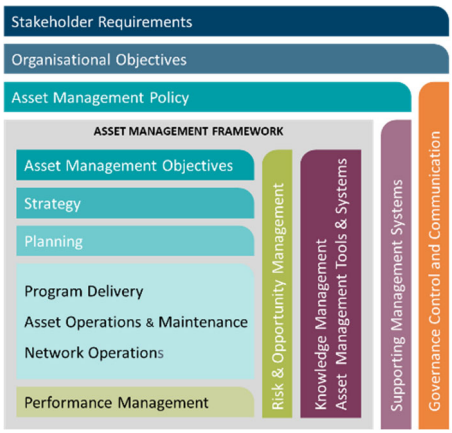
Western Power's Asset Management System



Distribution Substation Plant Manual
Chapter 1 - Introduction

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Document control

Endorsement approvals

	Name	Position	Signature and Date
Author	Samuel Liau	Senior Distribution Standards Engineer	Signature on file
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Record of revisions

Revision No.	Date	EDM version	Revised by	Description
0	May 2019	1	Gareth Chadwick	Original
1	September 2019	2	Gareth Chadwick	List of Chapters updated in Section 1 Document links added,
2	November 2019	3	Gareth Chadwick	Signatories updated
3	March 2022	4	Ken Tiong	References and signatories updated
Revision No.	**Date**	**Volt version**	**Revised by**	**Description**
4	April 2025	5.0	Samuel Liau	3 yearly periodic review

Key documents providing direction and influencing this document

Doc #	Title of document
EDM# 40304923	Asset Management System
EDM# 41965928	Safety in Design Guidelines
EDM# 50473207	DSPM Governance & Supporting Technical Documents Register

Stakeholders (people that were consulted when document was updated)

Business Unit / Function
Asset Management - Asset Performance
Asset Management – Safety Environment Quality and Training
Asset Management – Grid Transformation
Asset Operations – Network Operations
Asset Operations – Operational Services
Asset Operations – Customer Connection Services
Business and Customer Service – Customer Service

Notification list (people to be notified when document is updated)

Business Unit / Function
Asset Management - Asset Performance
Asset Management – Safety Environment Quality and Training
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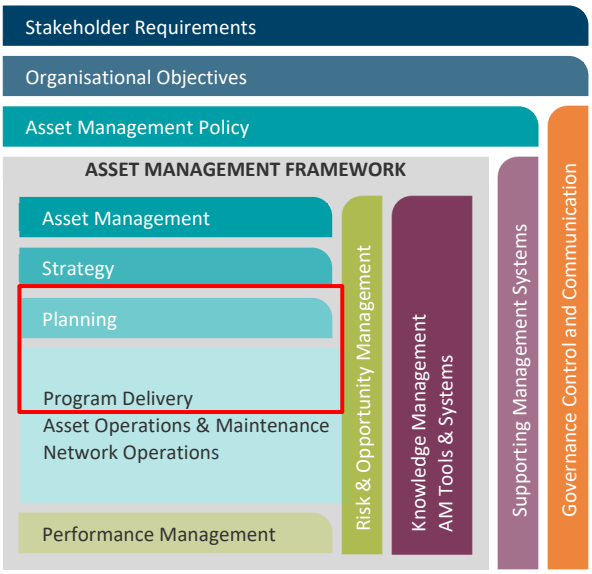
Asset Operations – Network Operations
Asset Operations – Operational Services
Asset Operations – Customer Connection Services
Business and Customer Service – Customer Service

Document classification and hierarchy

A key requirement of the Western Power Asset Management Policy (AMP) is to develop and maintain an Asset Management System (AMS). This Distribution Substation Plant Manual is defined as a technical document within the AMS document classification and structure and sits within the Planning and Program Delivery components of the AMS.

The AMS and the interrelationships between the collection of documents, tools and systems that are used for asset management are described in the AMS document EDM# 40304923.



