GC CASE STUDY APPLICATION PACK

CLEAN ENERGY COUNCIL
ACCREDITED INSTALLER

Introduction

A case study is a representation of your best work, so please pay particular attention to the quality of your installation:

- Are you using best practice methods?
- Have you included the right photographs, and are they clear?

Case Study Checklist

Assessment date: _____ *Installer to fill in green section* ☑

Note: Failure to supply any information listed below may result in rejection of the case study. A new case study application will incur additional fees.

No.	Item description	Installer	Assessor	Assessor's comments
D-01	Application form			
D-02	Electrical license / name matched / Date			
D-03	Insurance certificate / current			
D-04	Installation, testing and commissioning – fully completed			
D-05	Wiring diagram / components listed – fully completed			
D-06	System Performance Estimate – ANNUAL, BEST & WORST Kwh			
D-07	Engineering Cert for Frame/Rail System			
D-08	Mounting system – Rail foot spacing form			
P-01	ID photograph			
P-02	Solar array on roof – General view			
P-03	Roof fixing brackets / fixing of rails to roof			
P-04	Module earthing device			
P-05	Rail earthing device			
P-06	Rail joiner / splice kit – earthing rail to rail			
P-07	DC isolator / string fusing - internal			
P-08	Roof penetration - main cable entry point			
P-09	DC cable ID / protection & reticulation			
P-10	Panel cabling - under module secured			
P-11	Inverter & isolators – broad view			
P-12	DC isolators (main) – internal wiring			
P-13	MSB / upstream switchboard / meter panel			
L-01	'Warning–Dual Supply' label			
L-02	'Normal Supply Main Switch' label			
L-03	'Solar Supply Main Switch' label			
L-04	'Warning–Dual Supply-DB' label			
L-05	'Inverter Location' label (if required)			
L-06	'Warning Hazardous Dc Voltage' (J-box)			
L-07	'PV' label & 'Solar Array on….Voc…..Isc….'			
L-08	'PV Array DC Isolator' label			
L-09	'Warning–Multiple DC Sources' label			
L-10	'SOLAR' marked on conduit			
L-11	'Shutdown Procedure' label			
L-12	'Warning This premise contains…' (Required in Victoria)			
AC-01	AC isolator meets Max Inverter Output Current?			
DC-01	DC isolator rating meets Vmax at Isc x 1.25 requirements?			
DC-02	DC isolator appears to be wired correctly?			
GAL-01	Galvanic isolation sighted/evidence?			

Accreditation Application

(Please ensure all entries are legible)

Name: .....

Business Name: .....

Address: .....

State: ..... Postcode: .....

Work phone: ..... Work fax: ..... Mobile: .....

Email: .....

1. Accreditation Upgrade

I hereby apply for Upgrade of Full Accreditation.

Accreditation type (please tick at least one):

☐ SPS PV Design only

☐ SPS PV Install only

☐ SPS PV Design and Install

☐ GP PV Design only

☐ GC PV Install only

☐ GC PV Design and Install

Licensed Electrician No: ……
(legible photocopy attached)

Note: Upgrade to full accreditation is required within three months of provisional award date. Extensions up to a maximum of three months may be available on application.

2. Payment (refer to attached Clean Energy Council Accreditation fees and charges)

☐ My cheque is attached (payable to Clean Energy Council) Amount $ .....

☐ Payment by credit card (surcharges will apply): ☐ Amex ☐ MasterCard ☐ Visa

Card number: ...../...../...../..... Expiry Date: ..... Amount $ .....

Name on card: ..... Signature: .....

The accreditation fee will be refunded (less a processing charge) if the application is unsuccessful. If your accreditation expires prior to this application, you must apply for an extension in advance.

3. Insurance (please attach copy of your Certificate of Currency)

Current public liability insurance is held with:.....

Policy number: ……..... Policy value: $ ……..

4. Declaration (Confirm each item by ticking the checkbox, then complete and sign the declaration)

I represent and warrant that:

☐ All information contained in and attached to this form is correct and not misleading by inclusion or omission.

