

INSTALLING GRID CONNECTED PHOTOVOLTAIC SYSTEMS IN THE ACT

Frequently asked questions

The information published below was correct at the time of publication and has been updated for the 2014 edition of AS/NZS 5033 (January 2015).

What licences do I require the ACR to install PV systems?

You need to hold an ACT construction occupations licence:

Occupation: Electrician

Class: unrestricted

All wiring work in a grid connected photovoltaic (PV) installation is to be carried out by a holder of an ACT unrestricted electrical licence. Interstate licensees can apply for mutual recognition of their licence using the mutual recognition of their licence using the mutual recognition application form from our website under forms.

<https://www.accesscanberra.act.gov.au/app/services/licence/#/electrician>

How do we temperature adjust the Voltage Open Circuit (V_{oc}) value of a PV installation in the ACT?

The maximum voltage rating of all the electrical equipment needs to be higher than the maximum output voltage of the PV array when adjusted for temperature variations. Clause 4.1.2 of AS/NSZ 3000:2007 requires you to prevent any adverse effects the electrical equipment might cause on the electrical installation. In the ACT, you should use a temperature value of at least -10°C as the minimum operating temperature in the urban areas and possibly a lower value in the non urban and alpine areas of the ACT.

Where the temperature coefficient of the PV panels is not stated, all components used must have a voltage rating equal to, or greater than, $1.14 \times V_{OC}$ array. Clause 4.2 (c) of AS/NZS5033:2014

Where the temperature coefficient of the PV panels is stated, using the minimum temperature (T_{min}) of -10°C you may use the PV panel's temperature coefficient to ensure your system design does not expose the installation to a greater voltage than it is rated for. Clause 4.2 (a) of AS/NZS5033:2014

Example

Using a V_{OC} of 358.4Vdc (8 panels at 44.8 Vdc each) can I use an inverter rated with 400Vdc max volts?

Option 1: Temperature coefficient of PV panels is not stated

$$V_{oc} (358.4) \times 1.14 = 408.576 \text{ Vdc}$$

No, you cannot use an inverter rated at 400Vdc max volts

Option 2: Where the temperature coefficient of the PV panels is stated as $-0.1478\text{V} / ^\circ\text{C}$ using the formula from clause 4.2 of AS/NZS 5033:2014;

PV array max volts = $V_{oc\text{ Array}} + YV (T_{\min} - T_{STC})$ MYV is $-0.1478\text{V}/^\circ\text{C}$, T_{\min} is -10°C , T_{STC} is 25°C , M is 8 Panels.

PV array max volts = $358.4 + (-0.1478 \times (-10 - 25)) \times 8$

PV array max volts = 399.78Vdc

YES, you can use an inverter rated at 400Vdc max Volts

Is separation of DC and AC isolators/CBs at the inverter required?

Yes. Separation is required as the generation DC supply is not part of the electrical installation that is connected to the grid. Clause 3.9.8 of AS/NZS 3000:2007 covers segregation of wiring systems of different installations particularly within common enclosures.

Separation can be achieved by individual enclosures, by internal barriers within a common enclosure or by physical separation.

The requirement of Clause 5.2 of AS/NZS 4777:2016 also apply.

What approvals are required of miniature circuit breakers?

All miniature over current circuit breakers DC and AC are prescribed articles and must exhibit evidence of approval.

Evidence is either the regulatory compliance mark (rounded edged triangle with incorporated 'C' tick) or an alpha numeric safety mark (e.g. Q- QLD, N- NSW, V- Victoria, etc;) followed by the certification year (e.g. 09, 07) and the 4+ digit certificate number hence, Q071234. The ACT Electricity Safety Act 1971 sets out product safety approval.

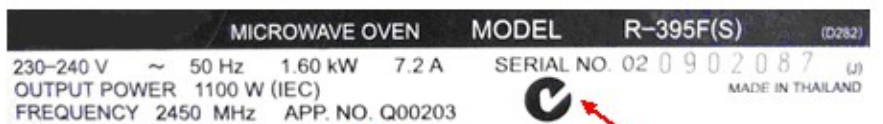
Note: Marking requirements prescribed equipment must be marked with the approved mark required by the electrical regulator who approved the equipment, or be marked with the regulatory compliance mark (RCM). Typically, these markings consist of a letter to indicate the State in which approval was granted, followed by a number of symbols.

Known Certification Marks

Examples of the marks issued under the legislation of the various regulators include:

Queensland	Q<number>
	ESO<number>
Western Australia	W<number>
Victoria	V<number>
	ESV<number>
South Australia	S<number>
Tasmania	T<number>
New South Wales	NSW<number>
	N<number>
	AGA<number>EA
	ASA<number>EA
	GMA<number>EA
	C/A<number>
	CBA<number>EA
	SAA<number>EA
	SAI TE EA<number>
	SAI SMK EA<number>
	SGS EA<number>
	TUV<number>EA
	A<number>EA
	U<number>EA

Electrical appliance approval label



This is a Queensland approval number (Q00203).

This tick  is NOT a safety approval mark.

Regulatory Compliance Mark



When used in conjunction with requirements of

The C-tick

The-tick is not an electrical safety approval.



