VICTORIAN BUILDING AUTHORITY

PLUMBING PRACTICE NOTE

Solar Hot Water SH 01 | Solar water heaters

Audience

The audience/s for this Practice Note include/s:

☐ Architects/ Designers
☒ Builders
☒ Building Surveyors/ Inspectors
☒ Engineers
☐ Home Owners / Residential Tenants
☒ Owner Builders
☒ Plumbers
☐ Real estate management agents
☒ Trades and Maintenance (inc. Electricians)

Purpose

This Practice Note provides guidance on applying the solar water heater option to meet Victorian energy efficiency variation to the National Construction Code 2019 Volume Two and associated requirements in the Plumbing Regulations 2018. It replaces Plumbing Practice Note SH-01: Solar Water Heaters version 3 dated 1 May 2023 to provide updated information on amendments to the Plumbing Regulations 2018 which came into effect on 28 November 2023.

The content below provides guidance on:

- Changes to Regulations for solar water heaters installed in new Class 1 dwellings
- Requirements for solar water heaters in NCC 2019 Volume Two
- Requirements for solar water heaters in the Regulations
- Compliance with the requirements for NCC 2019 Volume Two and the Regulations
- Installation requirements

This Practice Note applies only to the NCC 2019 Volume Two energy efficiency requirements. For practitioners following the energy efficiency requirements of NCC 2022 Volume Two, 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
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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 Building 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

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- **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, which is NCC 2019 Volume Three, Amendment 1
- **RBS** – Relevant Building Surveyor
- **Regulations** – Plumbing Regulations 2018
- **Standard** – AS/NZS 3500.4
- **SWH** – Solar Water Heater
- **VEU** – Victorian Energy Upgrades

Changes to Regulations for solar water heaters installed in new Class 1 dwellings

Amendments to the Plumbing Regulations 2018 were made on 28 November 2023 that change the requirements for a Solar Water Heater (SWH) installed in a new Class 1 dwelling.

Stage 1: Effective from 28 November 2023

Effective from 28 November 2023, there is no longer a restriction on the energy source for SWH installed in a new Class 1 dwelling to comply with Victoria's variations to Part 2.6 and Part 3.12 of the 2019 version of the Building Code of Australia (BCA), Volume Two.

This means that, where reticulated natural gas supply is available for connection, the SWH installed in a new Class 1 home can be a:

- heat pump water heater;
- gas boosted solar water heater; or
- electric boosted solar water heater.

Stage 2: Effective from 1 May 2024

From 1 May 2024, the SWH requirements in the Plumbing Code of Australia (PCA) 2022 will apply instead of those in the Regulations. Specifically:

- Solar collector orientation and inclination requirements are now contained in *AS/NZS 3500.4 Plumbing and drainage, Part 4: Heated water service.* These requirements are broadly similar to those that were contained under Clause 9 of Schedule 2 of the Regulations. AS/NZS 3500.4 also provides a means of achieving compliance where the solar collector orientation does not meet the prescribed requirements.
- The minimum performance requirements for solar and heat pump water heaters are now contained in NCC 2022 Volume Three – Plumbing Code of Australia: B2D2.
- Labelling of solar water heater is no longer required.

There will be transitional provisions in place for solar (including heat pump water) water heaters that are installed on or after 1 May 2024. If the system is being installed in a new class 1 building to comply with NCC 2019 Volume Two Energy Efficiency Provisions *(as documented in the relevant building permit)*, the solar and heat pump water heater must comply with Clauses 9, 10 and 11 of Schedule 2 of the Regulations that existed before 1 May 2024.

Requirements for solar water heaters in NCC 2019 Volume Two

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 varied the energy efficiency provisions within the 2019 versions of the BCA and PCA. The variation gives effect to the requirement for a new class 1 building to also have installed a rainwater tank plumbed to all toilets or SWH. The relevant variations under NCC 2019 that are applicable include:

PCA 2019 Variations

- Vic BP2.6 Energy use and source – this variation refers to the Regulations for compliance.
- Vic BV2.1 Greenhouse gas intensity of a water heater – this variation deletes the Verification Method
- Vic B2.2 Water heater in a heated water supply system – this variation refers to the Regulations for compliance.

BCA 2019 Volume Two Variations

- Vic P2.6.1 Building – this variation includes the efficient use of available water resources
- Vic P2.6.2 Services – this variation has the effect that hot water supply system requirements under this Performance Requirement does not apply, and instead refers it to the Regulations
- Vic V2.6.1 Application of this Part – this variation inserts a requirement for a new class 1 building to also have installed a rainwater tank connected to toilets or a SWH
- Vic 3.12.0 Application of Part 3.12 – this variation inserts a requirement for new class 1 buildings to also have installed a rainwater tank connected to toilets or a SWH

Requirements for solar water heaters in the Regulations

Clauses 9, 10 and 11 within Schedule 2 of the Regulations detail the requirements relating to SWH systems.