☐ I have read the Clean Energy Council Terms and Conditions (attached) and the Clean Energy Council Code of Conduct (attached) and agree to be bound by those Terms and Conditions and the Code of Conduct upon signature of this form.

☐ I understand that acceptance of my application is at the discretion of the Clean Energy Council and I agree to abide by any rule the Clean Energy Council may make with respect to Accreditation.

Application signed: .....

Date: .....

Please return application to:
Clean Energy Council
Level 15, 222 Exhibition Street
Melbourne
VIC 3000

Phone: 03 9929 4141
Email: accreditation@cleanenergycouncil.org.au

Your name, address and contact details will be published by the Clean Energy Council on its website and sent to the state agencies for the purpose of identifying you as an Accredited Installer of renewable energy systems. For further information about our use of your personal information and your right of access to it, please contact accreditation@cleanenergycouncil.org.au.

Instructions

The case study submission can only be made from a provisionally accredited person or fully accredited person seeking points as part of the CPD program.

If you are applying for a Design Only, Design & Supervise or Design & Install accreditation then your name is the only name that can be present on the circuit design drawings and performance estimate forms. Design forms and/or drawings designed by others will not be accepted.

If you are applying for any type of 'Install' accreditation you must be the person who undertook the installation (you cannot sub-contract to others). Therefore your name shall be the one appearing on all relevant documentation including Installation & Commissioning Sheets.

The installation must have taken place during your period of accreditation. Work that was carried out prior to accreditation being granted will not be accepted.

All photographs, design information and installation & commissioning sheets must be from the same installation. Multiple installation pictures will render the case study void and a new case study will be required.

Please note: The Clean Energy Council has a 5 MB limit on incoming emails. You may need to resize your images if you are submitting them via email.

Case study assessment ratings

Competent: An applicant will be deemed competent when the assessor is satisfied that there is sufficient evidence that the installation has been conducted to all current and relevant standards and guidelines and that supporting evidence has been sighted as evidence of this compliance.

Not yet Competent: An applicant will be deemed not yet competent when the assessor is not satisfied that there is sufficient evidence that the installation has been conducted to all current and relevant standards and guidelines and that insufficient supporting evidence has been sighted as evidence of this compliance.

Failed: An applicant will be deemed failed/rejected in the following circumstances:

- The applicant has repeatedly failed to submit the required information to the Clean Energy Council's accreditation administration department.
- The applicant has not submitted the correct information to the technical assessor within the allocated time. The assessor will only request this information once, and failure to provide the correct technical information will result in the application being rejected. A fail result will require the applicant to make a new submission and additional charges will apply.

- The Assessor deems that the evidence provided shows a PV installation that may be mechanically or electrically un-safe and may cause physical harm to people or property.
- The applicant has submitted a false electrical license or is not licensed to carry out the work.
- The applicant has not met the minimal training standard / completed the necessary training units as required to make the CS application.
- The assessor deems that the PV installation is in clear breach of AS/NZS 3000 wiring rules.

Supporting documents

D-02 Electrical License

Please submit a clear copy (both front & back sides) of your current electrical workers license.

D-03 Insurance Certificate

Please submit a clear copy of your current Public Liability Insurance certificate (minimum $5 million insurance cover).

P-01 Installer photo for ID card

For the photo to be valid it must:

- show you with a neutral expression and mouth closed
- show you looking directly at the camera
- have a plain, light-coloured background (e.g. white, cream or pale blue).

D-04 Installation and commissioning

1. General

Warning: Where short circuit currents are required, follow AS/NZS 5033 Appendix D for the steps that shall be undertaken to measure the short circuit current safely.

Note: Some projects require that short circuit currents are recorded as part of the contractual commissioning; otherwise a record of the actual operating current of each string is sufficient. This could be done by using the meter on the inverter or by using a clamp meter when the system is operational.

2. Insulation resistance measurement

Warning: PV array DC circuits are live during daylight and, unlike a conventional AC circuit, cannot be isolated before performing this test.

Follow AS/NZS 5033 Appendix D4 for the steps that shall be undertaken to measure the insulation resistance safely.

