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Substation Design Instruction

Drawings

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SUBSTATION DESIGN INSTRUCTION

PRIMARY SYSTEMS

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SDI 515 DRAWINGS

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1.0 PURPOSE

To set out the broad requirement for drawings to be used in transmission/zone substations and switching stations.

2.0 SCOPE

This instruction defines the requirements for drawings created and/or modified for use in transmission, zone substations and switching stations.

It covers several phases in the development of drawings and the process for entering drawings into Endeavour Energy's Drawing Information Systems.

This instruction shall be read in conjunction with:

- Substation Design Instruction SDI 505 – Minimum design and construction requirements for transmission and zone substations and switching stations;
- Standard Asset Data SAD 0001 – Project drawing standards; and
- Company Procedure (Network) GAM 0036 – Management of drawing records.

3.0 REFERENCES

Company Policy (Information & Communication Technology) 15.3.1 – Information Management
Company Policy (Network) 9.2.5 – Network Asset Design
Company Policy (Network) 9.2.6 – Network Asset Renewal
Company Policy (Network) 9.7.1 – Network Asset Construction
Company Procedure (Network) GAM 0036 – Management of Drawing Records
Standard Asset Data SAD 0001 – Project drawing standards
Substation Design Instruction SDI 505 – Minimum requirements for design and construction of transmission and zone substations
Substation Design Instruction SDI 528 – Substation signs and equipment labels principles
Network Management Plan December 2013 Review
Work Health and Safety Act 2011
AS 1100.101:1992 – Technical drawing Part 101: General
ENA National Electricity Network Safety Code (Doc 01-2008)

4.0 DEFINITIONS AND ABBREVIATIONS

Authorised Officer

An employee with privileges to generate a new drawing number or to book-out an existing drawing.

Content Server

Document organisation and control system, Endeavour Energy's document database.

Installation drawing

A drawing specifying complete information necessary to install an item or items to the supporting structure or to associated items.

Manual drawing

A drawing where the original drawing is paper or polyester (film) or other physical medium and is stored in the Plan Room, for example, non-cad drawings.

SDI

Substation Design Instruction

Work as executed (WAE) drawing

A record of work actually completed and shown on drawing.

5.0 ACTIONS**5.1 General**

When a major portion of a manual drawing (that is, non-Cad) requires amending, then the drawing shall be converted to AutoCAD drawing format. Converted drawings shall retain their original drawing numbers.

Before commencing work, drawing information shall be updated so that work is not started on a drawing that is already reserved for another project.

All copies of drawings submitted in both electronic format and hard copy are the property of Endeavour Energy.

Abbreviations shall not to be used in the drawing title. Elsewhere in the drawing, abbreviations of technical words or word combinations commonly used in drawings shall be in accordance with AS 1100.101 – Technical drawing Part 101: General.

Under no circumstances should there be two drawings with the same drawing number and revision number having different information.

5.2 Content server

The Content Server system is used for storage and retrieval of drawing images. All drawings in Content Server are *Approved for Construction* or work as executed (WAE) drawings. Amended drawings shall not be placed into Content Server until the drawings have been approved and signed.

5.3 Format

As a minimum, all drawings shall comply with the following format.

5.3.1 Dimensions

Drawing dimensions showing overall sizes and general construction shall be in millimetres (mm).

5.3.2 Signatures

All drawings shall include provision for initial signatures of the designer, draftsman, checker, the authorised person and the date of issue.

Drawings shall not be electronically signed, until they have been manually signed.

5.3.3 Amendment column

Drawings shall have provision for an amendment column to briefly describe each amendment and to show the signature of the checker for such amendments and the date of amendment.

5.3.4 *Drawing functional titles*

Standard format for drawing descriptions shall be used for all drawings and the title shall typically show the:

- location at which the drawing is intended for use;
- equipment that is being controlled, monitored or otherwise shown;
- type of scheme (for example, protection, metering, indication); and
- type of drawing (for example, circuit, connection).

Typical title example:

WEST PENNANT HILLS ZONE SUBSTATION
TRANSFORMER NO.1 33kV CIRCUIT BREAKER
PROTECTION AND INDICATION
CIRCUIT DIAGRAM

5.3.5 *Other requirements*

Terminal arrangement and mounting details shall be clearly shown. Information such as legends, codes and descriptions shall be applied to each drawing to allow easy identification of items.

5.3.6 *Electronic copies*

As a minimum, electronic copies shall be compatible with the AutoCAD release as specified in Standard Asset Data SAD 0001 – Project drawing standards

5.4 **External contractors**

5.4.1 *Reference drawings*

Copies of existing system drawings may be provided to contractors on written request. Any drawings issued to a contractor shall be for reference and information purposes only and shall not be considered as being 100% correct. For example, in existing buildings and switchyards, equipment may not line up with positions indicated on the drawings.

It is the contractor's responsibility to confirm the drawings meet requirements before design and construction commences.

5.4.2 *Numbering system*

If a contractor is required to provide drawings to Endeavour Energy, a block of numbers may be issued to the contractor by an authorised officer of Endeavour Energy when requested, and the contractor shall apply those numbers to the drawings before final submission.

The contractor shall request the exact quantity of drawing numbers required. The contractor's own numbering system can be included on the drawings, but this shall be less significant in appearance than that of the allocated numbers. Endeavour Energy's Authorised Officer is responsible for recording drawing title details for drawing numbers booked out to a contractor.

