

SOLAR ALTERATIONS REQUIREMENTS

May 2014

These requirements address typical alterations to solar installations; they cannot address every scenario. In Victoria an alteration to a solar installation is classed as 'prescribed electrical installation work' which requires the work to be inspected by a Licensed Electrical Inspector (LEI) and a Prescribed Certificate of Electrical Safety to be issued before the solar installation can be used.

Listed are common requirements that apply to existing solar installations when altered, added to or re-configured.

- A. If the inverter's capacity can accommodate additional panels or altered configuration, the inverter can remain, otherwise an upgrade is required.
- B. All existing and new panels shall be connected to the installation's earthing system. This requirement is to prevent the possibility of voltage gradients and creates a safer installation. Reference Equipotential Bonding – Clause 5.6 of *AS/NZS 3000:2007 – Wiring Rules*.
- C. String wiring must be installed as per *AS/NZS 5033:2012 – Installation and safety requirements for photovoltaic (PV) arrays*.
- D. The restricted use of cable ties apply to new and existing work as per *AS/NZS 5033:2012 – Installation and safety requirements for photovoltaic (PV) arrays*.
- E. Existing isolating devices must to be replaced when identified as:
 - i. not having the correct voltage rating for an earthed array system (1.2 X Voc*)
 - ii. polarised circuit breakers
 - iii. rated for AC voltage only
 - iv. if the enclosure is not protected against UV
 - v. if the enclosure is not mounted as required by the manufacturer and diminishes the IP rating
 - vi. correct current rating (ISC x 1.25)
- F. Existing cables that are suitably rated for purpose (DC rated cable), and cables that complied with the minimum requirements of the Standard at the time of installation, would not be required to be reinstalled in heavy duty (HD) conduit.
- G. When wiring is relocated or upgraded, the requirements of *AS/NZS 5033:2012 – Installation and safety requirements for photovoltaic (PV) arrays* and *AS/NZS 3000:2007 – Wiring Rules* apply.
- H. Where TPS cables (suitable for AC) are installed between the solar array and the inverter, and solar array is reconfigured or added to, the TPS cable shall be replaced with suitably rated DC cable installed in a conduit.

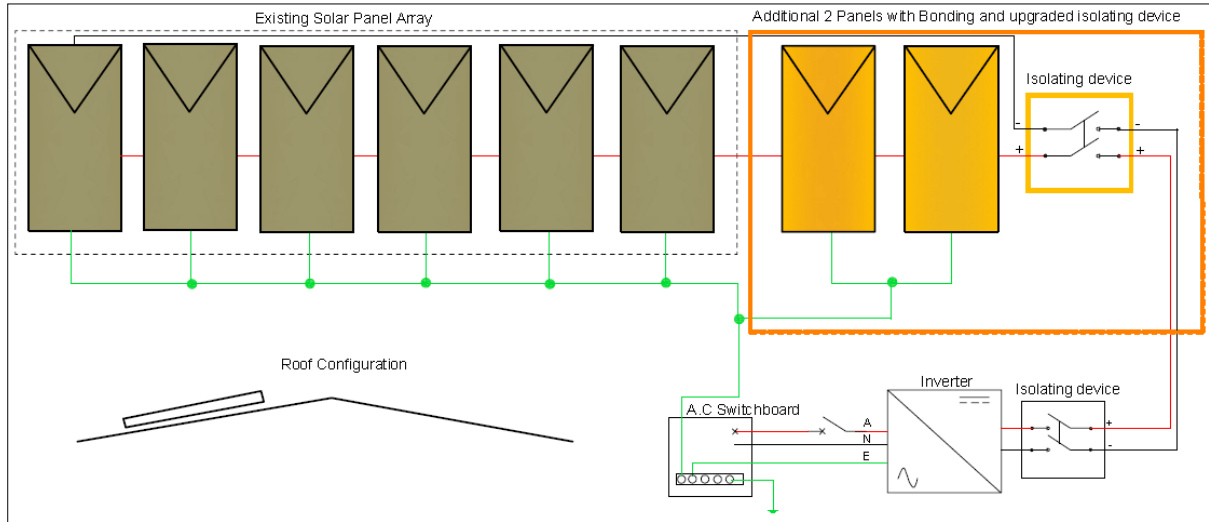
* - Approximate value – Refer to Clause 4.3.1 of *AS/NZS 5033:2012*.

SCENARIO 1

Adding new panels to an existing array

Example:

Original array configured with 6 panels in series, the alteration consists of installing an additional 2 new panels in series.



If the existing cables or isolating devices do not have the current carrying capacity or voltage rating they must be upgraded to comply with current standards and requirements.