3. Installation and commissioning sample

Installation details		
Address of installation:		
PV module manufacturer and model number:		
Number of modules in series in a string:	Number of strings in parallel in PV array:	
Inverter manufacturer and model number:		
Number of inverters:	Number of MPPTs:	
PV array		
☐ PV array tilt ……°	☐ PV array orientation ……°	
☐ Array frame is certified to AS1170.2 for installation	☐ Array frame is installed to manufacturer's instructions	
☐ No galvanically dissimilar metals are in contact with	☐ Roof penetrations are suitably sealed and weatherproofed	
☐ PV wiring losses are less than 3%at the maximum	☐ Where PV array comprises multiple strings-string protection has been provided	
☐ Wiring is protected from mechanical damage and is appropriately supported	☐ Weatherproof PV array isolator mounted adjacent to the array (Rating:……Vdc, ……Adc)	

LV DC and AC installation	
☐ All low voltage wiring has been installed by a licensed electrical tradesperson	☐ All wiring has been tested and approved
Inverter	
☐ PV array isolator mounted adjacent to the inverter (Rating:…….. Vdc, ……..Adc)	☐ Isolator is mounted on output of the inverter (where required)
☐ Lockable AC circuit breaker mounted within the switchboard to act as the inverter main switch for the PV/inverter system (Rating …….. A)	☐ Inverter is installed as per manufacturer's specification
☐ Inverter ceases supplying power within two seconds of a loss of AC mains	☐ Inverter does not resume supplying power until mains have been present for more than 60 seconds.

Continuity check
Circuit checked (record a description of the circuit checked in this column)
Continuity of all string, sub-array and array cables
Continuity of all earth connections (including module frame)

System check
Warning:

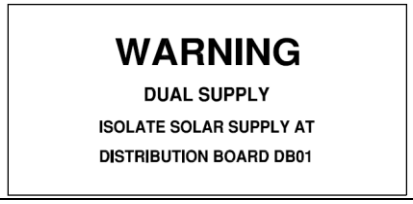
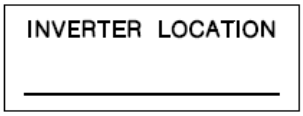
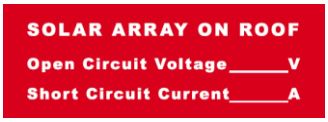
- If a string is reversed and connected to others, **fire may result**.
- If polarity is reversed at the inverter, **damage may occur to the inverter**.

	Polarity	Voltage	Short Circuit	Operating Current
String 1		V	A	A
String 2		V	A	A
String 3		V	A	A
String 4		V	A	A
Sub-arrays where required		V	A	A
PV array at PV array switch-disconnector		V	A	A
Irradiance at time of recording the current			W/m2	W/m2

Insulation resistance measurements (see table 1 below for minimum values)	
Array positive to earth	MΩ
Array negative to earth	MΩ

Installer information	
CEC Accredited installer's name:	
CEC Accreditation number:	
I verify that the above system has been installed to all relevant standards	
Signed:	Date:

CEC Accredited Designer's name:		
Licensed electrician's name: (where applicable, e.g. LV work)		
Electrician's licence number:		
Signed:		Date:

