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Substation Standard

Standard for Substation Signage

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Abstract: This Substation Standard outlines the safety, operational and functional signage application standards for zone substation and switching station sites. It establishes the guidelines for the design, manufacture, and installation of operational and safety signs at Ergon Energy and Energex Zone Substation sites.

Keywords: Signage, Sign, Substation Signage, Substation, Substation Standard, SS-1-9.3.

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1 Overview

1.1 Purpose

This Substation Standard outlines the safety, operational and functional signage application standards for zone substation and switching station sites. It establishes the guidelines for the design, manufacture, and installation of operational and safety signs at Ergon Energy and Energex Zone Substation sites.

It is intended to assist Designers, Technical Officers, Project Managers and Construction Staff in specifying, ordering and fitting signage.

1.2 Scope

Substation signs shall be designed and installed at Ergon Energy and Energex's Zone Substations to meet public safety and workplace safety standards in accordance with the relevant Industry Laws, Regulations and Applicable Standards. Care should be taken that signage placed conveys the message intended in a concise form.

Energy Queensland is committed to working in a way which ensures the health and safety of its employees, contractors, customers and members of the public

The document covers:

- An overview of definitions and sign classification.
- An overview of sign materials, location & sighting.

Should there be a difference between the general wording of this document and the precise interpretation of any relevant legislation, then that legislation shall apply.

2 References

2.1 Legislation, Regulations, Rules, and Codes

Document	Type
Electricity Act 1994 (Qld)	Legislation
Electricity Regulation 2006 (Qld)	Regulation
Electrical Safety Act 2002 (Qld)	Legislation
Electrical Safety Regulation 2013 (Qld)	Regulation
Queensland WH&S Regulation 2011	Legislation

2.2 Controlled Documents

Document	Alternative Doc ID
Substation Fire and Explosion Protection - 3058013	STNW3035
Network Physical Security – Design Reference - 13158190	STNW3039
Physical Security Technical Reference - 691017	R296

2.3 Other Sources

(Australian Code for the Transport of Dangerous Goods by Road & Rail, Edition 7.9, 2024),

(AS/NZS 3000, 2018), Australian/New Zealand Wiring Rules.

(AS 1742.1, 2021), Manual of uniform traffic control devices - General introduction and index of signs

(ISO 3864-3, 2024), Graphical symbols - Safety colours and safety signs - Part 3: Design principles for graphical symbols for use in safety signs.

(AS 2676.1, 2020), Installation, maintenance, testing and replacement of secondary batteries in buildings

(AS 2676.2, 2020), Guide to the installation, maintenance, testing and replacement of secondary batteries in buildings.

(AS 2865, 2009), Safe working in a confined space.

(AS 1319, 1994), Safety signs for the occupational environment (Reconfirmed 2018).

EESS-10181-84-86	Ergon Energy Substation Standard, Substation Signage, Location Guidelines, Signage Detail
2900-A3 Series	Standard Identification Equipment Labels (Energex)

3 Definitions and Abbreviations

3.1 Definitions

For the purposes of this standard, the following definitions apply.

Background	That part of a sign that is behind the legend definition of term.
Combination Sign	A sign which combines both words and a symbol.
Composite Sign	A sign on which the words qualify or augment the symbol.
Hybrid Sign	A combination sign on which the words simply repeat the message given by the symbol.
Danger	Applied in the context of safety signs to a situation which is likely to be life threatening if the message is ignored.
Legend	The message content of a sign in words (text) or symbols, or a combination of these.
Shall	The word shall is to be understood as mandatory.
Should	The word should is to be understood as non-mandatory, i.e. advisory or recommended.
Symbol	A graphic or pictorial device used to represent objects or concepts, but for purposes of this document excluding letters, numerals and punctuation symbols.
Warning	Applied in the context of safety signs to a situation which is likely to be hazardous but not likely to be life threatening if the message is ignored.

3.2 Abbreviations

This list does not include well-known unambiguous abbreviations, or abbreviations defined at their first occurrence within the text.

PPE	Personal Protective Equipment

4 Classifications

4.1 Regulatory

Signs containing instructions with which failure to comply constitutes either an offence at law, breach of standing orders, Ergon Energy and Energex safety procedures or other directions and subdivided as follows:

- Prohibition signs – Signs that indicate that an action or activity is not permitted.
- Mandatory Signs –Signs that indicate that an instruction must be carried out.
- Limitation or Restriction Signs –Signs that place a numerical or other defined limit on an activity or use of a facility.

4.2 Hazard

Signs advising of hazards - subdivided as below:

- DANGER signs – Signs warning of a particular hazard or hazardous condition that is likely to be life-threatening.
- WARNING signs – Signs warning of a hazard or hazardous condition that is not likely to be life threatening.