The Australian Communications and Media Authority (ACMA) regulates the EMC requirements of electrical product (The C-tick). This recognition process allows the use of a number that starts with an 'N' e.g. N1244. This number should not be confused with the approval number issued by the New South Wales electrical safety regulator.

The C-Tick number must be placed next to the C-Tick or RCM symbol.

For information on the C-Tick and EMC requirements contact the ACMA <http://www.acma.gov.au/>

Should disconnecting devices be de-rated when exposed to heat?

Yes. Switch ratings are derated as temperature increases.

Circuit breakers, isolators and any other load breaking disconnection devices used for protection and/or disconnecting means shall comply with the requirements of clause 4.3.5 of AS/NZS 5033:2014

- Typically the short circuit current (Isc) of the PV array should be multiplied by a factor of 1.25 and all equipment used shall be rated to this new value. For example; Isc is 10A, the rated current for equipment is $(10A \times 1.25) = 12.5A$
- The rated current of the disconnecting device is derated for the expected temperature rise above ambient. Table 4.2 of AS/NZS 5033:2014 provides for 40oC rise above maximum expected ambient. The de-rating values are supplied by the equipment manufacture and the installer would use the 80oC to 85oC values in the ACT.

To be compliant, the disconnecting device (de-rated for temperature rise) shall be rated greater than the PV array rated current for equipment protection.

Example

A PV Array has an Isc of 10A, can you use an isolator rated at 20A?

- Isc is multiplied by 1.25 for equipment protection rating $(10A \times 1.25) = 12.5A$
- Isolator manufacture requires it to be temperature derated by 0.6, then $(20A \times 0.6) = 12A$

No. From the above example the 20A isolator is not compliant.

Switch-disconnectors and any other load breaking disconnection devices used for protection and/or disconnecting means shall not be polarity sensitive. Clause 4.3.5.2 of AS/NZS 5033:2014

Where are array isolators required?

See clause 4.4.1.5 of AS/NZS 5033:2014 for full details.

Locations of roof top isolators:

Where the PV array is on the roof:

- at least 1 isolator is required at each PV array
- Where sub arrays are out of sight of the main array isolator, additional isolators may be required.

Where the PV array is on the side of buildings as glazing:

- an isolator on the inside wall adjacent to the PV panel, or between two panels
- label PV panel with location of isolator (the label must last the life of the panel)
- make the isolator accessible and label it to its function
- where the isolator is above a ceiling panel, provide access so that it can be worked on and provide a location label on the access panel
- ensure the isolator can be locked in the off position.

In all other cases:

An isolator is required on the array where the inverter:

- is not in sight of the array
- is more than 3 metres from the array.

Note: Care should be taken to stop moisture entering isolators through conduits and glands.

Note: Plugs and sockets are not to be used as isolators. Only specially constructed plugs and sockets are capable of interrupting load safely. All systems with an open circuit voltage greater than 30Vdc can experience DC arcs. Plugs and sockets which are not specially constructed for load interruption if disconnected under load represent a safety risk and generally incur damage to the connection, which will compromise the quality of the electrical connection and could lead to overheating.

What is the approved method of penetrating concrete roof tiles and what conduits can I use?

We have published an extensive response to this issue on our web site: [Electrician note](#)

Clause 3.9.4.3.1 of AS/NZS 3000:2007 – Wiring Rules, does not allow a wiring system to go between the roof tiles.

- Where conduit is used on the roof, it needs to be rigid conduit with UV protection or where corrugated conduits are used it must have UV protection and be suitable for the application.

What voltage rating do the poles of isolators need to be?

See Appendix B of AS/NZS 5033:2014 for full details. The following is a summary of the requirements:

- i. Where the inverter has an isolating transformer, the isolator shall be rated to VOC (temp adjusted)
- ii. Where the inverter is transformer-less, each pole shall be rated to VOC (temp adjusted)
- iii. Where a functional earth is used on the positive or negative conductor, each pole shall be rated to VOC (temp adjusted).

Some inverter manufactures are installing RCD protection in the inverter to detect earth faults. Appendix B of AS/NZS 5033:2014 does not allow for any changes to the above requirements.

Where does the main switch for the PV installation go?

Installers need to consult the ActewAGL Service and Installation rules and Requirements for Embedded Generators, to understand the requirements for the main switch. Both documents are available on the ActewAGL website.

<http://www.actewagl.com.au>.

The requirements of AS/NZS 4777 are also to apply.

Is there a minimum or maximum height for the installation of an inverter?

Yes-the inverter typically has an alarm display that the installation owner needs to be able to read this and the inverter should be readily accessible. Following the requirements of clause 1.4.2 of AS/NZS 3000:2007, the maximum height to the top of the inverter is 2 metres above ground, floor or platform, the minimum height to the bottom of the inverter should not be less than 500mm from ground, floor or platform.

Does the interconnecting wiring between each PV module require mechanical and IP protection?

Yes. the installation of DC wiring systems in a building require additional mechanical protection. The installer should refer to clause 4.3.6.3.2 of AS/NZS 5033:2014

Do I need to install an AC switch or circuit breaker at the inverter?