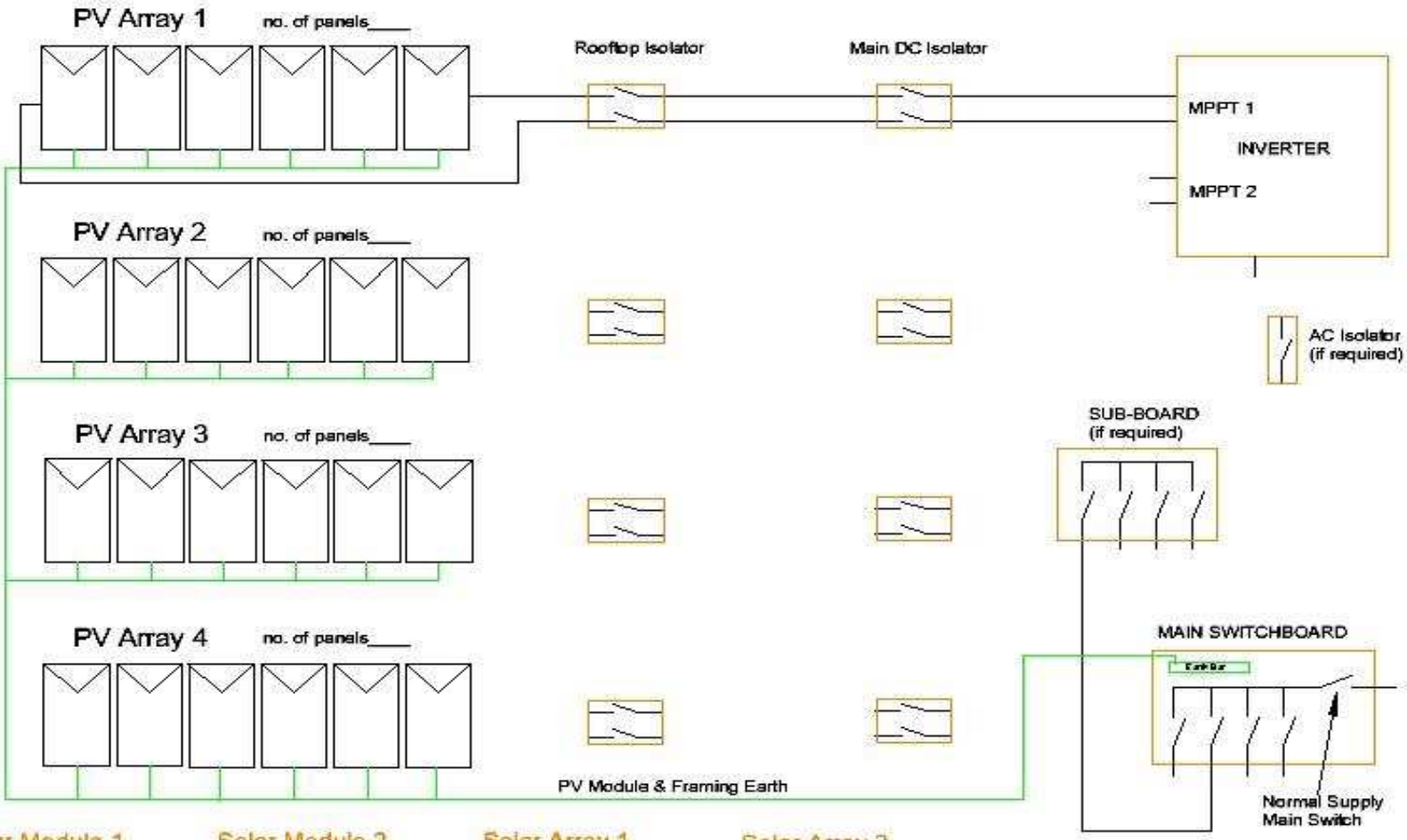
Signage (AS 4777)	
	☐ On switchboard to which inverter is directly connected.
	☐ Is permanently fixed at the main switch.
	☐ Is permanently fixed at the solar main switch.
	☐ If the solar system is connected to a distribution board then this sign is located on main switchboard and all intermediate distribution boards.
	☐ Where the inverter is not adjacent to the main switchboard, location information is provided
Signage (AS/NZS 5033)	
	☐ Is permanently fixed on array junction boxes (black on yellow)
 	☐ Fire emergency information is permanently fixed on the main switchboard and/or meter box (if not installed together)
	☐ PV DC isolation is clearly identified

	☐ Is placed adjacent to the inverter when multiple isolation/disconnection devices are used that are not ganged together
SOLAR	☐ Exterior surface of wiring enclosures labelled 'SOLAR'
	☐ Shutdown procedure is permanently fixed at inverter and/or on main switchboard
	☐ Any other signage as required by the local electricity distributor

Table 1: Minimum insulation resistance

System voltage ($V_{oc\,stc}$ × 1.25)	Test voltage	Minimum insulation resistance, MΩ
<120	250	0.5
120–500	500	1
>500	1000	1