Clause 11 is specific to SWHs installed in new Class 1 homes and outlines the requirements in order to comply with BCA 2019 Volume Two (as incorporated by the Building Regulations 2018). This connects the Regulations to the BCA 2019 Volume Two performance requirements, but the phrasing "in order to comply with the Building Regulations" means that clause 11 is only applicable where a SWH is installed directly to satisfy the BCA. The note to Clause 11 explains that requirements relate to Parts 2.6 and 3.12 of the 2019 version of the BCA: meaning that work carried out in accordance with NCC 2022 does not need to comply with this clause of the Regulations.

Requirements in clause 9 relating to solar collector positioning and clause 10 relating to annual energy performance are also relevant to SWHs installed in new Class 1 homes to comply with the Building Regulations 2018 (and by reference, the BCA 2019 Volume Two).

Application of requirements in clauses 10 and 11 depends on whether the SWH is being installed to comply with Part 2.6 and Part 3.12 of BCA 2019 Volume Two.

This is illustrated by Table 1 (below).

Table 1: Which clauses are applicable when installing a SWH

Reason for installing a SWH	Requirements to follow
To comply with Part 2.6 and Part 3.12 of BCA 2019 Volume Two. **Note:** this applies irrespective of when the building permit was issued.	Install in accordance with clauses 9, 10 and 11 in Schedule 2 of the Regulations. This Practice Note provides guidance on compliance with these requirements.
For reasons other than compliance with Part 2.6 and Part 3.12 of BCA 2019 Volume Two.	Install in accordance with clause 9 in Schedule 2 of the Regulations and Part B2 of PCA 2022. **Note:** this Practice Note applies only to the NCC 2019 performance requirements. Refer to Building Practice Note EE-03-2022 and EE-05-2022 for information on energy efficiency requirements in NCC 2022.

Table 1 - Requirements depend on whether installations to comply with Part 2.6 & Part 3.12 of BCA 2019 Volume Two

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 referenced standards (e.g. AS/NZS 3500.4).

Compliance with the requirements for NCC 2019 and the Regulations

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 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 SolutionUnder the Regulations a SWH is defined as either a heat pump water heater or a system with a solar collector and a container. This has not changed, and from 28 November 2023 a heat pump water heater, gas boosted solar water heater or electric boosted solar water heater can be installed in a new Class 1 dwelling where reticulated natural gas supply is available for connection.

Solar Water Heater 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.

Solar Water Heaters that perform to minimum 60% energy savings

A SWH installed in a new Class 1 building to comply with NCC 2019 Volume Two 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 Heated water systems – Calculation of energy consumption is the relevant standard in order to comply with the Regulations.

SWH systems registered for the Victorian Energy Upgrades program (VEU) prior to 1 July 2023 were assessed against an identical requirement. This means practitioners can refer to the register of products for that program to see if a SWH is registered and confirm that it delivers a minimum of 60% annual energy savings.

The VEU Product Register includes details 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 changed on 1 July 2023 and the program no longer provides incentives for gas boosted SWH. The Product Register retains a legacy listing of gas boosted SWH registered with the VEU before 1 July 2023.

Figure 1 (below) illustrates the steps to using the VEU Product Register to confirm that a SWH delivers a minimum of 60% annual energy savings. The numbers correspond to the following steps:

1. Go to the Register of Products.
2. Ensure the "Products" heading is selected in the left hand field.
3. Select the category of Product that you wish to search – categories for SWH are:
   1C(18) & 3D - Water heater - Electric boosted solar
   1D(18) & 3C - Water heater - Heat pump
   1F & 3B(18) - Water heater - Gas/LPG boosted solar (revoked 1/7/23)
4. Select 'All' as the status.
5. Click on 'Search'
6. Set the AS/NZS 4234 Version to 2008 by:
   a. clicking the arrow next to the 'AS/NZS4234 Version' column heading and choosing 2008 from the list; or
   b. entering 2008 in the text box below the column heading.
7. Filter results according to Brand, Model and other columns as needed to narrow the search.
8. Check that the Status column for the SWH shows either 'Approved' or 'Legacy'.

Practitioners should not rely on energy savings shown in the VEU Product Register for any products with a 'Removed' or 'Pending Assessment' status.

