



BRANZ Appraised

Appraisal No.287 [2005]

BRANZ Appraisals

Technical Assessments of products
for building and construction

**BRANZ
APPRAISAL
CERTIFICATE
No. 287 (2005)**

This Certificate replaces BRANZ
Appraisal Certificate No. 287(1994).

**SOLAHART SOLAR HOT
WATER SYSTEMS**

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Product

1.1 The Solahart Solar Hot Water Systems are close-coupled solar and electric mains pressure storage water heaters. They are an alternative to conventional water heaters for new buildings or can be retrofitted into existing buildings.

1.2 The Solahart Solar Hot Water Systems referred to in this Certificate are the following models only: 181Kf, 302Kf, 181 Kf BCXII, 302 Kf BCXII, 181 Free Heat and the 302 Free Heat.

1.3 The systems are closed-circuit indirect thermosiphons, utilizing a heat transfer fluid which flows through the solar absorbers and around the water tank in a narrow jacket, transferring the heat energy to the stored water. The fluid also acts as an anti-freeze and corrosion inhibitor.



Scope

2.1 Solahart Solar Hot Water Systems have been appraised for use as domestic solar-electric water heating and storage systems within the following scope:

- for the supply of hot water to domestic type hot water services; and,
- used within the scope of NZBC G12/AS1; and
- fixed to roofs of buildings situated in NZS 3604 Building Wind Zones up to and including Very High.

2.2 Multi-collectors and tank systems for commercial and industrial hot water supply can be supplied, but these must be the subject of specific design and are outside the scope of this Certificate.

Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, the Solahart Solar Hot Water Systems, if designed, used, installed and maintained in accordance with the statements and conditions of this Certificate, will meet or contribute to meeting the following provisions of the NZBC:

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2, and B1.3.4. Solahart Solar Hot Water Systems meet the requirements for loads arising from self-weight, temperature, earthquake and wind [i.e. B1.3.3(a), (c), (f) and (h)]. See Paragraphs 8.1 - 8.4.

Clause B2 DURABILITY: Performance B2.3.1(c) 5 years. Solahart Solar Hot Water Systems meet this requirement. See Paragraphs 9.1 - 9.3.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Solahart Solar Hot Water Systems meet this requirement and will not present a health hazard to people. See Paragraph 12.4.

Clause G12 WATER SUPPLIES: Performance G12.3.2 (a) and (c), G12.3.6, G12.3.8 and G12.3.9. Solahart Solar Hot Water Systems meet these requirements. See Paragraphs 12.1 - 12.7.

Clause H1 ENERGY EFFICIENCY: Performance H1.3.4 (b). Solahart Solar Hot Water Systems meet this requirement. See Paragraph 4.2 and 7.5 - 7.9.

3.2 Solahart Solar Hot Water Systems have been assessed as an Acceptable Solution to meet the performance requirements of the NZBC. The systems comply with AS 2712, as required by Paragraph 6.1.1 of Acceptable Solution G12/AS1.

Technical Specification

4.1 Solahart Solar Hot Water Systems' solar collectors contain a steel multi-channelled absorber which has a black chrome selective surface. The collector insulation is glass wool. The case is aluminium with a low-iron toughened glass cover.

4.2 Solahart tanks contain a steel cylinder internally double-coated with a vitreous enamel and a steel outer-jacket which is the heat exchanger. The main cylinder contains an electrical heating element, a thermostat, a thermal cut-out and an anode rod. Tanks are insulated with polyurethane foam and protected with an outside case of aluminium and end caps of black polypropylene.

4.3 The potable water system is mains pressure unvented. The valves used for control are a pressure limiting valve, a non-return valve, an expansion control valve and a temperature and pressure relief valve.

4.4 Where the water supply is low pressure, Solahart Solar Hot Water Systems can be fitted with an open vent.

4.5 Pre-shaped copper pipes and fittings are supplied for assembling the systems. Purpose-made clamps, rails and straps are used to fix the system to the roof.

