):
  - a) continues to have the product reviewed by BRANZ;
  - b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
  - c) abides by the BRANZ Appraisals Services Terms and Conditions.
  - d) Warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
  - a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
  - b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
  - c) any guarantee or warranty offered by [Radiant Central Heating Ltd](#).
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to [Radiant Central Heating Ltd](#) or any third party.

For BRANZ

P Burghout  
Chief Executive

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