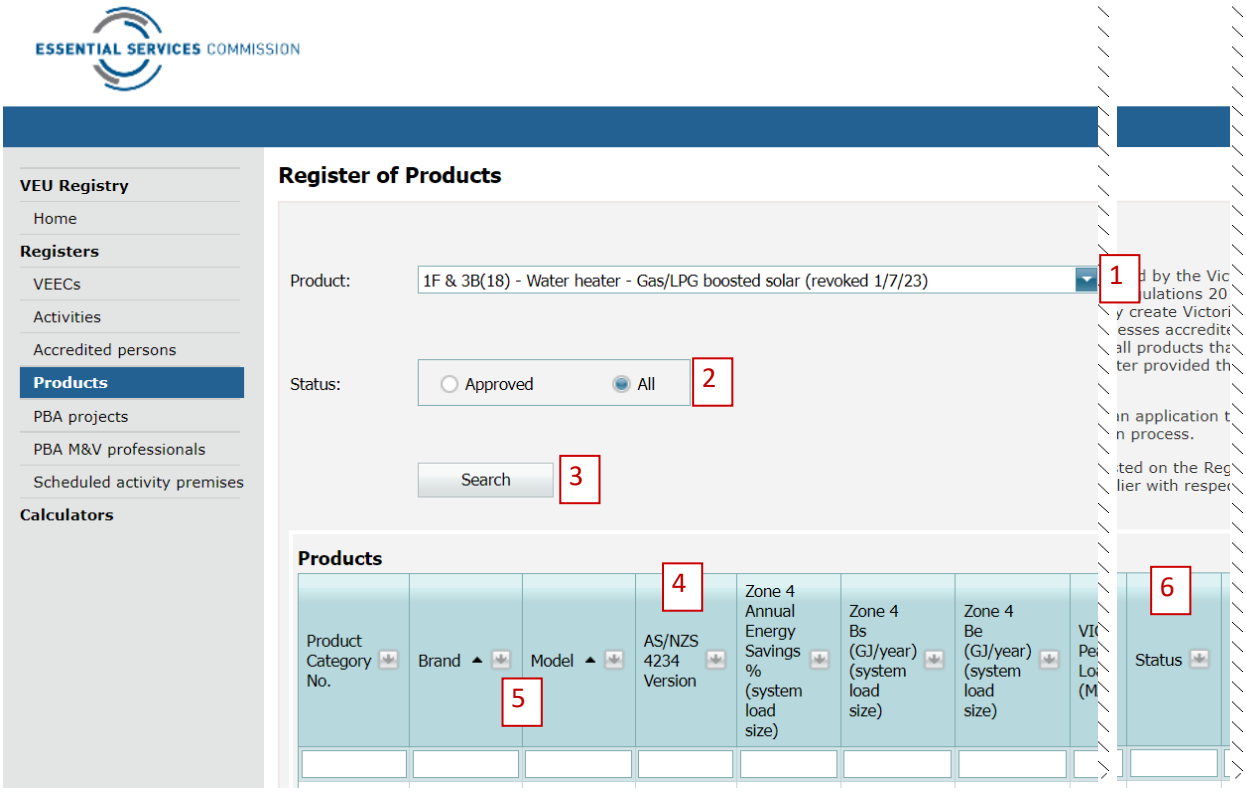

Figure 1 - Steps to check SWH energy savings using the VEU Products Register

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Registration of products with the VEU is voluntary and the product register may not include all brands and models available on the market. If a SWH is not listed in the VEU Product register, information on energy performance may still be available through other sources including the manufacturer.

Installation requirements

Orientation and angle of solar collectors

A SWH system's performance when calculated under AS/NZS 4234 assumes that the solar collectors are installed in the optimal position. If the collectors are not in the optimal position, the claimed energy savings is unlikely to be achieved, and must be compensated with a higher performing system.

The Regulations require solar collectors to face between 30° east and 60° west of magnetic north, as measured by a compass.

Solar collectors must also be inclined at 35° ± 20° to the horizontal. The most common roof pitch in Victoria (20° - 25°) would fall within this range.

Figure 2 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 Example 1 below shows an example of a system that is installed in accordance with the above requirements.

Figure 2 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: 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 2. To comply with the Regulations, a system that performs to 75 – 80 % energy savings will need to be installed. This can be found as shown on the VEU Product Register, Essential Services Commission website.

