

## Substation Design Instruction

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# Substation batteries and battery chargers

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## Substation Design Instruction

### ASSET STANDARDS & DESIGN

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### SDI 513 SUBSTATION BATTERIES AND BATTERY CHARGERS

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## 1.0 PURPOSE

To detail the minimum requirements for batteries, battery chargers and connection equipment used in transmission and zone substations and switching stations.

## 2.0 SCOPE

This instruction provides the minimum technical and installation requirements for batteries, battery chargers and connection equipment within transmission and zone substations and switching stations.

This instruction must be read in conjunction with:

- Substation Design Instruction SDI 505 – Minimum design and construction requirements for transmission and zone substations and switching stations; and
- Equipment Technical Specification ETS 0085 – Battery systems

## 3.0 REFERENCES

### Internal

Board Policy (Environment) 4.0 – Environment  
Company Policy (Network) 9.2.2 – Network Protection  
Company Policy (Network) 9.2.5 – Network Asset Design  
Company Policy (Network) 9.7.1 – Network Asset Construction  
Company Policy (Network) 9.8.3 – Network Operations  
Company Policy (Network) 9.9.1 – Network Asset Maintenance  
Company Procedure (Health & Safety) GSY 1066 – Worksite Hazard and Risk Assessment  
Equipment Technical Specification ETS 0085 – Battery Systems  
Substation Design Instruction SDI 505 – Minimum design and construction requirements for transmission and zone substations and switching stations  
Substation Design Instruction SDI 510 – Buildings  
Substation Design Instruction SDI 515 – Drawings  
Substation Maintenance Instruction SMI 102 – Substation batteries  
Substation Maintenance Instruction SMI 119 – Transmission and zone substation data asset structure and nameplate details  
Endeavour Energy Electricity Network Safety Management System (ENSMS)

### External

ENA National Electricity Network Safety Code (Doc 01-2008)  
Work Health and Safety Act 2011 (NSW)  
Work Health and Safety Regulation 2017 (NSW)  
Electricity Supply (Safety and Network Management) Regulation 2014  
AS 5577:2013 – Electricity network safety management systems  
AS/NZS 3000:2007 – Electrical installations  
AS 2676.2:1992 – Guide to the installation, maintenance, testing and replacement of batteries in buildings – Sealed cells  
AS 3011.2:1992 – Electrical installations - Secondary batteries installed in buildings - Sealed cells  
AS/NZS 4029.2:2000 – Stationary batteries lead acid - Valve regulated type  
AS 4029.3:1993 – Stationary batteries lead acid pure lead positive pasted plate type  
AS 4044:1992 – Battery chargers for station batteries

## 4.0 DEFINITIONS AND ABBREVIATIONS

### AC

Alternating current

**DC**

Direct current

**Ellipse**

Endeavour Energy's asset database

**SCADA**

Supervisory Control and Data Acquisition

**EPA**

NSW Environment Protection Authority

**5.0 ACTIONS****5.1 Battery systems****5.1.1 General**

The technical and installation requirements for transmission and zone, substation and switching station battery systems **must** be in accordance with Equipment Technical Specification ETS 0085 – Battery Systems.

**5.1.2 120V station battery system redundancy**

All new substations must have **two** 120V station battery systems – one for each protection system. Substations that do not have duplicated protection systems and do not have remote back-up protection will still require two battery systems, with protection adequately placed between the battery systems to achieve maximum redundancy. Substations that do not have duplicated protection systems and which have remote back-up protection, such as switching stations, will only require one battery system. Any request for substations to have only one battery system must be forwarded for approval by the Substation Design Manager, Asset Standards & Design.

Where dual battery systems are required, the batteries and associated chargers, including all associated wiring and protection must be kept physically and electrically isolated so that potential problems with one system do not affect the other. Each battery system must have a separate and dedicated charger system, and must be fed via separate dedicated AC circuits supplied by different phases from the AC panel.

Dual protection and tripping systems must be supplied by different batteries and the overall substation DC load (including communications, lighting, and the like) must be distributed as evenly as possible between the two battery systems.

**5.2 Battery isolation/temporary mobile battery connection**

Facilities must be provided to disconnect each of the station batteries from their load to allow discharge tests to be carried out and to also allow the temporary connection of a mobile battery. Battery isolation strips must be installed to provide this facility.

A barrier or lock must be provided on the DC isolation point to protect against unintentional operation.

Battery isolation strips must be mounted in a separate cupboard, or on the battery room wall, providing they meet the criteria of AS 3011.2:1992 – Electrical installations - Secondary batteries installed in buildings - Sealed cells.

