

Integrating thermal solar heating into building projects and renovations

Integrating solar water heating into a building design adds value to your client's property, saves them money, and helps the environment, all with minimal additional costs.

To successfully integrate solar water heating into a design, carefully consider each of the following:

- **Orient and locate the collector for maximum efficiency.**
- **Size the collector and cylinder to suit the number of occupants or the volume of hot water required.**
- **Locate the cylinder as close to the collector and services as possible.**
- **Choose a suitable water pressure.**
- **The drains for the solar pressure relief valve, and cylinder cold-water expansion valve and cylinder temperature pressure relief valve.**
- **The wiring requirements for the solar controller and cylinder element(s).**
- **Probability of extended periods without hot water use.**
- **Integration with other heat sources.**
- **The availability and reliability of the power supply.**
- **Extreme environmental or weather conditions.**
- **Poor water quality.**

This document is intended as a guide only. Prior to specifying a solar water heating system, consult SolarPeak New Zealand Limited for technical specifications, installation techniques, and current building code requirements.

Orientation for maximum efficiency

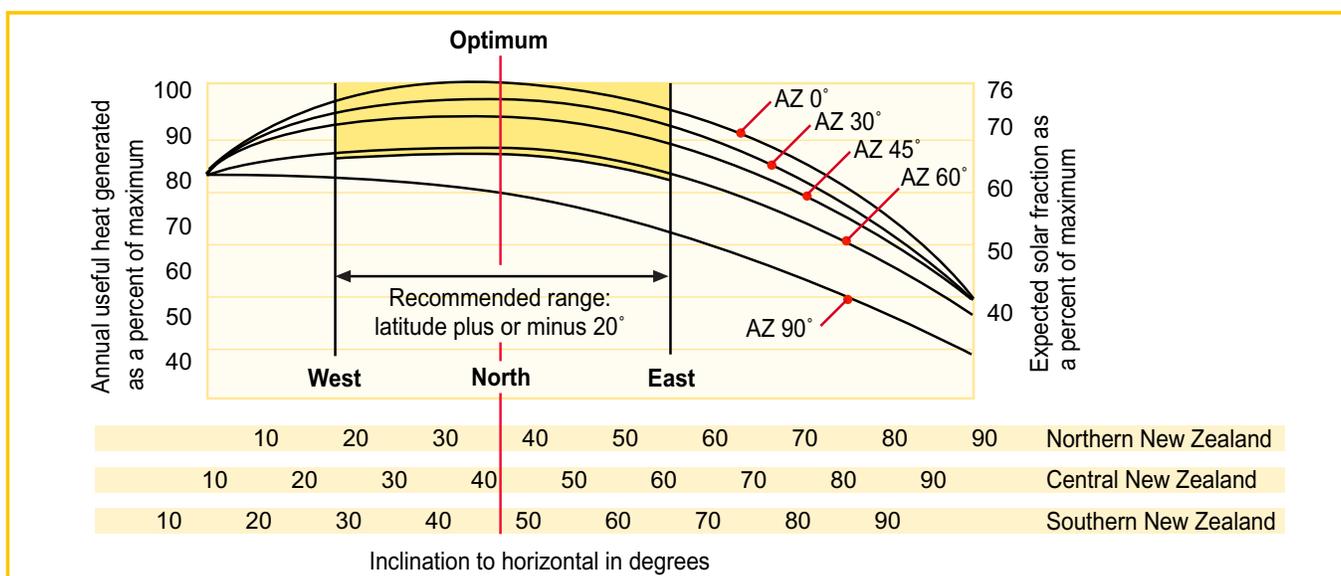
To maximise efficiency, the solar collector should be oriented to face between northwest and northeast at an inclination of between 25° and 45°. The ideal orientation (azimuth) is due north. The ideal inclination to the horizontal is equal to the latitude. A steeper inclination will improve winter performance. A shallower inclination will improve summer performance.

The graph below illustrates the optimum azimuth and inclination for various New Zealand locations.

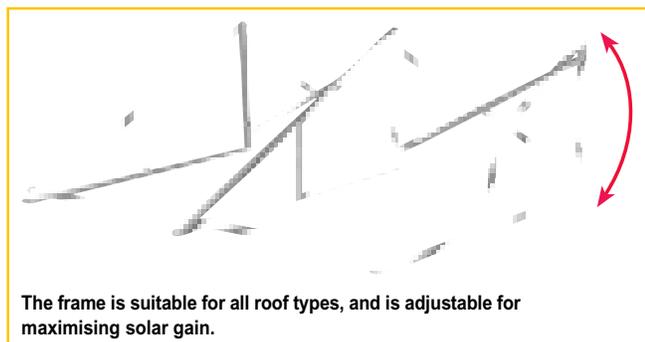
Designing a building with a suitably inclined north-facing roof will ensure that a solar collector will perform efficiently whether it is fitted while building or later.