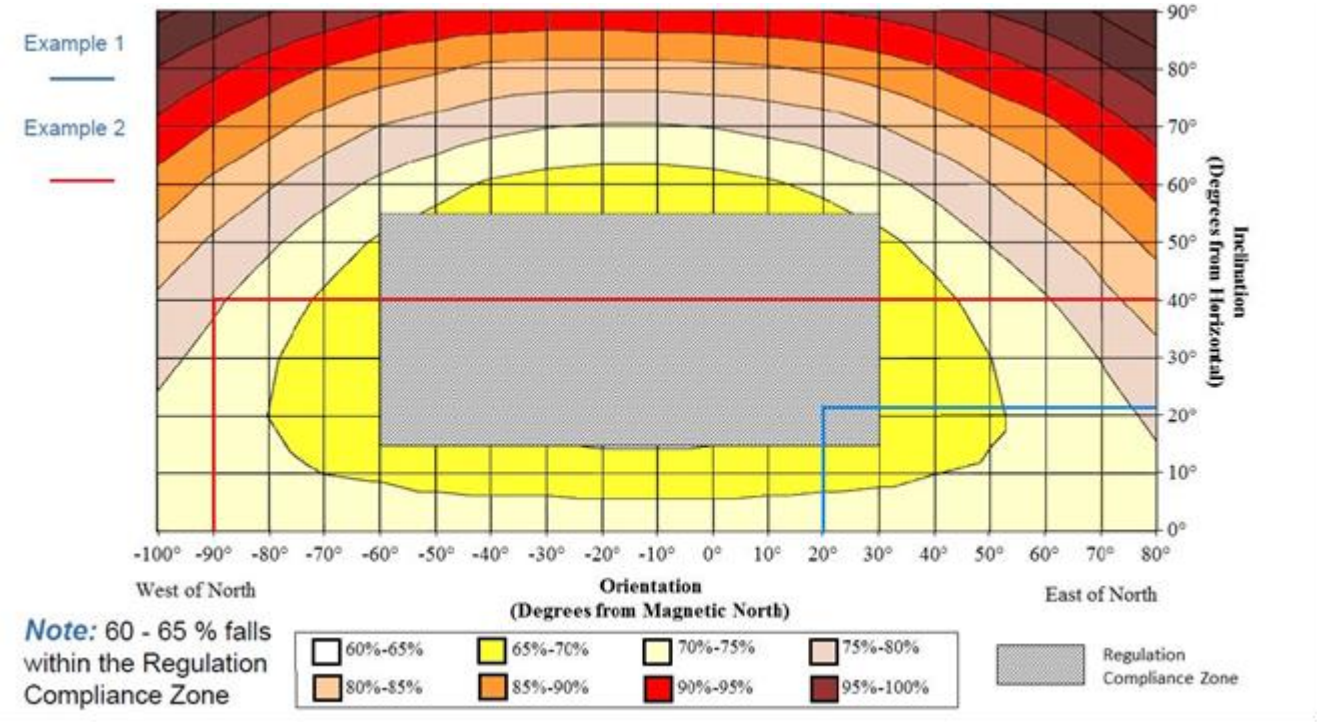

Figure 2 - Overview of required solar HWS performance at various inclinations and orientations
VBA owned image 2014

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		

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 which adopts the PCA. Part B2 of the PCA sets out the requirements for heated water service. *AS/NZS 3500.4: Plumbing and drainage Part 4: Heated water services* (herein referred to as AS/NZS 3500.4) is a referenced standard under Part B2 and can be used to satisfy some of the requirements.

AS/NZS 3500.4 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 polymer insulation 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.

Thermal insulation materials must be capable of withstanding the high temperatures generated as a result of its 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,
- appropriate sizing of the system (including the heated water storage tank),
- adequate insulation of pipes to mitigate risks of lost heat energy, water heaters not achieving correct temperature, and potential scalding from touching uninsulated hot metal pipes,
- temperature pressure relief (TPR) valve termination e.g. avoiding potential for hot water/steam to be ejected in an uncontrolled direction, which could lead to scalding or burns,
- properly securing the compressor (if a heat pump water heater) and appropriately placing the heated water storage tanks to avoid the unit falling and injuring someone,
- the weight of any heated water storage container installed on a roof,
- compliance with the OH&S requirements, and
- manufacturer's installation instructions.

For further guidance on temperature control for heated water services, refer to Plumbing Practice Note HW-01: Temperature control devices and heat retention for heated water piping associated with storage water heaters.

Related Documentation

- Building Act 1993
- Building Regulations 2018
- National Construction Code 2022
- Australian Standards: https://www.standards.org.au/access-standards/buy-standards
- Australian Building Codes Board: https://www.abcb.gov.au/
- Victorian Legislation (direct link to Plumbing Regulations): https://www.legislation.vic.gov.au/in-force/statutory-rules/plumbing-regulations-2018/003
- Essential Services Commission: https://www.veu-registry.vic.gov.au/Public/Public.aspx?id=Home
- Sustainability Victoria: www.sustainability.vic.gov.au
- Solar Victoria: www.solar.vic.gov.au
- Victorian Building Authority: Energy efficiency requirements: https://www.vba.vic.gov.au/consumers/home-renovation-essentials/energy-efficient-requirements
- Plumbing Practice Note: HW 01 - Installation of tempering valves and heat retention for hot water piping

List of Amendments

- Updated to reflect changes to the Plumbing Regulations 2018 which came into effect on 28 November 2023
- Updated to provide further guidance on use of the VEU product register to check that SWH comply with the Regulations
- Updated format and content review

Document history

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