D-05 - Please draw your circuit



SYSTEM SIZE:	kW
INVERTER	
Model:	
Max Vdc:	
MPPT Range:	
Max output AC amps:	
No. of MPPT's	
ROOFTOP ISOLATOR	
Make:	
Model:	
Rating amps:	
Rating volts:	
MAIN DC ISOLATOR	
Make:	
Model:	
Rating amps:	
Rating volts:	
AC ISOLATOR	
Make:	
Model:	
Rating amps:	
SOLAR SUPPLY MAIN SWITCH	
Make:	
Model:	
Rating amps:	
MOUNTING FRAME	
Make:	
Model:	
Main PV Cable	
Type:	
Size:	mm^2
PV Module & Framing Earth	
Size:	mm^2

Solar Module 1	Solar Module 2	Solar Array 1	Solar Array 2	
Model	Model	Voc	Voc	Installation address:
Power	Power	Voc-max	Voc-max	Installation date:
Voc	Voc	Vmp	Vmp	Installer:
Vmp	Vmp	Isc	Isc	Designer:
Isc	Isc			Reg Electrician:

CLEAN ENERGY COUNCIL ACCREDITED INSTALLER

D-06 System Performance Estimate

Under the CEC design guidelines, the designer has many responsibilities and one of the main responsibilities is in providing:

"A site specific full system design including all shading issues, orientation and tilt, along with the system's site specific energy yield, including average daily performance estimate in kWh for each month of solar generation."

And to: *"Ensure array configuration is compatible with the inverter specification."*

Sources: You can use the detailed formulae available from the CEC design guidelines to help with these design calculations. Alternatively you may use the free online CEC Performance Calculator by logging into the installer section at www.solaraccreditation.com.au.

There are many commercial tools available to assist in calculating energy yield, for example: PV-GC, SunEye, PVSyst, Solar Pathfinder, PV Watts, SolarPlus, etc. Some of these make an allowance for shading.

Please note that many inverter manufacturers' software will not provide sufficient detail in terms of monthly generation figures.

Install-only applicants: please obtain the above information from your system designer.

Estimated Performance - 8 Jan 2014

CLEAN ENERGY COUNCIL ACCREDITED INSTALLER

Installation Details

123 Example Street
Melbourne
VIC 3000
Designer name — Accredited Installer

Azimuth/Orientation	0
Tilt	20
Min panels per string	4
Max panels per string	9
Minimum DC Voltage	28.40 Volts
Maximum DC Voltage	48.88 Volts
System size	2960 W

Estimated Performance

* Average soil de-rating of 5% applied.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
PSH for Melbourne at tilt 20 and azimuth / orientation 0	7.33	6.89	5.97	4.67	3.64	3.19	3.47	4.19	5.03	6.19	6.98	7.22	5.39
Estimated Daily kWh production	15.74	14.79	12.96	10.34	8.22	7.32	7.99	9.57	11.33	13.77	15.05	15.85	11.89
Percentage of full sun	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Estimated Daily kWh production taking shading and all de-rating factors in to account	14.95	14.05	12.32	9.82	7.81	6.96	7.59	9.09	10.77	13.08	14.30	14.97	11.30

VERSION: Version 1 - 2012.

DECLARATION: These guidelines have been developed by Clean Energy Council. While all care has been taken to ensure this estimator is free from omission and error, no responsibility can be taken for the use of this information in the design/installation of any grid-connected power system.

An example of acceptable data from the CEC Performance Estimator

D-07 Engineering Certificate for the PV mounting frame system

Please enclose a copy of the Engineering Certificate for the PV frame mounting system that you have used in this installation. This will be available from your frame manufacturer or supplier.

Please note:

- An installation manual is not an engineering certificate
- A TUV Certificate is not an engineering certificate.

