



BRANZ Appraised

Appraisal No. 434 [2016]

REHAU RAUTITAN AND RAUTHERM S PIPING SYSTEMS

Appraisal No. 434 [2016]

This Appraisal replaces BRANZ Appraisal No. 434 [2009]

Amended 27 July 2017



BRANZ Appraisals

Technical Assessments of products for building and construction.



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Product

- 1.1 The REHAU RAUTITAN and RAUTHERM S Piping Systems comprise PE-Xa and macro-composite pipes, PPSU compression sleeve fittings, DR brass compression sleeve fittings, manifolds and accessories for use as the piping components for both hot and cold water delivery and underfloor heating.

Scope

- 2.1 The REHAU RAUTITAN and RAUTHERM S Piping Systems have been appraised for use as the piping components for water supply as per the scope of New Zealand Building Code [NZBC] Acceptable Solution G12/AS1, and Verification Method G12/VM1 and as piping for hydronic heating systems including in-floor systems.

Building Regulations

New Zealand Building Code [NZBC]

- 3.1 In the opinion of BRANZ, the REHAU RAUTITAN and RAUTHERM S Piping Systems, 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 NZBC:

Clause B2 DURABILITY: Performance B2.3.1 [a] not less than 50 years, B2.3.1 [b] 15 years and B2.3.1 [c] 5 years. The REHAU RAUTITAN and RAUTHERM S Piping Systems meet these requirements. See Paragraphs 9.1 - 9.6.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. The REHAU RAUTITAN and RAUTHERM S Piping Systems will meet this requirement and not present a health hazard to people.

Clause G10 PIPED SERVICES: Performance G10.3.1 [a]. The REHAU RAUTITAN and RAUTHERM S Piping Systems contribute to meeting this requirement when used in heating systems. See Paragraphs 9.1 - 9.6.

Clause G12 WATER SUPPLIES: Performance G12.3.2 [c], G12.3.3, G12.3.4 and G12.3.7 [a] and [b]. The REHAU RAUTITAN Piping Systems contribute to meeting these requirements. See Paragraphs 12.1 - 12.4.

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

Product Information

Description

Pipes General

- 4.1 The REHAU RAUTITAN and RAUTHERM S pipes covered by this Appraisal are manufactured by REHAU for the applications listed in Table 1.
- 4.2 RAUTITAN stabil pipes are made from self-supporting, pressure-resistant inner layer of cross-linked polyethylene (PE-X); middle layer of butt welded aluminium and polyethylene outer coating. They are silver in colour.
- 4.3 RAUTITAN platinum PE-Xa is manufactured from cross-linked high-density polyethylene with a co-extruded platinum coloured polyethylene sheath.
- 4.4 RAUTITAN pink contains a co-extruded additional oxygen barrier layer made from an ethylene vinyl alcohol (EVOH) copolymer resin. The oxygen barrier is a coating on the outer surface that is bonded to the inner PE-Xa layer with a heavily pigmented red adhesive layer. The pigmented adhesive layer provides a pink colouration to the final product, which distinguishes it as RAUTITAN pink.
- 4.5 RAUTITAN green PE-Xa pipe is manufactured from cross-linked high-density polyethylene with a co-extruded green polyethylene sheath. The green outer layer as well as the pipe markings clearly identify the pipe for use as carrying rainwater.
- 4.6 RAUTITAN lilac PE-Xa pipe is manufactured from cross-linked high-density polyethylene with a co-extruded lilac polyethylene sheath. The lilac outer layer as well as the pipe markings clearly identify the pipe for use as carrying recycled water.
- 4.7 RAUTITAN red PE-Xa pipe is manufactured from cross-linked high-density polyethylene with a co-extruded red coloured polyethylene sheath. The red outer layer clearly identifies the pipe for use as carrying hot water.
- 4.8 RAUTHERM S PE-Xa pipe is manufactured from cross-linked, high-density polyethylene. The outer layer of the pipe is an oxygen barrier. It is a thinner walled pipe, light red in colour, that is used for underfloor heating.
- 4.9 All pipes bear a continuous mark showing the manufacturer's trademark, dimension, maximum short term operating temperature and pressure, manufacturing code and date of production.
- 4.10 The RAUTITAN and RAUTHERM S pipes are available in different delivery make-ups for the pipe diameters as given in Table 2.
- 4.11 The fittings are Dezincification Resistant (DR) brass providing corrosion resistance, or polyphenylsulfone (PPSU), and are suitable for drinking water.
- 4.12 Miscellaneous fabrications are manufactured with silver soldered brass adaptations, in accordance with AS 1167.1. All other fittings, including couplings, elbows and T-pieces are manufactured from profiles and die-forged parts. The compression sleeves, which provide mechanical connections only, are manufactured either from free cutting brass or PVDF.