NOTE: The term CAUTION used in earlier editions of (AS 1319, 1994) has now been replaced by the term WARNING. The two terms are regarded as being interchangeable.

4.3 Emergency Information Signs

Signs indicating the location of or directions to, emergency related facilities such as exits, safety equipment or first aid facilities.

This may include but is not limited to the following:

- Emergency telephone numbers
- First aid facilities
- Safety equipment
- Emergency assembly points
- Exits form enclosures/buildings within a substation site

NOTE: EXIT signs indicating exit points from substation buildings are part of the Substation Building requirements.

Such signs are covered, (AS/NZS 2293.1, 2018), Emergency lighting and exit signs for buildings, and actioned by the Civil Engineering design team.

4.4 Fire Signs

Signs advising the locations of fire alarms and fire-fighting facilities.

Separate signs should be used for any associated messages.

4.5 Operational Signs

Signs, other than MANDATORY signs, that are required to convey information, for safety of personnel and Electricity Network, security, data/characteristics relating to the operation of Ergon Energy and Energex Substation Plant.

The signage may contain but is not limited to the following:

- Site asset naming
- Device naming
- Substation fault level
- Telephone (internal and external) usage data
- Site entry requirements
- Radio operation and procedures
- Other non-specific data of operational nature

4.6 Information Signs

These signs convey a message or instruction that does not fit into categories listed in (AS 1319, 1994) but do communicate information of a general nature such as Ergon Energy and Energex practices and site policies.

NOTE:

This standard excludes EXIT signs of the type specified in (AS/NZS 2293.1, 2018) for use inside buildings.

These items are covered by Civil Engineering Specification as part of building design.

For security signage refer to Physical Security Technical Reference R296 - 691017 and STNW3039 – Network Physical Security Design Reference - 13158190

5 Signs General Requirements

- All signage details relate to Ergon Energy and Energex Substation or Switchyard sites unless otherwise noted.
- Signs shall conform to the usage, details, references and all relevant documents as listed in this document.
- Signs may be listed under multiple categories for use in substations. The usage that alerts personnel to the greatest site danger to safety shall be the preferred use

5.1 Sign Materials

- Signage shall not be painted directly on to any existing surface.
- Sign materials shall be as shown on associated/referenced drawings

5.2 Project Safety Barriers & Signage

- The form of any temporary safety barrier e.g., vinyl tapes, netting, solid barriers or steel fence panels, shall be considered when placing any sign.
- The safety barrier must be capable of supporting a sign in such a manner as to be legible at all times, under adverse conditions, from all points of approach for the duration of project.
- Should a signed area be accessible to the general public, signs shall be placed to ensure site is signposted according to Energy Queensland Substation Standards for the full duration of the project.
- A risk assessment of such project should allow for the visibility and placement of signage for the full duration of a project.

5.3 Invalid Sign Removal

- All signs should be removed immediately if the information or condition listed thereon is no longer relevant.
- Such signs should be replaced with a sign outlining updated information where conditions on project have changed.
- Particular importance should be placed upon the prompt removal of temporary hazard or safety exclusion zone signs when that hazard or danger ceases to exist.
- All sites should be restored to pre-signed status after removal of signs.

5.4 Safety Conditions

All signage must be placed in such a manner that at a point face to face with a sign, the sign placement shall cause no breach of any safe working approach limits.

5.5 Sign Modification and Changes

Any request for addition to, deletion from or changes to this suite of Substation signs shall be made through the Substation Design Standards Team to the Manager Substation Standards for processing, approval and ratification before enactment of changes.

6 Location of Signs

6.1 Siting of Signs

- Signs shall be prominently placed as close as practicable to an observer’s line of sight in a vertical plane.
- For a standing adult this will be approximately 1500 mm above ground or floor level in front of the observer to the horizontal centre line of sign.
- A sign should be located so that an observer has time to read it (or at least extract the information essential to them) before reaching a point of hazard or decision.
- Signs which are free standing or mounted overhead shall be placed so that they are not a hazard to persons approaching to or working on site.
- Placement of signs should not compromise any safe approach limits.

- Signs should not be placed where the possibility of becoming obscured exists.
- Materials should not be placed or stacked in a position that may obscure any signs.
- All signs should be mounted so that no visibility, safety or operational hazards are created by their placement.
- Signs should not be erected in contravention of any relevant laws or regulations or operational procedures.

6.2 Visibility of Signs

Incorrect positioning of a sign can reduce its visibility and impact and may render it illegible. In selecting the most effective position for a sign the following needs to be considered.

