

Working safely when installing photovoltaic (PV) systems

Guideline

December 2018

Energy Safe Victoria (ESV) is the state energy safety regulator for gas, electricity and pipelines in Victoria. Part of our role is to ensure electrical workers isolate, take appropriate measures and work safely when installing electrical equipment and electrical installations.

WorkSafe Victoria is the state's occupational health and safety regulator. Our role is to prevent workplace injuries, illness and fatalities, and to enforce Victoria's occupational health and safety legislation. Recent incidents in the solar industry have given ESV and WorkSafe cause for concern about safe working practices when installing photovoltaic (PV) systems.

This guideline has been developed to provide business operators, managers, supervisors, employers and self-employed people with information about how to work safely, and control the risk of injuries or fatalities during solar installation and connection work.

Employer's responsibility

Employers, such as Registered Electrical Contractors (REC), must, so far as is reasonably practicable, provide and maintain a working environment for their employees that is safe and without risks to health.

Employees should be inducted into a well-developed safety management plan. A risk assessment process needs to be followed for each task, at the start of each day and task change.

A safe work method statement (SWMS) is required for undertaking high-risk construction work, which must be followed. The Victorian Occupational Health and Safety Regulations 2017 state that the following construction work is 'high-risk construction work':

- where a person has a risk of falling more than 2 metres; and
- on or near energised electrical installations or services.

When an employer is developing a SWMS, the duty to consult with employees under Victorian Occupational Health and Safety Act 2004 will apply.

Employers must provide information, instruction, training or supervision to employees as is necessary to enable them to work safely and without risks to health. This includes ensuring employees are appropriately trained in working at heights, working in ceilings spaces, installing and commissioning PV array systems, and installing and commissioning energy storage (battery) systems. Employees should only perform work that they are qualified and competent to do.

Employers must ensure that only employees who are licensed electrical installation workers carry out electrical installation work. Installation and maintenance of any of the following is electrical installation work and is required to be carried out by licensed electrical workers:

- PV systems
- Electrical equipment (including grid and stand-alone power systems)
- Associated wiring systems which operate or are intended to operate at a voltage greater than extra low voltage (ELV) – (not exceeding 50V a.c. or 120V ripple-free d.c.).

A person who is not a licensed electrical installation worker is only authorised to locate, mount or fix in place individual items of ELV electrical equipment. They cannot make or terminate electrical connections to

individual items of ELV electrical equipment, or install supply conductors that will connect the equipment to an electricity supply greater than ELV.

Self-employed people

A self-employed person must ensure, so far as is reasonably practicable, that other people, such as workers on the site, are not exposed to risks to their health or safety arising from the conduct of the self-employed person.

Risk of electric shock and risk assessment

The electrical risk associated with making incorrect connections, such as with panel to panel connectors, may result in serious shock or injury, or significant property damage.

Working at heights and near electricity, such as on roofs or in ceiling spaces, presents major risks to workers.

There is a serious risk of electric shock from exposed conductive parts such as guttering, roof sheeting or metal battens, as these could be live if there is a fault with the electrical installation.

Before starting any work, turn off and isolate - lock out and tag out (LOTO) - all electricity being supplied to the property at the main switchboard, and take steps to prevent the electricity from being turned back on while work is in progress. Ensure the correct personal protective equipment (PPE) is worn and that electrical equipment is safe to approach. Refer to AS/NZS 4836 *Safe working on or near low voltage electrical installations and equipment* for more information about LOTO and taking adequate precautions.

It is important to ensure someone is aware that you will be entering the ceiling and contact is maintained until the work is completed.

Complete a pre-work risk assessment of the roof cavity by looking around the ceiling space to identify other hazards that may pose risks, such as excessive heat, lack of ventilation or lighting, dangerous vermin, sharp objects or asbestos-containing materials.