Accessories

- 4.13 The tools specified by REHAU for installation, such as manual hand tools, hydraulic foot pumps and electro hydraulic pump are outside the scope of this Appraisal.
- 4.14 The REHAU hydronic heating / cooling manifolds control the flow of water through the pipe circuits in the floor. Manifolds are manufactured from brass and are mounted on galvanized brackets. The manifolds are available in a range of sizes from 2 to 12 outlets. Compression ring 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 a corrugated sleeve. The corrugated sleeve is outside the scope of this Appraisal.



Table 1: REHAU RAUTITAN and RAUTHERM S Pipe Systems and their applications

	RAUTITAN Universal system	RAUTITAN Plumbing system	RAUTITAN Heating/cooling system	RAUTITAN Rainwater system	RAUTITAN Recycled water system	RAUTITAN Hot water system	RAUTHERM S Heating/cooling system
	RAUTITAN stabil	RAUTITAN platinum	RAUTITAN pink	RAUTITAN green	RAUTITAN lilac	RAUTITAN red	RAUTHERM S
Field of application	Hot and Cold Water Services, Radiator Panels, Underfloor Heating/Cooling	Hot and Cold Water Services	Radiator Panels, Underfloor Heating/Cooling	Rainwater	Recycled Water	Hot Water Services	Underfloor Heating/Cooling
Dimensions	16.2 x 2.6 mm 20 x 2.9 mm 25 x 3.7 mm 32 x 4.7 mm 40 x 6.0 mm		16 x 2.2 mm 20 x 2.8 mm 25 x 3.5 mm 32 x 4.4 mm 40 x 5.5 mm 50 x 6.9 mm 63 x 8.6 mm			16 x 2.2 mm 20 x 2.8 mm 25 x 3.5 mm	10.1 X1.1 mm 14 X 1.5 mm 16 x 2.0 mm 17 x 2.0 mm 20 x 2.0 mm 25 x 2.3 mm

Table 2: REHAU RAUTITAN and RAUTHERM S Pipe lengths

RAUTITAN	Straight lengths		Coils								
	5 m	6 m	5 m	100 m	120 m	200 m	240 m	300 m	400 m	500 m	600 m
stabil	16-40		25	16-20							
platinum	16-63		25-32	16-20							
pink		16-63	25-32		20	16					
green	40-63		16-32								
lilac	32-63										
red	16-25		25	16-20							
RAUTHERM S					14-25	16	10.1, 14, 17, 20	16, 25	20	14-20	14, 17

Handling and Storage

5.1 REHAU piping system components should be handled and stored with care to prevent damage. On site all RAUTITAN pipes, RAUTHERM S pipes and PPSU fittings must be stored out of the sunlight until installed. Pipes and PPSU fittings should be covered from direct sunlight or UV emitting fluorescent lights during installation and operation.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the REHAU piping systems. 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 The low elastic modulus of polymer based pipes manufactured by REHAU and their ability to expand quickly and contract slowly enables the pipes to absorb water hammer effectively compared to metallic pipes.

Working Pressures and Temperatures

- 8.1 The working pressure and temperature rating for RAUTITAN stabil pipes, whether it is a hydronic heating component or hot water delivery component is 1 MPa at 70°C. Pipes have a working pressure of 1 MPa at 80°C.
- 8.2 The working pressure and temperature rating for RAUTITAN platinum, RAUTITAN green, RAUTITAN pink, RAUTITAN lilac and RAUTITAN red pipes, whether it is a hydronic heating component or hot water delivery component is 2 MPa at 20°C. These pipes have a working pressure of 1 MPa at 60°C.
- 8.3 The working pressure and temperature rating for RAUTHERM S pipes when used as a hydronic heating component is 0.4 MPa at 60°C.
- 8.4 RAUTITAN or RAUTHERM S pipes must never be connected directly to auxiliary heaters such as solar collection panels or wet-backs without the installation of temperature protection devices in the system. Without protection, temperatures may exceed the operating limits.