Table 1: System Properties

	181 Models	302 Models
Tank		
Potable water storage capacity	180 litre	300 litre
Dimensions (mm)	510 x 510 x 1494	510 x 510 x 2310
Collector		
No. of collectors	1	2
Collector dimensions (mm)	1937 x 1022 x 77	
Absorber area	1.87 m ²	3.74 m ²
System Dimensions		
O/A (mm)	Length	2450
	Width	1485
	Height	510

Table 2: Potable Water System Valve Settings

Pressure limiting valve	800 kPa
Expansion control valve	600 kPa
Temperature and pressure relief valve	99°C, 1000 kPa

Table 3: Closed Circuit Indirect Thermosiphon System

Transfer fluid capacity	15 litre (181 Models)
	22 litre (302 Models)
Pressure relief	80 kPa
Operating pressure range	-10 to +80 kPa

Table 4: Electrical

Element	240 volt
	2.4 kW
	10 amps
Thermostat - factory setting	60°C
Electrical energy cut-out setting	84°C

Handling and Storage

5.1 Handling and storage of all materials, whether on or off site is the responsibility of the Solahart service representative.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Solahart Solar Hot Water Systems. The Technical Literature must be read in conjunction with this Certificate. All aspects of design, installation and maintenance contained in the Technical Literature and within the scope of this Certificate must be followed.

Design Information

General

7.1 Solahart Solar Hot Water Systems use an efficient absorber design with the reliable operation of a thermosiphon. The use of a closed-circuit means that the internal circulation will not become blocked, and the efficiency of the systems will not be reduced by deposit build-up from the water supply.

Hot Water Usage

7.2 181 models are intended for a daily use of approximately 90-100 litres of hot water which is considered adequate for a two person household.

7.3 302 models are intended for a daily use of approximately 160-180 litres of hot water, which is considered adequate for a four person household.

7.4 Hot water in excess of these quantities can be provided with increased reliance on electrical energy.

Solar Performance and Energy Saving

7.5 The overall performance and energy saving that can be obtained from a Solahart Solar Hot Water System will depend on the hot water usage pattern, local climate, the inclination and solar orientation of collectors, and the continuous or manually controlled use of the electric water heating element. The following is an indication of the possible average hot water electrical energy savings for households in the Wellington region. (The solar systems are assumed to be facing north with an inclination angle of 20°. The comparison is with a 130 litre electric storage water heater operating at 70°C.)

Table 5: Average annual electricity savings

Model	Daily Hot Water Usage	Average Annual Electrical Energy Saving
181 Models	90 - 100 litres	60%
302 Models	160 - 180 litres	65%

7.6 The average annual electricity energy savings in Table 5 can be expected to vary approximately by plus or minus 10% depending on the location in New Zealand and the local climate conditions (sunshine hours and prevalence of cloudy and overcast conditions).

7.7 Further information on performance is contained in the manufacturer's Technical Literature.

Electrical Auxiliary Heating

7.8 The Solahart Solar Hot Water Systems are fitted with a thermostatically controlled electrical element in the tank. The thermostat is factory set at 60° C. The systems are able to supply electrically heated water in their own right (without solar energy) and have the following electrically heated water storage capacities:

181 Models	100 litres
302 Models	230 litres

7.9 Although the tanks are horizontal, the internal design ensures that sufficient thermal stratification is maintained. Solahart Solar Hot Water Systems have a switch for the manual control of the electrical energy use of the system. Individual experience will determine the periods the electrical energy can be turned off and a satisfactory hot water service provided. At a minimum, the electrical switch should be on all winter and during any period of poor weather.

Structure

Mass

8.1 The 181 models weigh approximately 300 kg and the 302 models weigh approximately 500 kg.

8.2 Solahart Solar Hot Water Systems must be situated on a roof area located over load bearing internal walls where loads can be directly supported. Where this is not possible, specific structural design must be carried out.

Wind Zones

8.3 Solahart Solar Hot Water Systems are suitable for use in all NZS 3604 Building Wind Zones up to, and including Very High.

