

SOLAR HOT WATER

May 2023

Plumbing Practice Note SH 01| Solar Water Heaters

This Practice Note provides guidance on applying the solar water heater option to meet Victorian energy efficiency variation to the National Construction Code 2019 and associated standards in the Plumbing Regulations 2018.



This Practice Note applies only to the NCC 2019 performance requirements. For practitioners following the performance requirements of NCC 2022, please refer to Building Practice Note EE-03-2022. For further information about transitional requirements please refer to Building Practice Note EE-05-2022 Transitional Requirements for NCC 2022.

The content below provides guidance on:

- Requirements for solar water heaters
- Compliance with the requirements
- Installation requirements

Abbreviations & Definitions

The abbreviations and definitions set out below are for guidance only. They are not intended to vary those set out in the Building Act 1993, the Plunioing Regulations 2018 or the National Construction Code.

- Act Building Act 1993
- BAB Building Appeals Board
- BCA Building Code of Australia Volume 2, NCC 2019 Amendment 1
- Building Regulations Building Regulations 2018
- DtS Deemed-to-Satisfy
- NCC National Construction Code 2019, Amendment 1, Volumes One, Two and Three
- PCA Plumbing Code of Australia Volume Three, NCC 2019 Amendment 1
- RBS Relevant Building Surveyor
- **Regulations** Plumbing Regulations 2018
- SWH Solar Water Heater
- VEU Victorian Energy Upgrades



Requirements for solar water heaters

Heated water services are primarily regulated through part B2 of the Plumbing Code of Australia (PCA). However, the Building Code of Australia, Volume Two (BCA) contains specific energy efficiency requirements for Solar Water Heater (SWH) in new Class 1 buildings that must be complied with where applicable.

Victoria varies the energy efficiency provisions within the BCA and PCA, with the BCA variation being where the commonly used requirement to install either a rainwater tank or SWH is found. The variations that are applicable include:

PCA Performance Requirement – Vic BP2.6 Energy use and source

Performance requirement Vic BP2.6 refers to the Regulations for compliance.

BCA Performance Requirement - P2.6.1 Building

Performance Requirement P2.6.1 in the BCA is varied in Victoria to include the efficient use of available water resources.

In satisfying P2.6.1, Victoria also varies DtS clause 3.12.0 and verification method V2.6.1 to require either a SWH system or rainwater tank connected to all sanitary flushing systems.

BCA Performance Requirement - P2.6.2 Services

Performance requirement P2.6.2 in the BCA excludes bot water supply systems in Victoria, as their design and installation are controlled by the Regulations and included in Performance Requirement P2.6.1.

Clauses 9, 10 and 11 within Schedule 2 of the Regulations detail the standards relating to SWH systems. Clause 11 is specific to SWHs instanced in new Class Likomes and outlines the requirements in order to comply with the Building Regulations. This connects the Regulations to the BCA performance requirements, but the physical "in order to comply with the Building Regulations" means that clause 11 is only applicable where a EWH is installed directly to satisfy the BCA. Requirements in clause 9 relating to solar collectors and clause 10 relating to annual energy performance are also relevant to SWHs installed in exclass 1 homes to comply with the Building Regulations (and by reference, the BCA).

Regardless of the application of clauses 9 to 11, all other plumbing requirements remain applicable under the Regulations and part B2 of the PCA. This includes performance requirements BP2.1 – BP2.5 of the PCA, and associated reference standards (e.g., AS/NZS 3500.4). There is no hierarchy established under the Acceletween the BCA and PCA, therefore both must be complied with.

Example 1: Establishing what clause in Schedule 2 of the Regulations is applicable for a SWH installed in a new Class 1 building

A building designer considers options to install a SWH based on the homeowner's preference for connected services such as gas, electricity, and water. Options presented to the homeowner to satisfy the Regulations are:

Option 1:

The BCA is satisfied by installing a rainwater tank, therefore the SWH is installed as per clause 9 and 10 of Schedule 2 of the Regulations. In this case an all-electric SWH system may be an option for the homeowner. **Option 2:**

The BCA is satisfied directly by a SWH; therefore, it must be installed as per clause 11 of Schedule 2 of the Regulations. In this case a gas boosted SWH system may be an option for the homeowner.