Lockburn Estate Winery, near Cromwell. A fine example of an efficiently positioned SolarPeak solar collector.



When it is not possible to have a roof with the optimum inclination for the collector, the SolarPeak AP collector can be mounted on an adjustable pitch frame. The frame has been tested, and is compliant with New Zealand building regulations for wind, snow, and earthquake loadings. A custom subframe is also available for buildings without a north-facing roof.



Generally it is better to ensure adequate winter performance by mounting the collector at the optimum inclination, (i.e. close to the latitude). In some cases it is better to favour summer performance by mounting the collector at a lower inclination, for example if a wetback fire supplies additional winter water heating, or a better summer performance is required, for example, for a Bed and Breakfast with higher summer occupancy. In these cases, cylinder volume should be increased. Locate the collector as close as possible to the cylinder, and the cylinder as close as possible to the points of highest use. Note that some councils specify a maximum distance from the cylinder to the kitchen sink.

The purlins to which the collector is attached must be secured to the trusses with Lumberlock fasteners. Detailed installation requirements can be obtained from a SolarPeak dealer.

With forethought, an efficient solar water heating system can be unobtrusively integrated into a building at the design phase.

Sizing the collector and cylinder

The heat collecting capacity of the solar collector, the heat storage capacity of the cylinder, and the number of occupants, and their anticipated water use must be matched.

As a guide, each person requires between 50 and 60 litres of hot water per day. For example, a family of five would require 250 litres of hot water per day. The nearest standard cylinder volume is either 270 or 280 litres.

Each tube on the collector is, on average, able to supply sufficient heat to raise 9 litres of water to between 60° and 90°C during sunny weather. To determine the collector size, divide the cylinder volume by nine. For example, if the cylinder volume

No. of people	Volume of cylinder	No. of tubes	Model
1-3	180	20	AP20
3-5	270	30	AP30
5-7	360	40	AP40
7-9	400	50	AP50

is 270 L, a 30-tube collector is required. Over sizing the cylinder a little allows for extra heat storage on very hot days or if there is a wetback fire providing additional heat. Under sizing the cylinder causes problems with the capacity of the cylinder to store heat and can cause overheating and water loss.

When retrofitting, unless the cylinder is being changed, use the cylinder volume to determine the collector size, as long as it has provided adequate hot water to date.

SolarPeak recommends only Duplex stainless steel or copper storage cylinders. In new homes, steel cylinders with glass linings should not be used for solar heated water because they do not tolerate the high temperatures that can be achieved. In retro fits, they can be used by lowering the set maximum cylinder temperature to 70° C.

SolarPeak New Zealand Limited can custom design systems to deliver larger volumes of hot water if required.

Locating the cylinder and choosing a suitable water pressure

Locating the cylinder close to the collector minimises installation costs and maximises efficiency. Locating the cylinder close to the main points of use reduces the time for hot water to reach the tap and minimises water and heat wastage.

Valve vented low, medium, and high-pressure water supplies can be used with SolarPeak collectors.

If possible, it is best to specify a medium pressure system because this delivers good performance for the client (especially if suitable shower heads are selected), and uses considerably less water in showers than mains pressure systems. Some mains pressure showers use 18 L/m and with an average shower duration of 7.7 minutes. That is about 140 litres of water per shower, about two thirds of which may be hot water. For best results, solar water heating should be integrated with hot water conservation measures.

Specifying drains

Direct solar systems require a pressure relief valve on the solar circuit to get rid of excess heat (for example if the hot water is not used for extended periods) and to prevent damage to the components should overheating occur. In new buildings, the copper drain from the cylinder cold-water expansion valve and cylinder TPR should be increased in size to 25 mm to accommodate the additional drain from the solar pressure relief valve. Plumbers are not generally aware of this so it should be specified on the drawings. On retrofits, a suitable drain can generally be installed, although it sometimes involves running a pipe down the outside of the building.

It is important that this information is available to the local Council with the consent application form. Your SolarPeak dealer can provide you with an up to date drawing showing all the necessary drains and valves.