- Visual obstructions between the sign and all locations from which it is intended to be read should be avoided. This includes temporary obstructions such as an open door, grass or tree growth.
- Signs should not be located against visually cluttered or confusing background, Shift position of sign or rearrange area to ensure sign is conspicuous.
- Signs should be located where the messages are visible and attract the attention of any person approaching or working at substation site.
- A contrasting colour surround may be used to enhance visibility of a sign where the predominant sign colour may blend in with that of immediate background colour.
- Where signs ‘weathered beyond readability’ are reported during substation inspections or audits, urgent replacement should be arranged.

6.3 Viewing Distance and Sign Size

The viewing distance for a sign shall be determined by the location of the sign relative to the expected position of the observer.

Text height, symbol size, and overall sign dimensions shall be selected to ensure legibility at the intended viewing distance, in accordance with AS 1319 – Safety signs for the occupational environment.

Where lighting conditions are poor, the sign is not located within the normal line of sight, or environmental factors may reduce legibility, increased text and symbol sizes can be applied, consistent with AS 1319.

The selected sign size shall be sufficient to accommodate the required legend, layout, and format while meeting minimum legibility requirements at the nominated viewing distance.

6.4 Signs on Movable Objects

Signs should not be mounted on moveable items, such as doors or windows, where a change in position of an object would void the intended purpose of sign or cause it to be out of sight. This does not apply to signs intended to have a portable or moveable application.

When a portable sign is moved, the new position should comply with all visibility and safety requirements for a fixed position sign.

6.5 Regulatory & Hazard Signs

- Regulatory and Hazard signs should be sited in relation to the particular hazard to allow a person ample time after first viewing the sign to heed the posted warning. The positioning of signs will vary according to the application of sign.
- Signs warning against the touching of switches or other electrical equipment in operational areas should be placed close to the equipment.

The following standards and legislation are to be complied with in conjunction with the requirements of this standard.

Table 1 - Legislation and standards related to locations

Location	Reference
Generic workplace signs	(AS 1319, 1994)
Confined spaces	(AS 2865, 2009)
Battery rooms	(AS 2676.2, 2020) (AS 2676.1, 2020)

6.6 Illumination of Signs

- Where natural lighting does not provide adequate illumination of signs, additional sources of illumination must be considered.
- Attention should be addressed to signs subject to some forms of artificial light which cause a change in the perception of colours and reduced sign visibility.

6.7 Number of Signs

Care should be taken in the placement of signs close together at the one position. The result of a congested placement may be that little information is absorbed or the visual impact may be confusing. To avoid over cluttering of signs consider using a combination sign, or application of better controls to engineer out the hazard.

The total sign information should be easily read and understood.

6.8 Battery Rooms, Battery Enclosures and Mounting Racks

These signs shall be in accordance with the requirement under the Australian Standards for Guidance for the installation, maintenance, testing and replacement of secondary batteries in buildings – Vented Cells (AS 2676.1, 2020). To meet the requirements Safety Signs shall be designed and constructed to (AS 1319, 1994) and should be permanently displayed in prominent positions.

The signs are of the following three types:

a) Restricted Access & Regulatory

b) WARNING signs

c) Emergency related information signs

Restricted Access, Regulatory & Warning signs should be placed on every door giving access to a battery room or enclosure and in a prominent position on a wall within a Battery Room.

Emergency related information signs should be placed in a prominent position within a battery room and on the inside of the door on a battery enclosure.

The following sub sections detail the signs for use in applications containing vented battery cells in the context of Battery Rooms, Batter Enclosures and Mounting Racks – Secondary Cells

6.8.1 Sealed Cells – Emergency Related Information

To meet the relevant Australian Standards for Guidance for the installation, maintenance, testing and replacement of secondary batteries in buildings – Sealed Cells (AS 2676.2, 2020) the following should be used.

The specific direction from 'AS 2676.2 SAFETY' is as follows:

'Emergency Related Information Signs (ERIS), if any, should give instructions for dealing with issues related to the type of batteries installed in battery room/enclosure/mounting rack and may be specific to the installed batteries.

Any such signs should be displayed in a prominent position within a battery room and on the inside of the door on a battery enclosure.'

(AS 2676.2, 2020) Secondary Batteries in Buildings – Sealed Cells - does not state any signage requirement for Sealed Cells.

It may be possible during charging with incorrect control or faulty charger may result in the discharge of a combustible mixture of hydrogen and oxygen. Ignition sources should not be allowed / located in close proximity to the tops of cells.

6.8.2 Sealed Cells – Firefighting Equipment

To meet the relevant Australian Standards for Guidance for the installation, maintenance, testing and replacement of secondary batteries in buildings – Sealed Cells (AS 2676.2, 2020) the following should be used.

The specific direction from 'AS 2676.2 FIREFIGHTING EQUIPMENT is as follows:

All battery installations should be provided with portable fire extinguishers suitable for use on acid and alkaline solutions and electrical fires, e.g., CO2 and BCF

Fire appliances/Signs should be sited adjacent to entrances of rooms or convenient to battery enclosures.