Compliance with the requirements

Compliance for a SWH system must consider both the BCA and PCA, and for overall NCC compliance the following must be satisfied:

- Governing Requirements (Part A of BCA and PCA);
- Performance Requirement Vic BP2.6 (PCA); and
- Performance Requirements P2.6.1 and P.2.6.2 (BCA)

There are various mechanisms available to comply with these, including multiple DtS solution pathways, performance solutions, or a combination of DtS and performance solutions. There are also modification processes to the NCC available under the Act through the BAB or via plumbing modifications.

The most commonly used compliance pathway is to have either a rainwater tank connected to all sanitary flushing systems, or a SWH system installed in accordance with the Regulations. This is a DtS solution under the BCA however, it is only one of many options available for compliance with the BCA including development of a Performance Solution.

Boosting requirement

A SWH installed in Victoria that uses solar collectors needs to incorporate a booster. This is to ensure that hot water is available all year round and that it reaches suitable temperatures for safe operation in compliance with the Regulations.

Boosting can be provided by either gas or electric energy supply, and requirements set out in clause 11(4) in Schedule 2 of the Regulations determine what energy supply is required for compliance where the SWH is installed specifically to comply with the Victorian variation to the BCA.

If a SWH is installed to comply with the building Regulations and reticulated gas is available to the property, then the following requirements apply:

- if the SWH incorporates booster heating and is not a heat pump water heater, it must be gas boosted; and
- if the SWH is a lear pump water heater, it must be installed so that no part of the heat pump water heater that is capable of heating water can be connected to the mains electricity supply either directly or indirectly in order for that part of the heater to operate.

Where reticulated gas supply from a gas company is NOT available then under clause 11 the SWH can be either:

- an electric boosted SWH, or
- a heat pump water heater connected to mains electricity.

It should be noted that regardless of the source of energy, all systems must perform to a minimum 60% energy savings.





Heat pump water heaters are efficient electric appliances that are considered a type of SWH for the purpose of the Regulations. Although there are specific requirements under clause 11 when reticulated gas is available to the property, alternative pathways provide for installing a heat pump water heater while remaining compliant with the requirements:

- Install a rainwater tank connected to all sanitary flushing systems, therefore demonstrating compliance with Victoria's variation to energy efficiency requirements in the BCA and enabling installation of a heat pump water heater without needing to comply with requirements in clause 11(4) of Schedule 2 of the Regulations when reticulated gas is available to the property;
- Install the heat pump water heater so that no part of the heat pump water heater that is capable of heating water is connected to the electricity grid directly or indirectly, thereby complying with requirements under clause 11(4) of Schedule 2 of the Regulations;
- Develop a compliant Performance Solution which may be approved by the RBS and included within the building permit, or
- Apply to the Building Appeals Board (BAB) under either section 160 or section 160A of the Act to modify or determine compliance with the BCA.

Performance Solutions

In some instances, a Performance Solution may be developed as an olternative to a SWH, or a rainwater tank being installed. The Performance Solution must demonstrate how a proposed alternative satisfies the Performance Requirements directly or is shown to be at least equivalent to DtS. This must be thoroughly documented to demonstrate compliance with the BCA and must be approved for use under BCA Performance Requirement P2.6.1

Practitioners must check the building permit for any approved Performance Solutions, and follow the detail set out within. Any installation must be carried point strict accordance with the Performance Solution approved as part of the building permit

Example 2: A Performance Solution for Inglalling Heat Pump Hot Water System

A homeowner wants to have an all-electric home and wants to install a heat pump hot water system but has insufficient space to install a reinwater tank.