Specifying wiring

The following power supplies are required for the AP series:

Supply for the element

The cylinder element (which is usually 3 kW) supply is interrupted by a relay that is controlled by the SolarPeak controller. Timer controlled heating is now mandatory under AS2/G12, and increases savings by up to 50%.

Supply for the controller

The SolarPeak controller is rated at 4 amps and requires a continuous power supply. The SolarPeak controller also has a standard Anti-*Legionella* function that heats the water as per the requirements of AS2/G12, and a 'Party' button for instant heating.

Positioning of the controller and relay

The controller must be mounted in a cool dry place 0° - 40° C (usually at eye level on a wall close to the HWC). The domestic solar circulation pump is connected by a feed from the controller. The combined electrical draw of the controller and pump is approximately 70-90 Watts, and the average total electricity used per annum is only 146 kW.

The relay for the element on/off control can be mounted near to the storage cylinder, or DIN rail mounted on the consumer board. To reduce the amount of cable used, it is best to mount it next to the HWC.

Extended periods without hot water use

If the home is regularly left for extended periods without any hot water use (for example if the owners are away on holiday regularly during summer), provision should be made to dispose of the heat collected over and above the heat storage capacity of the cylinder.

Solutions to this problem include running the return flow from the collector through a heat dissipater before it returns to the cylinder or dumping the heat into a heat sink such as a swimming pool or under floor heating circuit. Your local SolarPeak distributor will be able to advise you on a suitable solution. Note that dissipaters must be located within the insulated envelope of the house to prevent frost damage.

Integration with other heat sources

The SolarPeak AP collector can be integrated with a variety of other heat sources including electric instantaneous heating systems, some instantaneous gas heaters (consult the manufacturer), heat pumps, diesel boilers, and wetback fires. Integrating solar water heating with wetback fires is particularly efficient because the wetback provides additional water heating when the solar water heating is at its least efficient. This provides year-round hot water and maximises savings. Contact your local SolarPeak distributor for advice about integrating a SolarPeak solar water heater with other heat sources.

Availability and reliability of the power supply

In areas without a power supply, a 12 V solar panel and battery can supply the power for a 12 V controller and pump.

Alternatively, a thermosiphon system can be used. This requires the cylinder to be located above the collector. Generally, thermosiphon systems circulate glycol through the collector (and a coil in the cylinder) to ensure frost protection.

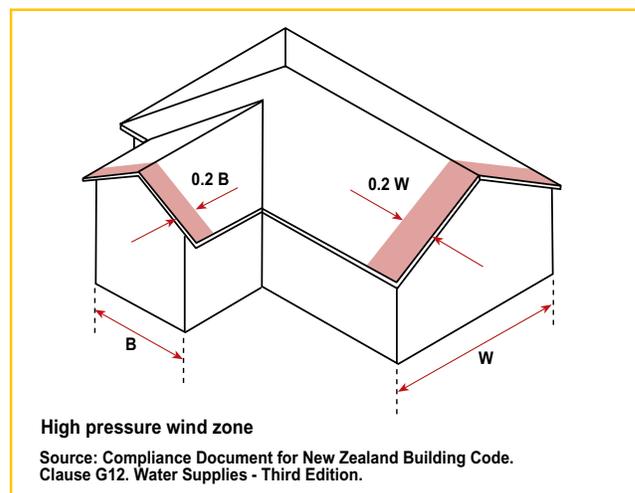
In areas with an erratic power supply, a backup battery pack can be installed that will run the collector and pump for up to four days. This maintains water heating and frost protection. Consult your SolarPeak dealer for other solutions in areas with an erratic power supply.

Extreme environmental or weather conditions

High wind areas

In high wind areas, the SolarPeak AP30 model should have additional fastening points. On gable roof structures, collectors should not be installed within 0.2 times the width of the gable.

Compliant installation requirements can be obtained from a SolarPeak dealer.



Sea spray zone

If the house is in the sea spray zone, fastenings etc should be able to cope with salt spray. Consult your SolarPeak dealer on additional sea spray zone requirements.

Heavy frost areas

SolarPeak achieves frost protection by using tubes that do not contain water and are therefore impervious to frost. To prevent the water from freezing (in the piping to and from the heat exchange manifold of the collector), the pipes and manifold are extremely well insulated. Furthermore, the digital controller monitors for frost conditions and trickles a small amount of water through the piping and heat exchange manifold should freezing conditions occur. In areas with extremely heavy frosts and freezing temperatures, additional precautions should be taken, particularly in areas with an unreliable power supply. Your SolarPeak dealer will be able to advise you on indirect systems using Glycol and other solutions.