Durability

- 9.1 The polyethylene material used to manufacture RAUTITAN pipes will be unaffected by soft or hard drinking [potable] water. In many cases it will also be resistant to aggressive drinking water as well as many standard chemical additives used in a hydronic heating systems.
- 9.2 RAUTITAN stabil pipe used for a hydronic heating systems and hot and cold water delivery, if used under the working pressures and temperatures described in paragraph 8.1 above, should provide a durable life of up to 50 years. RAUTITAN stabil pipes used with a continuous working temperature of 80°C at 1 MPa should provide a durable life of 15 years.
- 9.3 RAUTITAN platinum, RAUTITAN green, RAUTITAN pink, RAUTITAN lilac and RAUTITAN red pipes used for hydronic heating systems and hot and cold water delivery, if used under the working pressures and temperatures described in paragraph 8.2 above, should provide a durable life of up to 50 years. These pipes used with a continuous working temperature of 80°C at 1 MPa should provide a durable life of 15 years.
- 9.4 RAUTHERM S pipes used for hydronic heating systems, if used under the working pressure and temperatures described in paragraph 8.3 above, should provide a durable life of up to 50 years.
- 9.5 The durable life of pipes embedded in concrete in a hydronic heating applications will be reduced if they are exposed to extremes in elevated temperatures and pressures for prolonged periods, throughout their serviceable life.
- 9.6 Dezincification resistant brass and PPSU fittings used with RAUTITAN pipes for hot and cold water delivery should provide a durable life of 15 years minimum.

Maintenance

- 10.1 The REHAU RAUTITAN and RAUTHERM S Piping Systems as assessed, being hot and cold water delivery components and hydronic heating piping components, do not require any special maintenance. Items such as flow valves and control equipment are outside the scope of this Appraisal but may require routine maintenance, as specified by the system manufacturer's installation instructions.
- 10.2 The EVOH barrier in the RAUTITAN pink and RAUTHERM S pipes practically eliminates the diffusion of oxygen into the heating system provided the system is completely sealed. However in a hydronic heating system, the addition of a corrosion inhibitor to the water is recommended on an annual basis.

Control of Internal Fire and Smoke Spread

- 11.1 In all applications where RAUTITAN or RAUTHERM S pipes pass through a fire rated element of a structure or cavity barrier, the opening must be fire-stopped in a way that will permit thermal movement. In the event of fire, RAUTITAN PE-Xa pipes decompose above 400°C, with decomposition products from fire being non-corrosive and non-hazardous.
- 11.2 When RAUTITAN or RAUTHERM S pipes are used as a component in a fire-resistant rated (FRR) suspended floor construction, an appropriate consultant should be engaged to ensure compliance with NZBC requirements.

Water Supplies

- 12.1 RAUTITAN platinum, RAUTITAN red and RAUTITAN stabil pipes and fittings for hot and cold water supply are hygienic, non-toxic and suitable for use with drinking water.
- 12.2 The RAUTITAN lilac pipe is for use with non-drinking water. For compliance with NZBC Clause G12.3.3, when the RAUTITAN lilac pipe is used for personal hygiene it must be protected from High and Medium hazards as defined by NZBC Clause G12/AS1, Paragraph 3.3. Where backflow protection is required it must be in accordance with Paragraphs 3.1 to 3.7 of NZBC Clause G12/AS1.
- 12.3 The RAUTITAN lilac pipes are lilac in colour and marked 'RECYCLED OR RECLAIMED WATER - DO NOT DRINK' for compliance with NZBC Clause G12.3.4. NZBC Clause G12/AS1, Paragraph 4.2 requires signs to be provided at outlets for non-potable water.
- 12.4 The RAUTITAN lilac pipe has adequate pipe and fitting size options for water supplies to comply with NZBC Clause G12.3.7 (a).

Installation Information

General

- 13.1 RAUTITAN and RAUTHERM S pipes must be installed in accordance with the Technical Literature and procedures defined in this Appraisal.
- 13.2 When installing RAUTITAN pipes in framed walls, the holes must be accurately sized to allow pipework to expand and contract. In metal framework grommets must be used to protect the pipe from sharp edges. The grommets used for this application are outside the scope of this Appraisal.
- 13.3 RAUTITAN and RAUTHERM S pipes have a permitted unaided cold bending radius of 5 times the external diameter of the pipe.