Yes- clause 7.3.8.2.3 of AS/NZS 3000:2007 requires an isolating switch adjacent to the inverter.

Note:

- The wiring between the inverter and switchboard needs to have a current rating higher than the max current output of the inverter, or a circuit breaker should be used. See AS/NZS 3008 for current ratings.
- The isolating switch only needs to be single pole and effectively isolate the active supply conductors. Internal isolating arrangements of the inverter are not an acceptable means of isolation ; it must be an externally mounted isolator.
- In installations where there is more than 1 inverter, each inverter shall have its own isolation switch.

What is the process to get the grid connected PV installation energised?

When the PV installation is completed, the electrician must submit a certificate of electrical safety (CES) for a new installation within 14 days of completion. The installation of a PV system is considered as a new electrical installation and cannot be connected the electricity network until it is inspected by an ACT Government electrical inspector.

The isolator of “Net” metered systems should be danger tagged in the off position until the electrical inspector has tested and approved the installation.

[CES forms](#) are submitted via our web site under forms at:

How does the Network Distributor (ActewAGL distribution) know a PV installation is approved for connection to their network?

After the electrical inspector has approved the PV installation for connection to the grid, they attach an approval sticker to the meter box. ActewAGL will only connect the PV installation to the grid if the electrical inspector’s authorisation sticker is present.

Note: ActewAGL Distribution is the electricity network distributor. To have an electricity meter installed a metering retailer needs to be contacted.

Note: All grid connected PV systems need to be approved by ActewAGL Distribution before they are installed. See their web site for contact details and further information: <http://www.actewagl.com.au>

Labels

All required labels in AS/NZS 5033, AS/NZS 4777 and AS/ NZS 3000 are required to be fitted before the installation is completed and an inspection booked.

All labels shall be of a type approved by the Registrar that will last the life of the electrical installation. The Registrar has approved:

- Engraved labels of the Traffolyte style.

The Label on the Meter Box lid/door and other labels that are exposed to weathering shall be secured by mechanical means. Labels exposed to sunlight need to be UV stabilised.

Note:

The ActewAGL Service and Installation rules also have requirements for labels.

See their web site for further information: <http://www.actewagl.com.au>

Does the electrical inspector need to see documentation?

Yes. Clause 5.7 of AS/NZS 5033:2014 has the minimum requirements for documentation to be left with the installation owner. We recommend this be in the form of a dossier and be available for the electrical inspector to view. Electronic copies should be in PDF and can be emailed to the electrical inspector directly at electrical.inspections@act.gov.au

Updating fire plans

Where a building has a fire plan adjacent to the fire or sprinkler panels, the plan is to be updated with the locations of the main switchboard and locations of the generators (inverters) as per AS/NZS 3000:2007 clause 2.9.2.4.

Is building approval (BA) and development approval (DA) required?

In most cases class 1 and 10 buildings are exempt and class 2 to 9 building do require BA and DA approval. Some external photovoltaic panels and support structures on class 1 buildings still need BA or DA approval if they fail to comply with rules set out in regulations. Additional information is available on our website, and we recommend you consult your building certifier if you still have any question on approvals.

For further information visit the [Environment, Planning and Sustainable Development Directorate](#) website

The class of a building is defined in the National Construction Code.

Solar farms and non urban blocks

Ground based PV Arrays on non urban blocks will in most cases require a DA and BA. Any person considering ground mounted PV arrays need to check with Environment, Planning and Sustainable Development Directorate DA assessment team before installation.

Do the electrical inspectors provide advice on installation questions?

Yes. The electrical inspectors do not offer a design approval service, but are willing to provide advice in any area we feel your design might not comply with the wiring rules, and are willing to come out to site before you start to answer questions on electrical compliance.

To arrange a site visit call the electrical inspections team on 02 6207 7775 or contact them via email on electrical.inspections@act.gov.au

There is no fee for this service.

Who is responsible for turning the PV installation on?

The installer of the PV installation is responsible for turning on and commissioning the new PV installation after:

- approval is given by the electrical inspector to connect to the grid
- ActewAGL approve the connection, and
- the new metering equipment has been installed.

The electrical inspectors are not required to turn on the PV installation and the ACT Government is not liable for any lost revenue should the installer fail to turn on the PV installation after all the required approvals are given.

Can an existing PV installation be relocated to another building?

The re-installation is considered a new installation and will need to be done to the current edition of the relevant Australian Standards. E.g. AS/NZS 3000, AS/NZS 5033 and AS/NZS 4777.

You can relocate some of the equipment and install it at the new location, but all materials and methods of installation need to be compliant to the current edition of the standards, as it is a new installation and is treated as new.

NOTE: Since **16 July 2013**, PV modules installed on buildings must be certified as Fire Safety Class C or better. PV systems installed prior to this date may not be compliant to the new standard. The Clean Energy Council maintains the database and website listing of AS/NZS 5033-compliant PV modules- See more at: <http://www.solaraccreditation.com.au/products/modules.html>

For grid-connected installations, ActewAGL Distribution needs to be notified of the proposed relocation.

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