Contents

1. Introduction

The Distribution Substation Plant Manual (DSPM) is currently under development using new distribution plant and equipment that is being procured and will be available for use on Western Power's Network. This new plant has been designed and manufactured using the latest technology and techniques available to Western Power's equipment and plant suppliers and will provide Designers with a suite of options that allow a safe and efficient connection to Western Power's Grid. During the equipment procurement process and the development of the DSPM, additional work has been initiated to progress towards AS 5577 compliance. The new DSPM will replace the interim Distribution Substation Manual (DSM) once the plant procurement and implementation process has been completed. Until such time, the DSPM will consist of the following Chapters utilising existing information published within Chapters of the DSM:

- DSPM Chapter 1 - Introduction (This Chapter)
- DSPM Chapter 2 - Future
- DSPM Chapter 3 - Substation Arrangements up to 22kV (incl. Interim DSM Chapter 3)
- DSPM Chapter 4 - Plant General Arrangements and Installation Guides up to 22kV (Inc. Interim DSM Chapter 4)
- DSPM Chapter 5 - Fire Protection
- DSM Chapter 6 - Miscellaneous
- DSPM Chapter 7 - Superseded Equipment Installation Guide
- DSM Chapter 8 - Distribution Automation (withdrawn)
- DSPM Chapter 9 - Substation Arrangements, 33kV
- DSPM Chapter 10 - Plant General Arrangements and Installation Guides, 33kV

Readers should reference the Distribution Design Catalogue (DDC) for the current plant to be used within Western Power Distribution Substation sites. Western Power Equipment and Standards Bulletins will be issued to inform Stakeholders of progressive changes to the DSPM and the implementation of the new plant in the DDC. Should the users of the new distribution plant require additional information or have any concerns about the validity of the information within this manual or the DDC, please contact Western Power's Distribution Design and Standards Area via (https://westernpower.com.au/contact-us/).

2. Purpose and Scope

The DSPM contains a suite of Standard Designs that show a detailed diagrammatic representation of standard Western Power plant and equipment within a specified land area (the distribution substation site). These Standard Designs are based on plant and equipment procured by Western Power and listed within the DDC. This standard plant and equipment shall be used in all distribution network projects connected onto Western Power's Grid that will be Western Power owned and operated.

A description of the information provided on each drawing sheet of the Standard Design is located at the beginning of each DSPM Chapter. These Standard Design drawings are to be used in conjunction with the following Design Standards published within the following Western Power customer connection manuals:

- **Western Australian Service and Installation Requirements (WASIR)** – This Manual contains general information for a single customer who would like to connect onto a Distribution Network within Western Australia.

- **Underground Distribution Schemes Manual (UDSM)** – This is Western Power's Manual for Land Developers who undertake the subdivision of a single piece of land to create multiple lots.
- **The Distribution Customer Connection Requirements (DCCR)** - This is a document that contains the single line diagrams illustrating the network planning requirements for a customer connection (based on load size and voltage level).

The Standard Designs and Design Standards shall also be applied in conjunction with the following Western Power documents when specific types of network arrangements are used:

- **Distribution Overhead Line Design Standard (DOLDS)** – Design and construction of overhead lines
- **Distribution Underground Cable Installation Manual (DUCIM)** – Underground cable systems design and installation.
- **Single Phase Underground Distribution Systems Manual (SPUDS)** – For broadacre rural sites that require underground power.

3. How to use this Manual

The Standard Designs within this manual may be used as templates for when a standard distribution substation is required within a customer network connection or network capacity expansion project. The specific location of the distribution substation and the arrangement of the distribution network connection assets, that are outside of the substation site, shall be determined by the application of the Design Standards previously listed.

4. Safety in Design

Distribution substations are typically located within public open space, substation buildings and privately-owned land that is used for commercial, industrial and residential purposes. These areas are frequented by people who may be oblivious to the potential hazards associated with ground mounted substation equipment that is operated at voltages as high as 33,000V. When used as intended this substation equipment is designed to keep the risk associated with hazards to a negligible level, however, often inherent risks associated with live electrical equipment remain and these risks shall be considered by the designers of the electrical networks.