The number of appliances and installation should be in accordance with the requirements of the Building Code and appropriate regulatory authority/codes.

Type, placement, administration and maintenance of these signs is administered by Civil Group

For further details on substation fire and explosion protection refer to Substation Fire and Explosion Protection - 3058013 (STNW3035).

7 Operational Labels

7.1 General

Operational labels are provided primarily to assist switching operators to identify HV equipment and to validate switching requirements. Labels not exposed to the weather can be manufactured from Gravoply fitted with approved double sided adhesive tape, whilst outdoor labels shall be anodised aluminium fitted with non-corrosive fasteners. Viewing distance, sign font size and overall

sign size shall be in accordance with Section 6.3. For information on specific label details and locations for particular switchgear refer to the relevant standard drawings in the drawing management system.

7.2 Operational Labels – MV Switchgear

Operational labels on metal enclosed indoor switchgear shall include:

- Busbar ID (on middle breaker of each bus)
- Bay/Function Identification
- Location Code
- Feeder Identification (including rear for rear entry cables)
- Operational CB Identification
- Operational identifiers for isolators and earth switches
- Operating sketch including multiple cable boxes
- Reference label (where multiple cable exits on a single panel)
- Destination labels on cable boxes

7.3 Instrument Panels and Protection Cubicles

The following items shall be labelled with function number and description

- Protection relays
- Auxiliary relays
- Fuses and links
- Switches
- Terminal groups (description not required)

7.4 Other Equipment

- Location codes for distribution boards, and function codes and descriptions for circuit breakers and switches
- Operating numbers for other plant (transformers, AF equipment, HV circuit breakers, isolators)
- Cable destination labels

8 Substation Commissioning

- A pre-commissioning inspection shall be made to ensure that all signs required by this standard are made available in time for commissioning.
- Ensure all signs are legible, unambiguous, provide correct information, be placed in appropriate positions and securely fixed in place for commissioning.

9 Sign Placement

9.1 Sign Details and Locations

For standard sign design production details refer to listed Ergon Energy and Energex drawings as detailed in the following sub sections. Where multiple versions (sizes) of the sign type are available the preferred option should be selected provided that it meets the requirements of the preceding sections.

Table 2 - Sign details and locations

Location	Signs	Comment
Main vehicle entry gate or adjacent fence line	Energex/Ergon Energy – Site Identifier sign PPE required sign Danger – High Voltage Sign Authorised personnel only sign.	
Personnel entry gate or adjacent fence line	Danger – High Voltage Sign Authorised personnel only sign. Conditions for entry sign Instructions for arming/disarming security systems	
Fence signs	Danger – High Voltage Sign Authorised personnel only sign. Substation identifier sign Danger – Anti-climbing device installed (block fence) Electric fence warning signs (electric fence)	Maximum 30m between signs on perimeter fence
Capacitor bank enclosure	Danger – High Voltage Sign Danger – High voltage at ground level (access permit required before entry) Working on capacitor bank instruction	
Other outdoor HV enclosures	Danger – High Voltage Sign Warning – Do not open door until equipment tested and earthed.	
Control Building Signs	Danger – High Voltage sign at all personnel and equipment doors, internal doors to HV equipment areas. Authorised personnel only sign at external doors. No Smoking – external personnel doors Emergency information sheet – above desk Zone substation prospective fault current – above desk Buried electric cables – external walls, above conduit entries where not obvious (e.g., cable pit)	

Location	Signs	Comment
Battery Rooms	Danger – Risk of battery explosion Instructions for electrolyte burns	
Pilot Cubicles	Warning labels for isolation (insulate 1m radius).	
Fire Suppression Systems	Instructions for disabling/enabling fire suppression systems	At personnel entry doors
Eyewash and Emergency Shower Station sign		
Fire Extinguisher Station signs		
Confined Spaces	No entry without confined space permit	On entry doors, above pit covers
Unpotable Water tap	Do not drink signs	
Single Point Underground Cable Screen Bonding	Danger/Warning signs	At earthed and unearthed ends
Switchgear Arc Fault Vent Ducts	Warning – do not stand below signs	Vent outlets
LV and HV switchgear	Arc Flash labels and Warnings	Where an arc flash study has been conducted, and the resulting study indicates required arc flash category for PPE exceeds Category 2
Temporary Signs – Network Access Restrictions	Danger – Network Access Restriction at This Site – at main entry gate. Danger – Network Access Restriction Exists – at affected location	
Forestry signs	Site Details Illegal Dumping Notice Log Book Location	

10 Drawing Details and Stock Codes

Drawings for signs are controlled in Autodesk Vault. There are both Ergon and Energex standard drawings for signs. A listing of stock codes and reference drawings is included in the Substation Standards Controlled Standards Listing.