8.4 In Very High Building Wind Zones, the cyclone stand kit supplied by Solarhart Industries Pty Ltd must be used.

Durability

Serviceable Life

9.1 Solahart Solar Hot Water Systems are expected to have a serviceable life of 15-20 years provided the system is maintained in accordance with this Certificate and the manufacturer's instructions. This will be influenced by the environment, the amount of maintenance carried out and the local water supply quality.

9.2 The local environment and the degree of maintenance are the main factors determining the serviceable life of the weather casing and contents. The water quality is the major factor determining the serviceable life of the storage tank, valves and piping.

9.3 The weather casing is constructed of durable materials. The internal surfaces of the closed-circuit system are protected by a corrosion inhibitor in the heat transfer fluid. The potable water storage tank contains a sacrificial magnesium alloy anode for corrosion protection. The correct type of anode must be used and the correct replacement period appropriate for the water supply quality must be adhered to.

Maintenance

10.1 The owner must carry out minor maintenance such as visual checks for damage and water entry, the operation of the relief valves, and hosing down the system with clean water in salty, polluted, and dusty environments, paying particular attention to areas not washed by rain.

10.2 Solahart Industries Pty Ltd recommend that a 'major service' be carried out by a Solahart service representative every five years. This service includes anode, temperature and pressure relief valve replacement, flushing and checking of cold water control valves, inspection of the closed-circuit, an electrical check, and a general check of the system for water entry, damage, corrosion, and soundness of roof fixings. The major service is important to the long-term durability of the system and must only be carried out by a Solahart service representative.

10.3 Full details for 'minor' and 'major' maintenance are included in the manufacturer's Technical Literature.

Electricity

11.1 Electrical wiring for the power supply must be in accordance with the relevant provisions of NZBC G9.

11.2 All electrical wiring is to be enclosed in plastic or metal conduit with watertight fittings. An on/off switch is to be installed inside the building in an easily accessible location. An isolation switch is to be installed for service work on the system.

Water Supplies

12.1 The Solahart Solar Hot Water Systems comply with AS 2712 as a means of code compliance to Acceptable Solution G12/AS1, Paragraph 6.1.

12.2 The systems can be used to meet performance G12.3.5.

Freezing

12.3 The closed-circuit heat transfer fluid Hartgard® contains an anti-freeze which protects the circuit down to -15°C. The system water pipes are insulated, and valves and controls are located where freezing is unlikely.

Potable Water

12.4 The use of the Hartgard® heat transfer fluid will not pose a health hazard to people. The fluid is food grade propylene glycol and a food grade blue marker dye will indicate the presence of the transfer fluid should it become mixed with the potable water.

Safety

12.5 During summer, high water temperatures are possible. The requirements of performance G12.3.6 are met by a tempering valve which prevents the danger of scalding. This can be set at 55° C for housing or 45° C in facilities for children and the elderly.

12.6 The mains pressure potable water system is unvented (valve vented) and includes a pressure limiting valve, an expansion control valve, a temperature and pressure relief valve, as well as an electrical energy over-temperature cut-out. The performance requirements of G12.3.8 are met with this system.

12.7 The thermostat is set to maintain an average daily temperature of 60° C to prevent the growth of Legionella bacteria, therefore meeting performance G12.3.9. It is important that during winter and cooler or cloudy weather the booster switch is switched on.

Installation Information

Installation Skill Level Requirements

13.1 Installation must only be carried out by Solahart service representatives.

General

14.1 Solahart Solar Hot Water Systems must be installed and commissioned in accordance with the manufacturer's Technical Literature and only by an approved Solahart service representative. An installation report is completed for each installation and is prepared in association with the client both before starting installation, and on completion. The report covers aspects such as the position for the Solahart system, the condition and any modifications needed to the plumbing or roof, and a check list for the installation.

14.2 All installations of Solahart Solar Hot Water Heaters must be fitted with a Heat Dissipation Kit. This kit is fitted before the potable water tank is filled.