To help manage the risk Western Power has developed a Safety in Design (SiD) guideline. SiD is an ongoing, iterative process that integrates hazard identification and risk assessment methods early in the design process to eliminate or minimise the risks of injury throughout the lifecycle of the asset being designed. Western Power's Safety in Design Guideline (EDM# 41965928) supports Western Power's Electricity Network Safety Management System (ENSMS) in alignment with AS 5577. This Industry Standard requires Western Power to identify, record, assess and manage hazards associated with the whole lifecycle of electrical networks. The risks associated with these hazards are required to be eliminated so far as is reasonably practicable (SFAIRP), or where impractical, to reduce the risks associated with these hazards to as low as reasonably practicable (ALARP).

With updated energy network safety regulations, each new or updated WP Standard Design must now have a Hazard Management Register (HMR) to capture and document what risks have been controlled by that Standard Design; and what residual risks may remain that should be considered at the project design and construction stages of the project. The Standard Designs within the DSPM, if incorrectly applied could result in an unacceptable level of risk at a specific site because that hazard may not have been evident at the time the Standard Designs are developed. It is also not practical nor cost effective to mitigate all risk within a

Standard Design drawing as these risks may not appear at all substation sites. Therefore, where site-specific risk (such as, but not limited to environmental risks, flooding or drainage, fire, vehicle impact, access and egress routes) or any network related risk (e.g. touch voltages during network faults, or security of supply) may exist, these risks shall be identified and considered by the Network Designer for each project. Hazards that have been identified as being common to all DSPM Standard Design drawings have been listed within a single HMR. This HMR can be used by Network Designers to help them better understand the inherent risks associated with plant and equipment hazards that may be present within the distribution substation site. The HMR for the DSPM can be located at EDM# 47791256.

When procuring new plant and equipment, Western Power's specification considers the hazards and risks that could be eliminated or controlled by that plant and equipment. These hazards and risks are entered in a HMR that is reviewed periodically and updated as necessary when there is a change to the specification, to allow hazards to be designed out by the manufacturers of plant and equipment. It is imperative that any previously unforeseen hazards (due to the design of the plant and equipment) are also communicated to those people involved in the tendering and procurement process.

Any residual risk within the project is to be considered and managed by the Network Designer to So Far As Is Reasonably Practical (SFAIRP). The project specific HMR is to be completed by the Network Designer in accordance with the Application of Formal Safety Assessment Guideline (EDM# 50170216).

5. Disclaimer

The information contained within this Manual shall not be used for anything other than its intended purpose (as stated within each Chapter). Other documents that refer to this Manual (whether it is written or inferred) shall not change the stated purpose of any of the Standard Design drawings. This Manual should be used collectively with relevant International or Australian Industry Standards and Codes of Practice where there is a need to demonstrate compliance with other Legislation such as that applicable to privately owned electrical installations (e.g. Electrical Licencing Regulations).

6. Compliance with this Manual

The Network Designer shall use the Standard Designs published within this Manual unless it is impractical or unsafe to do so. Where a customer requires a non-standard substation arrangement (for example where an odd shape site exists), the drawings within this Manual can be made available to the land owner. It is then the Network Designer's responsibility, in conjunction with the landowner or their architect, to prepare an alternative arrangement design that shall meet Western Power's requirements.

Where project designs vary from Western Power's Standard Designs a register is required to be updated detailing the variation and shall include a record of information as described below:

a. the reason for non-use of the standard layouts or non-compliance

b. the alternative provision that demonstrates that the non- standard design has ensured that safety risks are SFAIRP.

c. an explanation of how the proposed substation design is fit for purpose and will facilitate installation of "standardised Western Power distribution equipment".

Any non-standard design must be approved by a Team Leader and a Senior Engineer. The design shall be recorded in the register:

Non-standard drawings register for Distribution Construction Standards Handbook (DCSH) and Distribution Substation Manual (DSM/DSPM) (EDM# 34163616)