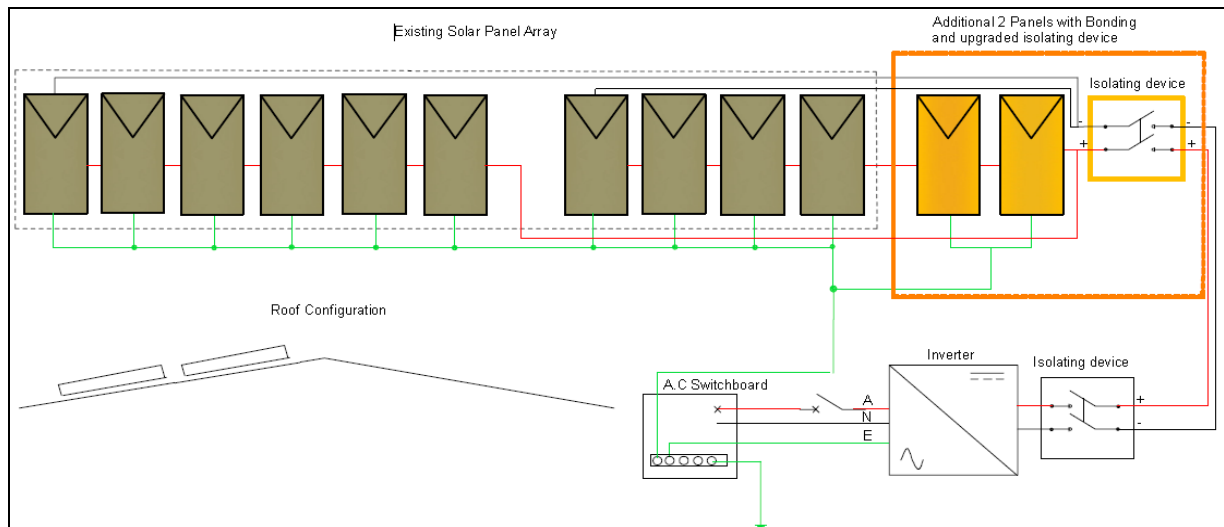
Where addition panels are added, plug and socket shall be mated with those of the same type from the same manufacturer. Refer to Clause 4.3.7(k) of AS/NZS 5033:2012.

SCENARIO 2

Adding new panels to an existing string but changing the configuration of the existing string

Example:

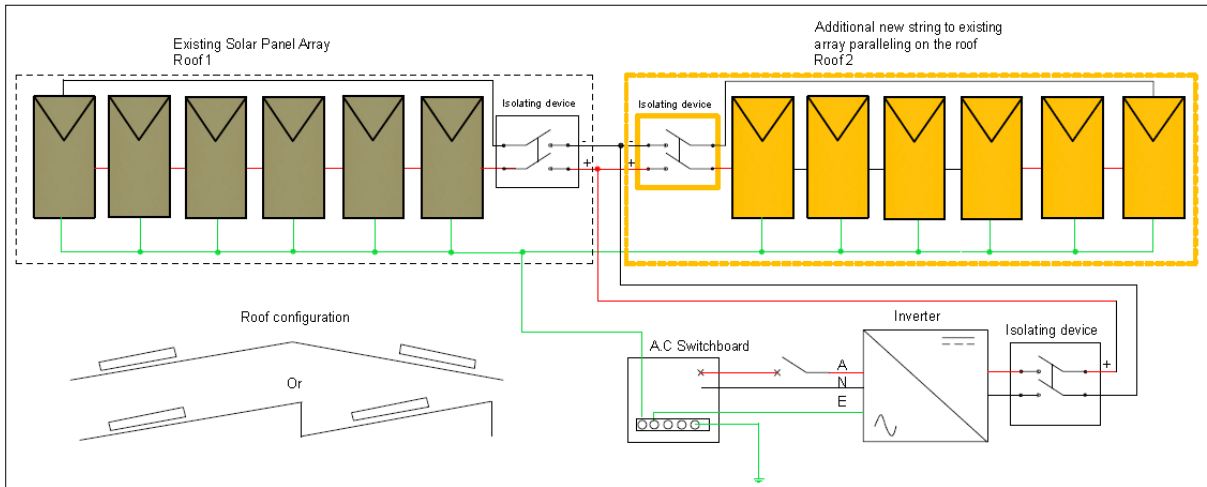
The original array configured with 10 panels in series, the alteration consists of installing an additional 2 new panels in the series but the configuration of the array is to be in 2 strings of 6.



If the isolating devices do not have the current carrying capacity, they must be upgraded to comply with current standards and requirements.