14.3 For optimum performance the Solahart Solar Hot Water Systems should be installed facing North. It is possible to face up to 45° to each side of North, and in such cases a lower pitch installation will give better performance. The minimum angle of pitch of the heater is 10°. At pitches greater than 30° the system must be installed using special tank straps and mounted on a cyclone frame.

14.4 Roofs to which Solahart Solar Hot Water systems are to be fixed shall be assessed in accordance with the manufacturer's Technical Literature and appropriately strengthened if necessary. Solahart systems must be located over an area of internal walls where the loads can be directly supported. They must also be located as close as possible to the most frequently used hot water outlets.

14.5 Solahart Solar Hot Water systems are supplied directly from the cold water mains via a pressure limiting valve. The 'hot out' pipe is connected directly to the hot water distribution system. Inlet control valves and pipes must be located and/or insulated to protect them from freezing.

Basis of Appraisal

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

Tests

15.1 Tests have been carried out on the thermal performance (energy savings) of Solahart Solar Hot Water Systems. The results have been reviewed by BRANZ and found to be satisfactory.

15.2 Tests have been carried out on static pressure; 30 day exposure (stagnation); thermal shock water spray; thermal shock cold fill; post exposure static pressure; performance; auxiliary energy capacity; heat loss; and disassembly inspection, by the Solar Rating and Certification Corporation, USA. The test results have been reviewed by BRANZ experts and found to be satisfactory.

Other Investigations

16.1 The satisfactory performance of solar water heaters, which have been manufactured and installed by Solahart Industries Pty Ltd, over a period of 35 years in many countries, including New Zealand, has been noted. This includes the structural performance, durability, energy saving performance, and non-hazardous nature of the construction materials.

16.2 Solahart Solar Hot Water Systems are designed and manufactured in accordance with AS 2712.

16.3 Solahart Solar Hot Water Systems meet the requirements of the Japanese Industrial Standards Mark JIS A4111 (Approval No. AU 8501).

16.4 Solahart Solar Hot Water Systems are approved by the Florida Solar Energy Centre, USA.

16.5 Solahart Solar Hot Water Systems are licensed under the Australian WaterMark product certification scheme by SAI Global.

16.6 The practicability of installation was assessed by BRANZ and found to be satisfactory.

16.7 The manufacturer's Technical Literature has been reviewed by BRANZ and found to be satisfactory.

16.8 The New Zealand Department of Health was consulted regarding the use of Hartgard® transfer fluid.

Quality

17.1 The manufacture of Solahart Solar Hot Water Systems has been examined by BRANZ, including methods adopted for quality control. Details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory.

17.2 The quality control system of Solahart Industries Pty Ltd has been assessed and registered as meeting the requirements of AS/NZS ISO 9001: 2000 by SAI Global, Certificate No. QEC0360.

17.3 Solahart Industries Pty Ltd are responsible for the quality of the product supplied.

17.4 Solahart service representatives are responsible for the quality of installation, handling and storage on site.

Sources of Information

- AS 2712 - 2002 Solar and heat pump water heaters - design and construction.
- NZS 3604: 1999 Timber framed buildings.
- Directory of Certified Solar Water Heating Systems ratings, Solar Rating and Certification Corporation, USA.
- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- The New Zealand Building Regulations 1992, up to, and including October 2004 Amendment.



In the opinion of BRANZ, Solahart Solar Hot Water Systems are fit for purpose and will comply with the Building Code to the extent specified in this Certificate provided they are used, designed, installed and maintained as set out in this Certificate.

The Appraisal Certificate is issued only to the Certificate Holder, Solahart Industries Pty Ltd, and is valid until further notice, subject to the Conditions of Certification.

Conditions of Certification

1. This Certificate:
 - 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. The Certificate Holder:
 - 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.
3. The product and the manufacture are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ.
4. BRANZ makes no representation 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 the Certificate Holder.
5. Any reference in this Certificate to any other publication shall be read as a reference to the version of the publication specified in this Certificate.

For BRANZ

P Robertson
Chief Executive

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