A Performance Solution is prepared, and the proposal is documented in accordance with the BCA, with appropriate evidence to demonstrate equivalence to the DtS provisions in the context of P2.6.1 (e.g., the number of Small-scale Technology certificates the heat pump attracts is equivalent to or greater than the number of STCs the alternative gas boosted SWH would attract demonstrating the heat pump is suitable for the relevant climate zone).

The RBS assesses the Performance Solution on its merits and makes the decision to approve the Performance Solution because it satisfies the requirements of the BCA.

Building Appeals Board

An application may be made to the Building Appeals Board (BAB) to:

- modify a particular clause of the Building Regulations 2018 or the BCA; or
- determine that the design of a building complies with the Act, the Building Regulations or the BCA.

Because SWH standards in the Regulations relate to compliance with the Building Regulations and by extension to Victoria's variation to energy efficiency requirements in the BCA, applications can be made to BAB to reduce greenhouse gas emissions and enhance energy efficiency in line with the intent of current requirements.



Applicants must supply sufficient information on the proposed alternative for BAB to determine whether to approve a modification to the energy efficiency requirements of the BCA. Advice should be sought from the RBS before considering an application to the BAB.

Example 3: Applying to BAB to Install a Heat Pump Hot Water System

A homeowner wants to have an all-electric home without the need for a rainwater tank and wants to install a heat pump hot water system.

An application is made to BAB under either:

- section 160 of the Act, to modify clause P2.6.1 / 3.12.0 of the BCA to permit the installation of heat pump water heater in lieu of a gas boosted solar water heater or a rainwater tank; or
- section 160A of the Act, to determine that installing a heat pump water heater under a performance solution complies with the BCA by reducing greenhouse gas emissions and enhancing energy efficiency consistent with the intent of P2.6.1 / 3.12.0 of the BCA as modified by Victoria's variation.

Appropriate evidence is provided with the application to demonstrate equivalence of outcomes to P2.6.1 /3.12.0 of the BCA (e.g., specifications for the heat pump water heater, copies of energy reports and assessments prepared for the house).

The BAB assesses the application and provides a determination to the oplicant.

Solar Water Heaters that perform to minimum 60% every savings

A SWH installed in a new Class 1 building to comply with the Building Regulations must perform to a minimum 60% energy savings, relative to energy consumption of a conventional water heater calculated in accordance with AS/NZS 4234: Heated Water Systems – calculation of energy consumption.



AS/NZS 4234: 2008 Heared water systems – Calculation of energy consumption is the relevant standard in court a comply with the Regulations.

Many SWH systems have been at sessed against an identical requirement to be registered as an eligible product for the Victorian Energy Operades program (VEU). This means practitioners can refer to the register of products maintained for that program to confirm that a SWH delivers a minimum of 60% annual energy savings.

The VEU Product Register incluces realls such as brand, model number for each system, tank size, annual energy savings and number of solar collectors that need to be installed. Solar water heaters are listed in three categories: electric boosted solar, gas/LPG boosted solar, and heat pumps. Practitioners will find this information useful when they need to:

- provide a customer with information about what SWH they can use, or
- identify if a SWH meets the compliance requirements.

It is important that the selected system matches exactly the details on the website.



The VEU Product Register is a convenient means of determining compliance with requirements for new Class 1 homes but that is not the core function of the register. VEU water heating activities are being reviewed by the Victorian Government and this Practice Note will be updated if needed to reflect any changes to how the register can be used to check compliance with the Regulations.





Orientation and angle of solar collectors

A SWH system must collect enough energy to achieve the 60% annual energy saving. To achieve this, the solar collectors must face between 30° east and 60° west of magnetic north, as measured by a compass. A 35° angle to the horizontal is ideal but collectors may be installed at $35^\circ \pm 20^\circ$ to allow for a different roof pitch/inclination. The most common roof pitch in Victoria (20° - 25°) is quite suitable.

Figure 1 illustrates the required system performance for different inclination angles and orientations of solar collectors. The grey area shows the acceptable inclination and orientation (the compliance area) for systems that perform to a minimum of 60% energy savings. The blue line shows an example of a system that is installed in accordance with the above requirements.