SCENARIO 3

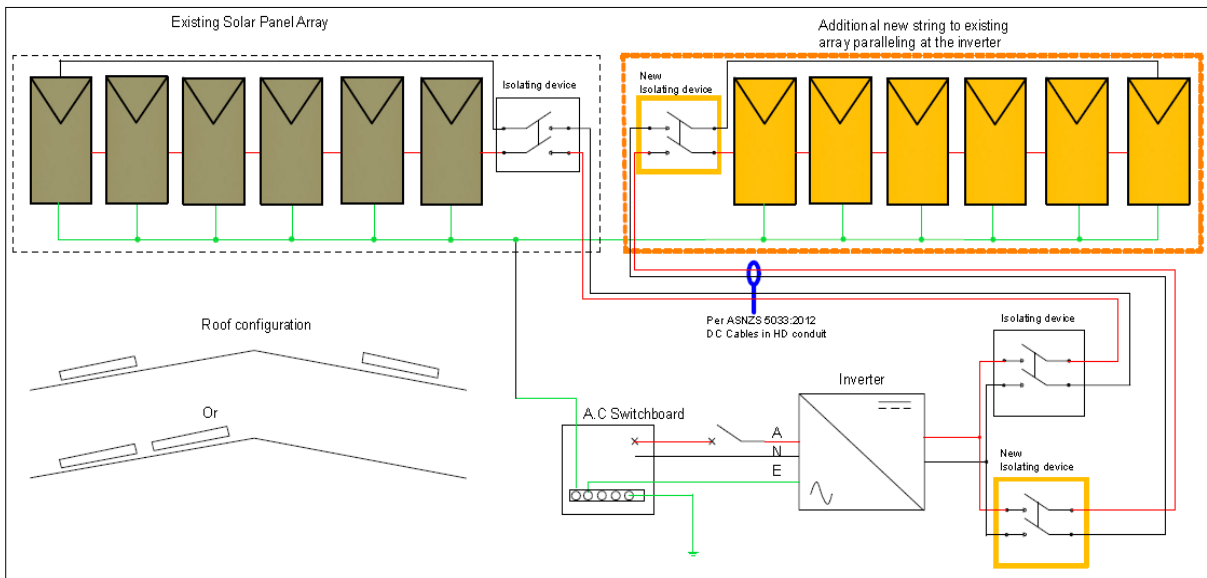
Adding a new string to an existing array, paralleling on the roof (separate roofs)



A roof top isolator is required to be installed on the new string and the string wiring must comply with *AS/NZS 5033:2012 – Installation and safety requirements for photovoltaic (PV) arrays*. Where the DC cables are installed within a structure (such as a roof space) to minimise the risks of DC arcs occurring between conductors, double insulation between positive and negative conductors shall be maintained within heavy duty (HD) enclosures where installed within a structure. In locations where it can reasonably be expected that cables are subject to mechanical damage, the protection method of *AS/NZS 3000:2007, Wiring Rules Cause 3.9.4.4 (a) & (b)* must be used, eg. cables installed in an accessible roof space or cable enclosed in walls.

SCENARIO 4

Adding a new string to an existing string, paralleling at the inverter



The new string must comply with *AS/NZS 5033:2012 – Installation and safety requirements for photovoltaic (PV) arrays*. The existing string can remain provided the original installation complied with the minimum requirements of the Standard applicable at the time of installation.

FREQUENTLY ASKED QUESTIONS

INVERTER REPLACEMENT

Equivalent inverter:

Question	Answer
Where the characteristics of the inverter are not changed (Eg. a transformerless inverter is replaced with a transformerless inverter) is it considered an equivalent replacement?	It would only be considered equivalent if the inverter is replaced with the same make and model.
If a defective inverter is replaced with an equivalent inverter and the array does not comply with AS/NZS 5033:2012, would I need to upgrade it to the current edition?	No

Different inverter:

Question	Answer
When replacing a defective inverter with an inverter with the same characteristics but has a higher DC power output and the array remains unchanged, is this considered an alteration?	Yes
Where the characteristics of the inverter are changed (Eg. a transformer inverter is replaced with a transformerless inverter) and the array does not comply with AS/NZS 5033:2012, do I need to upgrade the array?	Yes. The items to be checked and changed, if required, is the earthing system for compliance with AS/NZS 5033:2012, and if the isolators are identified as being non-compliant.

Isolators:

Question	Answer
Would a roof top isolator be required if not previously installed?	Yes

Replacement of panels:

Question	Answer
If a faulty 175W panel is replaced with a 180W panel of the same make and series. Does the replacement of just that one panel require the panel/string to be upgraded to comply with AS/NZS 5033:2012?	If the manufacturer deems the replacement panel an equivalent panel – No. or If the array is altered as part of the replacement of the faulty panel or if the manufacturer deems the replacement panel as not an equivalent panel – Yes.