Even with the power off, avoid contact with electrical cables and equipment, as some cables - such as consumer service lines and solar PV systems (which have DC supply cables) - may still be live. Any damaged electrical cables or equipment identified will need to be repaired by a licensed electrical installation worker. A risk assessment may also require these supplies to be isolated, including taking steps to guard against accidental re-energisation (LOTO).

Risk of fall from heights

Working on a roof or inside a roof is a hazardous task and fall prevention measures need to be used. Many injuries and deaths are caused by people falling either from a roof, through a roof, through an opening in a roof or while accessing a roof.

Fall risks typically associated with solar panel installation on residential premises can occur at each stage of accessing and working on a roof. Each stage of work has a number of risk control recommendations:

1. Fall risks while accessing or getting down from a roof

- Can the roof be accessed via a portable scaffold access system?
- If that is not reasonably practicable, use an 'industrial rated' ladder which:
 - extends at least 900mm above the step-off point, and
 - is installed at an appropriate angle (i.e. 4:1), and
 - is secured at the top and bottom.

Note: Ladders should not be used where large, heavy or bulky items need to be installed or removed. For example, lifting solar panels and components onto a roof.

2. Fall risks while working at a roof edge

- Can a proprietary guardrail system be installed to roof edges?
- If that is not reasonably practicable, use a work positioning system (roofer's kit) that:
 - complies with Australian Standards, and
 - is installed and maintained according to the manufacturer's instructions, and
 - prevents a person from reaching a position that would allow them to fall from the roof edge.

Note: Only suitably competent people who have undertaken accredited training should use a work positioning system.

3. Fall risks through fragile roof surfaces

- Can a proprietary guardrail system be installed to the edges of skylights, polycarbonate sheets or fragile roof areas, to prevent access to these areas?
- If that is not reasonably practicable, install a solid structure of appropriate rated capacity, for example a mobile platform scaffold, immediately below the fragile surface.
- If that is not reasonably practicable, use a work positioning system (consistent with item 2b above).

Risk of stored energy (batteries)

Energy storage systems (batteries) for homes or small commercial buildings are a serious safety risk if incorrectly installed.

Battery cells have the potential to deliver a severe electrical shock when interconnected as battery banks, reaching hazardous voltage levels. There will also be 230V a.c. rated parts or other components, such as chargers or inverters, that have hazardous voltages.

To install a system, you and your employees must be competent, use safe work practices and comply with relevant occupational health and safety legislation and electricity safety legislation. The installation must also comply with the Wiring Rules (see AS/NZS 3000), other relevant standards and the manufacturer's guideline and instructions.

In addition, you will need to pass on information to your customer so they can continue to maintain a safe energy storage system and be able to shut it down safely.

Different battery technologies and chemistries have different performance capabilities, and different requirements for installation, operation and maintenance. You will need to be aware of the hazards of the technology, and know how to safely handle (including transporting), install and operate the system. Hazards can result from overheating, electrical abuse (over/under –charging), mechanical damage or exposure to hazardous chemicals.

Risk of heat-related illness

Heat-related illness occurs when the body cannot sufficiently cool itself. Factors that contribute to this include:

- temperature and humidity
- amount of air movement
- radiant temperature of surroundings
- clothing
- physical activity (metabolic heat load).

Heat-related illness covers a range of medical conditions that can arise when the body is unable to properly cope with working in heat. The Occupational Health and Safety Act 2004 applies to controlling the risks associated with heat-related illness to employees.

For health advice about working safely in the heat refer to the Better Health Channel website and WorkSafe Victoria website for resources.