Hail

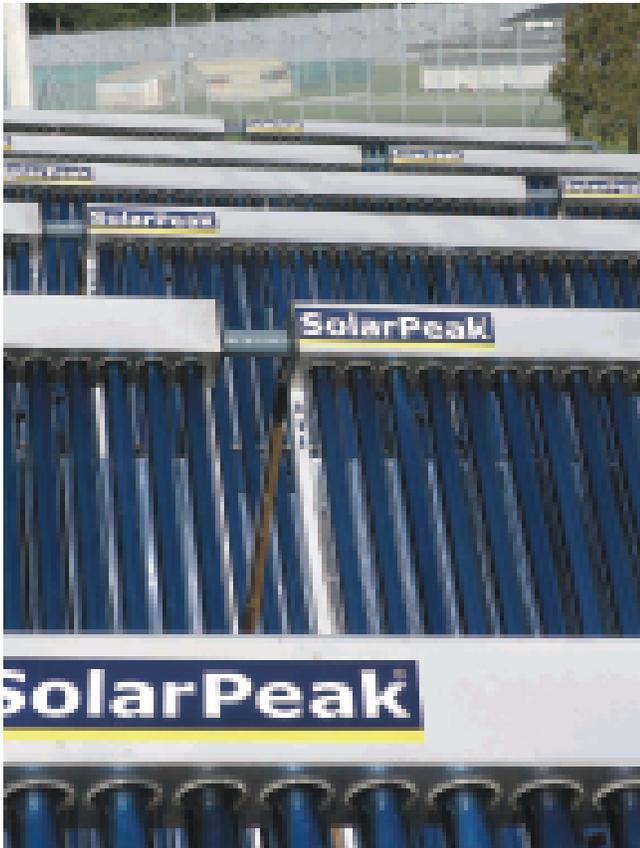
All certified solar units sold in New Zealand are required to resist 25 mm hailstones. The glass used in the evacuated tubes is similar to Pyrex, and although it is not indestructible, is very strong and able to resist impact from 25 mm hailstones.

Poor water quality

In areas with poor water quality (usually due to impurities from well water), appropriate filters should be used to rectify the water quality. Alternatively, your SolarPeak dealer can advise you about installing an indirect system that does not circulate the water from the cylinder into the collector manifold.

Other uses for solar heated water

There are many other uses for solar heated water including swimming pools and spas. Currently, it is not economically feasible to use solar water heating as a primary heat source for under floor or radiator heating.



Paparoa Men's Prison Laundry uses 7,000 litres of hot water per day at a temperature of 80° C. The 630 tube SolarPeak system contributes 39% of the annual load, the balance is heated with an integrated gas boiler.

Commercial installations

SolarPeak solar powered water heaters can be used to heat large volumes of water (at high temperatures, should that be required) for commercial installations such as aged care facilities, laundries, prisons, hotels, motels, and dairy farms. In many commercial applications, solar water heating is used to preheat water. The water is then brought up to the required temperature by an additional heat source.

System design

The design of commercial installations is a specialised field and should be done in conjunction with your SolarPeak distributor. Your distributor will be able to manage the project from the initial brief, design, installation, and commissioning to a maintenance contract.

Performance and maintenance monitoring

SolarPeak also offers system monitoring and intervention equipment that provides detailed online data logging such as water temperature, volumes used, and energy savings. This information can be seen in realtime on any standard internet browser from an offsite location. This equipment can also send malfunction alerts as a text message to a nominated cellphone, and issue maintenance schedule reminders.

EECA incentive schemes

Incentive schemes are available for domestic installations, bulk house building, commercial installations, and research into new solar water heating applications. Consult EECA or SolarPeak for information on current incentives.

New Zealand standards and affiliations held by SolarPeak.

AS/NZS 2712 Solar installation, performance, packaged system.

AS 2535 Solar collector instantaneous efficiency.

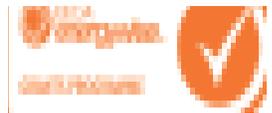
NZS 4613 Fifteen+ years durability, solar installation, performance.

GBT 17049 Solar all glass tube test.

AS2/G12 Installed to comply with G12.

Engineer certified frame and fixing for New Zealand conditions including snow and wind loadings.

SIA Fully accredited member of the Solar Industries Association.



Local distributor freephone:

0508 0508 468 928 (0508 HOTWATER)

or visit www.solarpeak.com