Charging and pressure testing

- 14.1 Prior to system closure, whether it is for plumbing in wall or floor cavities, or in a hydronic heating systems, a visual check of every fitting is required to ensure the compression sleeves have been compressed properly against the fitting collars.
- 14.2 All circuits within the system must be flushed with water so that they are free from trapped air.
- 14.3 When all air is bled from the system, it must be pressure tested.
- 14.4 Pipe services used for hot and cold drinking water delivery must not show any leakage when subjected to pressure of 1500 kPa at 20°C for a period of not less than 30 minutes, in accordance with AS/NZS 3500.
- 14.5 A hydronic radiator panel system should be tested to 1.3x times the maximum operating pressure at ambient temperature. Pressurization may need to be repeated after 2 hrs to achieve stability as the pipe may expand slightly during this time. Actual testing time should be 3 hours. Tightness is confirmed when there is no water leakage from the pipework. It is also recommended to test for tightness at the highest operating temperature and should be performed immediately after the cold water pressure test. When pipes are installed in concrete or screed the maximum operating pressure must be applied before and during the concreting / screeding process to detect any leaks straight away.

- 14.6 An underfloor heating system should be tested to 600 kPa at ambient temperature, but may require five or six applications of the pressure to achieve stability as the pipe may expand slightly as it is pressurised. The pressure must remain stable at between 350 kPa and 450 kPa for a minimum of 24 hours before the system has settled and is functioning satisfactorily. Special precautions are necessary if the pressure testing of the underfloor heating pipes is to take place in subzero temperatures.

Commissioning an Underfloor Heating Systems

- 14.7 Heat must not be applied to the hydronic heating system until the concrete has cured for a minimum of 28 days, however BRANZ Bulletin No. 497 recommends 6 weeks, especially in winter. When cured, water at 20°C must be introduced into the system and maintained for 24 hours, increasing by 5°C every 24 hours until the maximum operational temperature is reached. The system must then be allowed to cool until the working temperature is acquired.

Basis of Appraisal

The following is a summary of the technical investigations undertaken.

Tests

- 15.1 Performance tests have been carried out on the RAUTITAN pipes. The testing covered equivalent pipe sizes, pressure requirements, velocity requirements and pipe size limitations. The test results have been reviewed by BRANZ experts and found to be satisfactory.
- 15.2 Tests have been carried out on the RAUTITAN piping systems by IMA Dresden and SKZ. This testing was completed to verify the characteristics of the REHAU RAUTITAN piping system for a range of products and applications. The test results have been reviewed by BRANZ experts and found to be satisfactory.

Other Investigations

- 16.1 An assessment was made of the durability of the REHAU piping system by BRANZ technical experts.
- 16.2 Site inspections were carried out to examine completed installations and installation methods.
- 16.3 The Technical Literature has been reviewed by BRANZ and found to be satisfactory.

Quality

- 17.1 The REHAU piping systems are manufactured in various locations by REHAU under an ISO 9001 Quality Management System.
- 17.2 The RAUTITAN and RAUTHERM S pipes and the associated fittings are covered by current WaterMark Licences.
- 17.3 Quality of installation on site is the responsibility of the installer.

Sources of Information

- AS/NZS 3500.1: 2015 Plumbing and drainage - Water services.
- AS/NZS 3500.4: 2015 Plumbing and drainage - Heated water services.
- AS/NZS 2492: 2007 Cross-linked polyethylene (PE-X Pipes) for pressure applications.
- AS/NZS 4020: 2005 Testing of products for use in contact with drinking water.
- BRANZ Bulletin No. 586 [2015] Embedded Floor Heating.
- Ministry of Business, Innovation and Employment Record of Amendments for Compliance Documents and Handbooks.
- The Building Regulations 1992.

Amendments

Amendment No. 1, dated 27 July 2017.

This Appraisal has been amended to update Table 2.



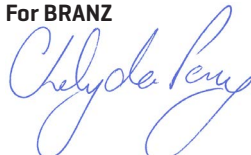
In the opinion of BRANZ, the **REHAU RAUTITAN and RAUTHERM S Piping Systems** are fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided they are used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to **REHAU [NZ] 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. **REHAU [NZ] 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 **REHAU [NZ] 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 **REHAU [NZ] Ltd** or any third party.

For BRANZ



Chelydra Percy

Chief Executive

Date of Issue:

04 May 2016