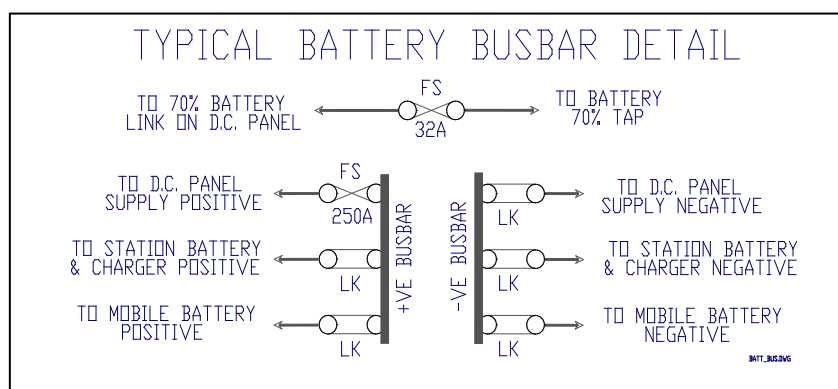


Figure 1 – Typical battery busbar detail

The isolator strips must be capable of accommodating DIN fuses and links.

### 5.3 Battery accommodation

#### 5.3.1 Substation battery

The battery and associated charger must be located in a suitable battery room or enclosure in accordance with AS 3011.2:1992 – Electrical installations - Secondary batteries installed in buildings - Sealed cells and Substation Design Instruction SDI 510 – Buildings.

Access to the battery and charger must not be obstructed by the structure of the building or by the fixtures and fittings within the building.

Sufficient room must be provided to allow for the charger door to be opened and for the battery system to be tested and maintained.

#### 5.3.2 Communications battery

The battery and associated charger must be located in a suitable enclosure in accordance with AS 3011.2:1992 – Electrical installations - Secondary batteries installed in buildings - Sealed cells. The communications control panel may be used for this purpose if a shelf is provided to keep the battery away from the battery charger and other electrical equipment.

### 5.4 Ventilation

The battery room/enclosure must be ventilated to keep the average concentration of hydrogen and other combustible gases within safe limits, in accordance with AS 3011.2:1992 – Electrical installations - Secondary batteries installed in buildings - Sealed cells.

All battery compartments must be ventilated from the roof of the compartment to the outside of the building. The battery room/enclosure must also be ventilated on its lower walls to the exterior of the building to allow air circulation in the battery room/enclosure.

Open perpendes or similar ventilation must also be installed in the control room.

The preferred method to be used is natural ventilation. Other methods of ventilation must be submitted to the Substation Assets Manager for assessment and approval before the commencement of the design or installation.

## 5.5 DC control panels

Each station battery must be connected to a separate DC distribution half ( $\frac{1}{2}$ ) control panel. Where the substation has two or more station batteries, each panel must be separated to allow maintenance on one battery panel to be carried out without the need to decommission the other panel.

Each panel must be fitted with a minimum of the following equipment:

- Voltmeter ( $\pm 1\%$  accuracy);
- Voltage transducer for SCADA;
- Positive earth fault indicator (lamp - preferred); and
- Negative earth fault indicator (lamp - preferred).

Where two x 120V DC panels are installed, paralleling switches must be installed on each panel. All circuits must be individually fused.

A DC monitoring system powered from an alternate DC supply must be installed to send alarms to the control room.

## 6.0 AUTHORITIES AND RESPONSIBILITIES

**Manager Asset Standards & Design** has the authority and responsibility for approving the amendments to this Standard in accordance with GAM0001.

**Substation Assets Manager, Asset Standards & Design** has the authority and responsibility for keeping the content of this instruction up to date.

**Substation Design Manager, Asset Standards & Design** has the authority and responsibility to approve any request for substations to have only one battery system.

All **Endeavour Energy employees and/or contractors** have the authority and responsibility for:

- Meeting the requirements of this instruction and Substation Design Instruction SDI 505 – Minimum design and construction requirements for transmission and zone substations and switching stations;
- Working in accordance with local and statutory requirements;
- Maintaining public safety; and
- Working in accordance with Endeavour Energy's Electrical Safety Rules.

All **Project Managers** have the authority and responsibility for:

- Meeting the requirements of this instruction within their area of responsibility;
- Confirming that Endeavour Energy employees and/or contractors engaged to perform the work have appropriate qualifications; and
- Verifying that appropriate equipment details are entered into the Ellipse database as part of the work.

## 7.0 DOCUMENT CONTROL

**Documentation Content Coordinator** : Substation Assets Manager  
**Documentation Distribution Coordinator** : Branch Process Coordinator