REMOVAL & REINSTALLATION OF PANELS

Re-fit in same location:

Question	Answer
If a solar system has been installed and connected to the grid, and the customer wants the panels removed from the roof to allow for the roof to be replaced then have the system re-installed in the same location, can I re-install the same parts?	<p>Yes. Where the array and cabling is not changed or modified and provided the original installation of the array and cables complied with the minimum requirements of the Standard applicable at the time of installation, the array, frame and cables can be reinstalled.</p> <p>Exception: Isolating switches that are polarised circuit breakers or rated for AC voltage only, shall be replaced.</p>

Re-fit in different location:

Question	Answer
If the solar system has been installed and is connected to the grid, and the customer wants the panels removed for an extension to be built and then the panels re-installed on the new extension, can I re-install the existing wiring and panels under the Standard applicable at the time of installation with the extended wiring compliant to AS/NZS 5033:2012, or is the whole re-installation considered a new installation?	The whole replacement is considered a new installation and all the requirements of the relevant current standards apply.



Installation of DC cables:

Question	Answer
Can I install DC sub-array cable within a roof space of a building where the arrays are located on different sections of the roof?	<p>Yes, DC cables must be installed compliant with section 3 of AS/NZS 3000:2007 'Selection and Installation of Wiring Systems'.</p> <p>To minimise the risks of DC arcs occurring between conductors, double insulation between positive and negative conductors shall be maintained within heavy duty (HD) enclosures where installed within a structure. In locations where it can reasonably be expected that cables are subject to mechanical damage, the protection method of AS/NZS 3000:2007 Cause 3.9.4.4 (a) & (b) must be used, eg. cables installed in an accessible roof space or cable enclosed in walls.</p>
When installing solar roof tiles, can I install the isolating switch on the fascia board?	Yes, where DC cables are installed within a structure (such as a roof space) and are not controlled by an isolating device, the protection method of Cause 3.9.4.4 (a) & (b) of AS/NZS 3000:2007 must be used.

Solar boosted equipment:

Question	Answer
Is the DC supply from the solar panels for a solar boosted air conditioning (A/C) unit required to be controlled through the main switchboard or can it be connected directly to the A/C unit?	<p>The DC supply from the solar array can be connected directly to the A/C unit providing:</p> <ul style="list-style-type: none"> • The DC supply has an isolating switch installed at the origin of the circuit • The DC cable is enclosed in HD conduit within a structure and enclosed in conduit elsewhere • Be protected against UV where conduits are exposed to direct sunlight • There is an isolating switch installed adjacent to the compressor unit beside the AC isolating switch • The DC supply cannot be converted to AC and then fed back into the general installation • Signage installed at the switchboard is displayed stating that a solar generating system supplying the A/C system exists • Signage is installed at the A/C unit stating it has a dual supply.
Is the DC section of the solar boosted A/C unit considered 'prescribed electrical installation work'?	Yes, all of the DC installation is prescribed electrical installation work and is required to be inspected by an LEI before the solar installation is used.
Is the DC supply from solar panels for a solar boosted hot water service (HWS) required to be controlled through the main switchboard or can it be connected directly to the HWS?	<p>The DC supply from the solar array can be directly connected to the HWS providing:</p> <ul style="list-style-type: none"> • The DC supply has an isolating switch installed at the origin of the circuit • The DC cable is enclosed in HD conduit within a structure and enclosed in conduit elsewhere • Be protected against UV where conduits are exposed to direct sunlight • The installation of an isolating switch adjacent the HWS controlling the AC supply • An isolating switch controlling the DC supply installed adjacent to the HWS beside the AC isolating switch • The DC supply cannot be converted to AC and then fed back into the general installation • Signage installed at the switchboard is displayed stating that a solar generating system supplying the HWS exists • Signage is installed at the HWS unit stating it has a dual supply. <p>The DC section of the installation is also considered prescribed electrical installation work and shall be inspected by an LEI before the solar installation is used.</p>

Roof penetrations:

Question	Answer
<p>Does installing DC cable enclosed in conduit between tiles instead of using a proper seal comply?</p> 	<p>No. Roof penetrations shall be made using an approved method such as a deck tie or similar approved device. Grinding out a section of tile to create a passage for the conduit is not an approved method.</p> 

Solar systems that generate above 600 Volts:

Question	Answer
<p>Is the roof of a factory considered an area with restricted access?</p>	<p>The roof of a factory may be considered a restricted area depending on the access to the roof and other equipment being installed on the roof that requires servicing (eg. A/C equipment, ventilation fans). If other equipment is installed on the roof you may need to segregate the solar from the other equipment to restrict access. Reference Clause 1.4.61 of AS/NZS 5033:2012 defines restricted access as: <i>'access restricted to authorised persons only eg. by a perimeter fence or barrier with access only via a padlocked or equivalently secured gate or door'</i>.</p>
<p>Can I install a solar system that generates voltages greater than 600 Volts DC on the roof of a residential home?</p>	<p>PV arrays for installation on domestic dwellings shall not be able to generate voltages greater than 600 Volts.</p>