Figure 1 also shows how a better performing system meets the requirements of the Regulations. Upgrading the system to a more efficient one may be necessary, where the roof does not allow for collectors to be installed within the orientation or angle suitable for a system to achieve a 60% annual energy saving. The red line example 2 below demonstrates how Figure 2 can be used to identify the required performance the SWH must achieve in such cases.

Example 4: Solar Water Heaters installed outside the compliant angle and orientation

A plumber is installing a SWH on a roof. The roof has an inclination of 40- to horizontal and the orientation of the roof allocated to the hot water system is 90° west of north. This is shown as the red line on Figure 1. In order to comply with the Regulations, a system that performs to 75–88% energy savings will need to be installed. This can be found as shown on the VED Product Register, Essential Services Commission website.



Figure 1 Overview of required solar HWS performance at various inclinations and orientations



Checking product compliance on site

A SWH must have a label permanently attached to the heater's storage container. The label must be legible and must contain the following information:

"This solar water heater installation complies with the Plumbing Regulations 2018 (Victoria) when installed with the following collectors...".

Example label:

No. of bedrooms in building 1-2 3 or more Number of collectors installed in building Model number of each collector installed in building

The solar collectors must be adequate for the SWH and the number of bedrooms in the building. The

labelling above does not apply to heat pump water heaters, as they do not have solar collectors.

Frost protection

Most inland areas of Victoria experience frost conditions and even the milder coastal areas can occasionally be subject to frost. Some solar panels are designed with frost protection and manufacturers will recommend frost protection for their units in Victoria.

Pipe insulation and other considerations

Design and installation of a heated water supply system is regulated under the Regulations.

The Regulations require that all heated water plumbing must must the requirements of Part B2 of the PCA. These requirements are satisfied if the work is performed in accordance with AS/NZS 3500.4: Plumbing and drainage Part 4: Heated water services.

AS/NZS 3500.4: Plumbing and Vranage Part • Heared water services requires flow and return pipes between the collectors and storage container to be insulated to a minimum R-value of 0.3. This is equivalent to closed cell polymerinsulation with wall thickness of 13mm.

Depending upon the climate region, the R-value may need to be increased to 0.6 or 1.0. Refer to Table 8.2.1 in AS/NZS 3500.4: Plumping and drainage Part 4: Heated water services.

Thermal insulation materials must be capable of withstanding the high temperatures generated as a result of a solar HWS operation, and where external, be appropriately weather resistant and protected from ultraviolet degradation.

When installing a SWH, consideration should be given to:

- temperature requirements e.g., storage and delivery temperature,
- temperature pressure relief (TPR) valve termination,
- the weight of any heated water storage container installed on a roof,
- compliance with the OH&S requirements, and
- manufacturer's installation instructions.

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For further guidance on temperature control for heated water services, refer to Plumbing Practice Note HW-02: Temperature control devices and heat retention for heated water piping associated with storage water heaters.



Related Documentation

- Australian Standards: <u>https://www.standards.org.au/access-standards/buy-standards</u>
- Australian Building Codes Board: https://www.abcb.gov.au/
- Victorian Legislation (direct link to Plumbing Regulations): <u>https://www.legislation.vic.gov.au/in-force/statutory-rules/plumbing-regulations-2018/003</u>
- Essential Services Commission: <u>https://www.veu-registry.vic.gov.au/Public/Public.aspx?id=Home</u>
- Sustainability Victoria: <u>www.sustainability.vic.gov.au</u>
- Solar Victoria: <u>www.solar.vic.gov.au</u>
- Victorian Building Authority: Energy efficiency requirements: <u>https://www.vba.vic.gov.au/consumers/home-renovation-essentials/energy-efficient-requirements</u>
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List of Amendments

Updated format

Version History

• Version 3, published 1 May 2023, supersedes Version 2 published 10 November 2022.

Contact Us

If you have a technical enquiry, please email <u>plumbingtechnical advice@vba.vic.gov.au</u> or call 1300 815 127.

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