5.5 **Minimum drawing requirements during design phase**

The exact quantity and types of drawings required will generally be set out in the project, but this may vary as the design progresses. The minimum drawing requirements, where applicable, are listed below:

- general arrangement covering the entire site;
- elevations and cross sections of site (including tallest equipment);
- civil drawings including footings, plumbing, drainage, buildings and structures;
- architect building concept drawings;
- landscaping detail;
- earthing systems (including design calculations);
- control building light and power systems (with a complete emergency lighting system);
- general arrangement of major equipment (for example, busbars, transformers, circuit breakers, current transformers, voltage transformers, disconnectors);
- one (1) complete set of circuit or schematic diagrams from or between each major piece of equipment (a set of circuit or schematic diagrams will include items such as current transformers, voltage transformers, control, protection, alarms and indication);
- one (1) set of panel layout drawings for each type of panel. Each drawing will identify all equipment on that panel, with details such as the functional name/number, make, type and code number; and
- wiring and connection diagrams.

All drawings shall be *fit for purpose* for both construction and ongoing effective management of the asset throughout its life cycle.

5.6 Installation drawings

Detailed design installation drawings representing the project to be constructed shall be submitted fully completed. Partially submitted drawings are not acceptable.

The Transmission Civil and Substation Electrical Design sections shall coordinate the drawings so that all drawings are submitted for approval.

A complete set of approved for construction or installation drawings in both .PDF and AutoCAD drawing file format shall be sent to the Network Data and Performance Plan Room for processing into the Content Server.

5.7 Manufacturers' drawings

Manufacturers' drawings such as equipment drawings, data schedules, specification sheets, installation and operating instructions, and any other relevant data, as part of the project, shall be appropriately included in the list of drawings.

The Project Manager shall forward the manufacturers' drawings to the Transmission Civil and Substation Electrical Design sections for coordination and approval.

The Transmission Civil and Substation Electrical Design sections shall save the AutoCAD.dwg files and .PDF files of the manufacturers' drawings to the appropriate folder in the network path for

access by the Network Data and Performance Plan Room for processing in accordance with Standard Asset Data SAD 001 – Project drawing standards.

5.8 Work as executed (WAE) drawings

As the project nears completion, WAE drawings shall be prepared in sufficient detail to present an accurate record of the work carried out.

All mark-ups from commissioning shall be completed and the WAE drawings shall reflect the true, as built, tested and commissioned condition.

Where equipment manufacturer's circuits are modified, as part of the WAE drawings a special note shall be included to indicate the details of the modification.

Amendment blocks in the WAE drawings shall give a true indication of the amendment/s carried out on the drawing.

The final WAE drawings shall include, but not be limited to, the following (where applicable):

- architect's drawings;
- building construction drawings;
- cabling drawings;
- circuit or schematic diagrams;
- civil works drawings;
- connection diagrams;
- earthing drawings;
- equipment drawings (for example relays, control switches and lights);
- hydraulics drawings;
- light and power drawings;
- panel layout drawings;
- single line diagrams;
- site plans and general arrangements;
- support structures drawings;
- survey and contour drawings; and
- wiring diagrams.

5.9 Drawings approval process at completion of project

At the completion of WAE drawings, the Transmission Civil and Substation Electrical Design sections shall save the AutoCAD.dwg files and .PDF files of the WAE drawings to the appropriate folder in the network path for access by the Network Data and Performance Plan Room for processing in accordance with Standard Asset Data SAD 001 – Project drawing standards.

Where construction work affects the accuracy of the GIS, a *works in progress* drawing shall be sent to Network Data and Performance for processing the changes into the GIS.

On completion of project works, a copy of complete set of all approved drawings pertaining to the substations shall be filed on site in the assigned drawing cabinet within the substation's control room by the Project Manager. Refer also to Substation Design Instruction SDI 528 – Substation signs and equipment labels for specific details relating to Single Line Diagrams.

6.0 AUTHORITIES AND RESPONSIBILITIES

Chief Engineer has the authority and responsibility for approving this Substation Design Instruction.

Manager Primary Systems has the authority and responsibility for making recommendations to the Chief Engineer in respect to this Substation Design Instruction.

Network Substations Manager has the authority and responsibility for **keeping** the content of this instruction up to date.

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

- **meeting the** requirements of this Substation Design Instruction and Substation Design Instruction SDI 505 – Minimum requirements for design and construction of transmission and zone substations;
- working in accordance with local and statutory requirements;
- **maintaining** public safety; and
- working in accordance with Endeavour Energy's Electrical Safety Rules.

Project Managers have the authority and responsibility for:

- meeting the requirements of this instruction within their area of responsibility;
- **establishing** that Endeavour Energy staff and/or contractors engaged to perform the work have appropriate qualifications;
- **arranging** for all new and amended manufacturers' drawings **to be** placed in Endeavour Energy's **Content Server** document database; and
- **arranging** for a complete set of drawings **to be filed** on site in the assigned drawing cabinet within the substation's control room.

Design Service Manager and Transmission Civil Development Manager have the authority and responsibility for:

- **managing the process so that all** design drawings are **in accordance with** this Substation Design Instruction; and
- **managing the placement of all approved installation drawings (both new and amended) into** Endeavour Energy's **Content Server** document database.

7.0 DOCUMENT CONTROL

Documentation Content Coordinator : **Network Substations Manager**

Documentation Distribution Coordinator : **Branch Process Coordinator**