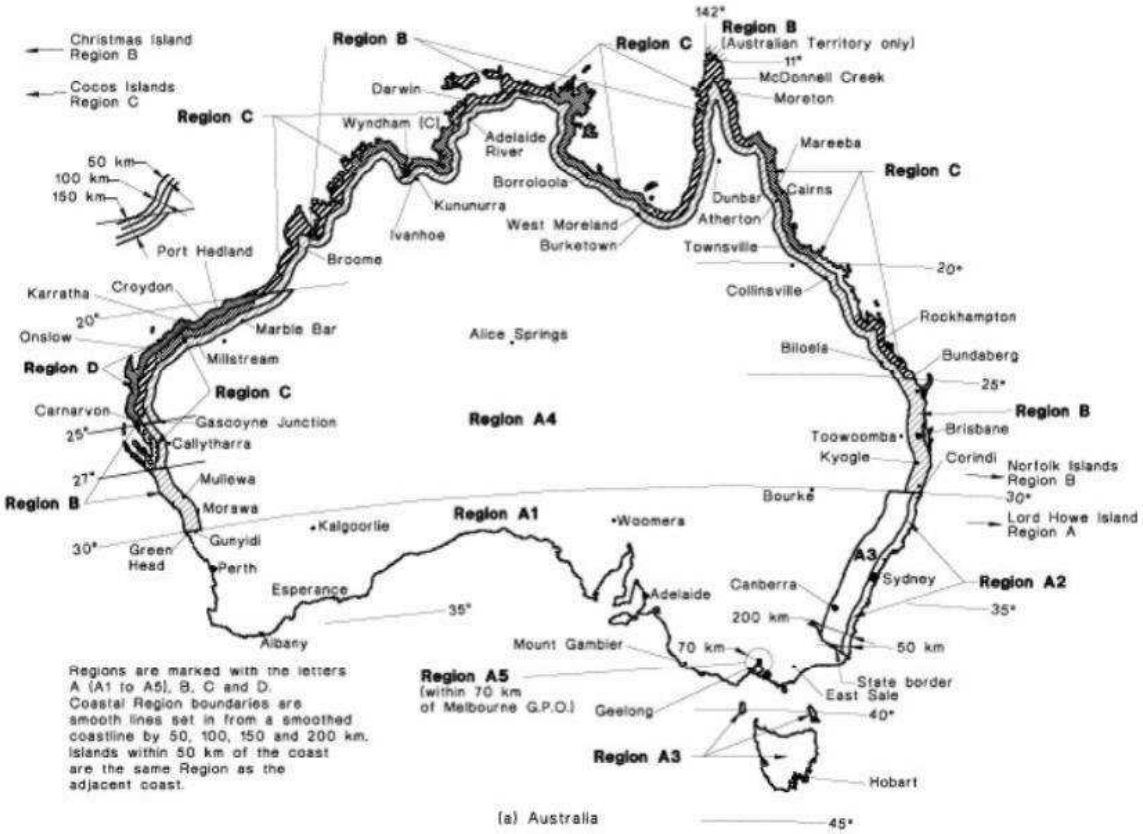
As a minimum, the Engineering Certificate should include:

- Engineering Company Name & Business details
- Brand / Model number of the frame tested
- Identification of Geographical region of testing
- Reference Standards associated with the certificate (AS/NZS 1170.2)
- Name of Engineer and ID number who certified the equipment.

D-08 Mounting system installation details

Please give details for this installation:

Wind region (see map)	
Actual max. distance between your brackets/rail feet	



Examples of installation photographs required

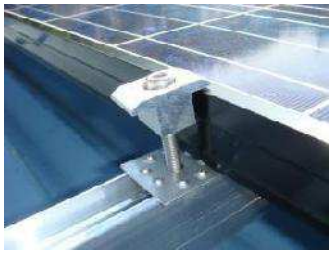
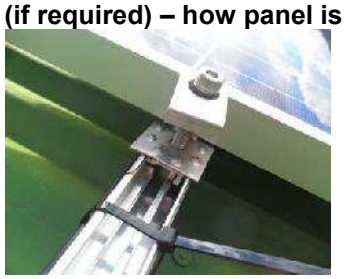
P-02: Solar array on roof



P-03: Roof fixing brackets securing rails in position / fixing of brackets to roof.