Further information

EnergySafe Victoria

For information on electricity safety contact Energy Safe Victoria on 1800 800 158 or go to esv.vic.gov.au

- **Your Responsibilities as a Licensed and Registered Electrician -**
www.esv.vic.gov.au/licensing-coes/electrical-licences/your-responsibilities
- **Requirements for the effective supervision of apprentice electricians -**
www.esv.vic.gov.au/technical-information/electrical-installations-and-infrastructure/electrical-technical-guidelines-and-determinations/requirements-for-the-effective-supervision-of-apprentice-electricians
- **Who can work on large-scale solar farms?**
www.esv.vic.gov.au/technical-information/electrical-installations-and-infrastructure/electrical-technical-guidelines-and-determinations/who-can-work-on-large-scale-solar-farms

For information on occupational health and safety, contact the WorkSafe Victoria Advisory Service on 1800 136 089 or go to worksafe.vic.gov.au

WorkSafe

Go to worksafe.vic.gov.au for the following publications:

- Alert – Fatal fall while installing solar panels
- Compliance code – Prevention of falls in general construction
- Compliance code – Prevention of falls in housing construction
- Construction safety focus – Prevention of falls
- Controlling OHS hazards and risks: A handbook for workplaces
- Hazardous manual handling: Safety basics
- Preventing electric shocks to electricians
- Preventing electric shocks when working in ceiling spaces
- Prevention of falls – Ladders
- Prevention of falls – Working on roofs
- Working in heat.

Legislation

- Victorian Occupational Health and Safety Act 2004
- Electricity Safety Act 1998
- Occupational Health and Safety Regulations 2017
- Electricity Safety (Installation) Regulation 2009
- AS/NZS 3000 Wiring Rules
- AS/NZS 4836 Safe working on or near low-voltage electrical installations and equipment.

Extracts from relevant legislation

Electricity Safety Act 1998

No. 25 of 1998

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- (4) A person carrying out electrical installation work must ensure that—

- (a) All electrical circuits or electrical equipment handled in the course of that work are disconnected from the electricity supply; or
- (b) Adequate precautions are taken to prevent electric shock or other injury in the handling of electrical circuits or electrical equipment in the course of that work.

Victorian Occupational Health and Safety Act 2004

Division 2—Main duties of employers

21 Duties of employers to employees

(1) An employer must, so far as is reasonably practicable, provide and maintain for employees of the employer a working environment that is safe and without risks to health.

Penalty: 1800 penalty units for a natural person;

9000 penalty units for a body corporate.

(2) Without limiting subsection (1), an employer contravenes that subsection if the employer fails to do any of the following—

(a) provide or maintain plant or systems of work that are, so far as is reasonably practicable, safe and without risks to health;

(b) make arrangements for ensuring, so far as is reasonably practicable, safety and the absence of risks to health in connection with the use, handling, storage or transport of plant or substances;

(c) maintain, so far as is reasonably practicable, each workplace under the employer's management and control in a condition that is safe and without risks to health;

(d) provide, so far as is reasonably practicable, adequate facilities for the welfare of employees at any workplace under the management and control of the employer;

(e) provide such information, instruction, training or supervision to employees of the employer as is necessary to enable those persons to perform their work in a way that is safe and without risks to health.

(3) For the purposes of subsections (1) and (2)—

(a) a reference to an employee includes a reference to an independent contractor engaged by an employer and any employees of the independent contractor; and

(b) the duties of an employer under those subsections extend to an independent contractor engaged by the employer, and any employees of the independent contractor, in relation to matters over which the employer has control or would have control if not for any agreement purporting to limit or remove that control.

(4) An offence against sub-section (1) is an indictable offence.

Division 3—Duties of self-employed persons

24 Duties of self-employed persons to other persons

(1) A self-employer person employer must ensure, so far as is reasonably practicable, that persons are not exposed to risks to their health or safety arising from the conduct of the undertaking of the self-employed person.

Penalty: 1800 penalty units.

(2) An offence against subsection (1) is an indictable offence.

Document information

Further enquiries can be referred to:

Electrical Installation Safety

Energy Safe Victoria

Level 1, Building 4

Brandon Business Park

Glen Waverley VIC 3150 **Phone:** (03) 9271 5414

WorkSafe Victoria's Advisory Service

Phone: 1800 136 089