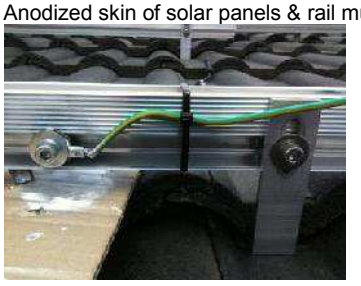


P-04: Solar module earthing device (if required) – how panel is earthed to rail


P-05: Solar module earthing device (if required) – how earth cable is secured (note Gal Spray)

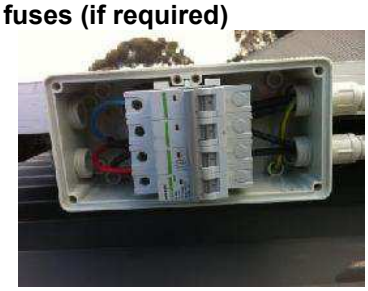
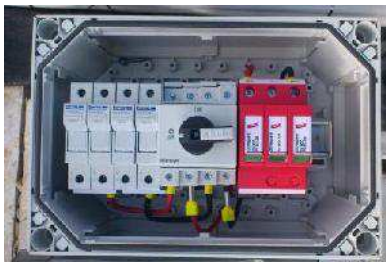
Anodized skin of solar panels & rail must be pierced with Earthing Device



P-06: Rail joiner / Splice kit (showing continuity between segments)

Anodized skin of rail must be pierced with Earthing Device


P-07: Rooftop isolator and string fuses (if required)

P-08: Roof penetration (main cable entry point from array)



P-09: DC cable identification, mechanical protection and reticulation



P-10: Under-module cabling / cables secured from damage



On the ground

P-11: Inverter and isolators installed (broad view)

P-12: Close-up: DC isolator internal view (showing wiring)

P-13: Main switchboard / meter panel and upstream switchboard labeling
(One or more pictures to cover all labels below)

Examples of required labels

L-001: on switchboard to which inverter is directly connected

WARNING
DUAL SUPPLY
ISOLATE BOTH NORMAL AND SOLAR SUPPLIES BEFORE WORKING ON THIS SWITCHBOARD

L-002: permanently fixed at the main switch

NORMAL SUPPLY MAIN SWITCH

L-003: permanently fixed at the solar main switch

SOLAR SUPPLY MAIN SWITCH

L-004: located on main switchboard and all intermediate distribution boards if solar system is connected to a distribution board

WARNING
DUAL SUPPLY
ISOLATE SOLAR SUPPLY AT DISTRIBUTION BOARD

L-005: location information is provided where the inverter is not adjacent to the main switchboard.

INVERTER LOCATION

L-006: permanently fixed on array junction boxes (black on yellow).

WARNING
HAZARDOUS D.C. VOLTAGE

L-007: Fire emergency information permanently fixed to the main switchboard and/or meter box (if not installed together)

PV

SOLAR ARRAY ON ROOF
Open Circuit Voltage_____V
Short Circuit Current_____A

L-008: PV DC isolation is clearly identified

PV ARRAY
D.C. ISOLATOR

L-009: Placed adjacent to inverter when multiple isolation/disconnection devices are used that are not ganged together

L-010: Exterior surface of wiring enclosures labelled 'SOLAR'

SOLAR

L-011: Any other signage required by local distributor

Shutdown procedure is permanently fixed at the inverter and/or on main switchboard

L-012: Required in Victoria on MSB

Warning: this premise contains...

Supporting documentation and helpful links

Links

- Accredited Installer resources: www.solaraccreditation.com.au
- Bureau of Meteorology: www.bom.gov.au

Relevant standards

Some aspects of these standards are relevant to grid-connected PV systems:

- AS/NZS 3000: Wiring rules
- AS/NZS 1768: Lightning protection
- AS 3595: Energy management programs
- AS/NZS 4509: Stand-alone power systems, Issue 5, December 2011, page 2
- AS/NZS 3008: Selection of cables
- AS/NZS 1170.2: Wind loads
- AS/NZS 5033: 2012
- AS/NZS 4777.1: Grid connection of energy systems via inverters