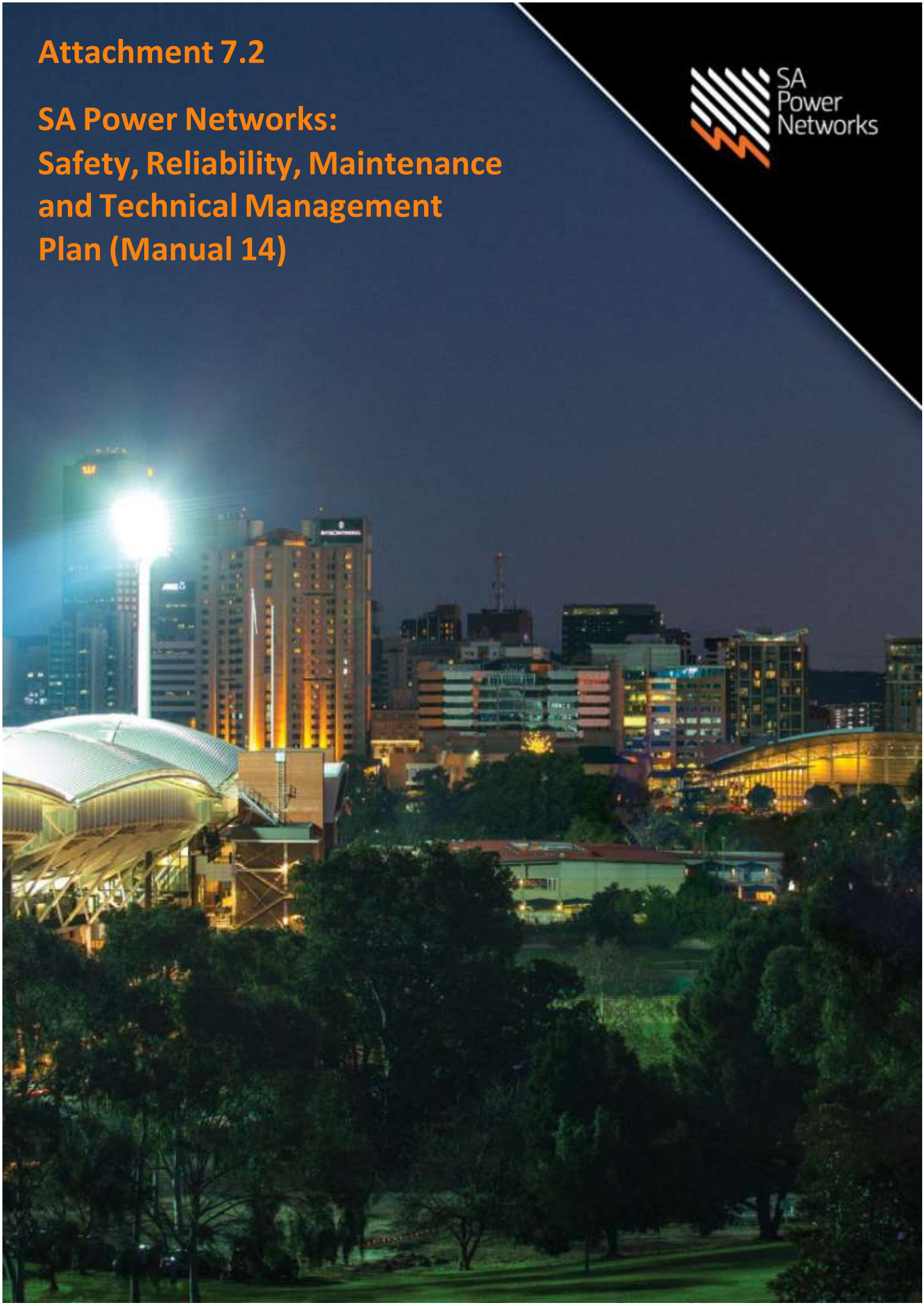
Attachment 7.2

SA Power Networks: Safety, Reliability, Maintenance and Technical Management Plan (Manual 14)



SAFETY, RELIABILITY, MAINTENANCE & TECHNICAL MANAGEMENT PLAN

Manual No. 14

Published: August 2014

SA Power Networks
www.sapowernetworks.com.au

OWNERSHIP OF STANDARD

Name of Standard / Manual: **Safety, Reliability, Maintenance & Technical Management Plan - 14**

Standard/Manual Owner - Title: **GM Network Management**

Name: **Doug Schmidt**

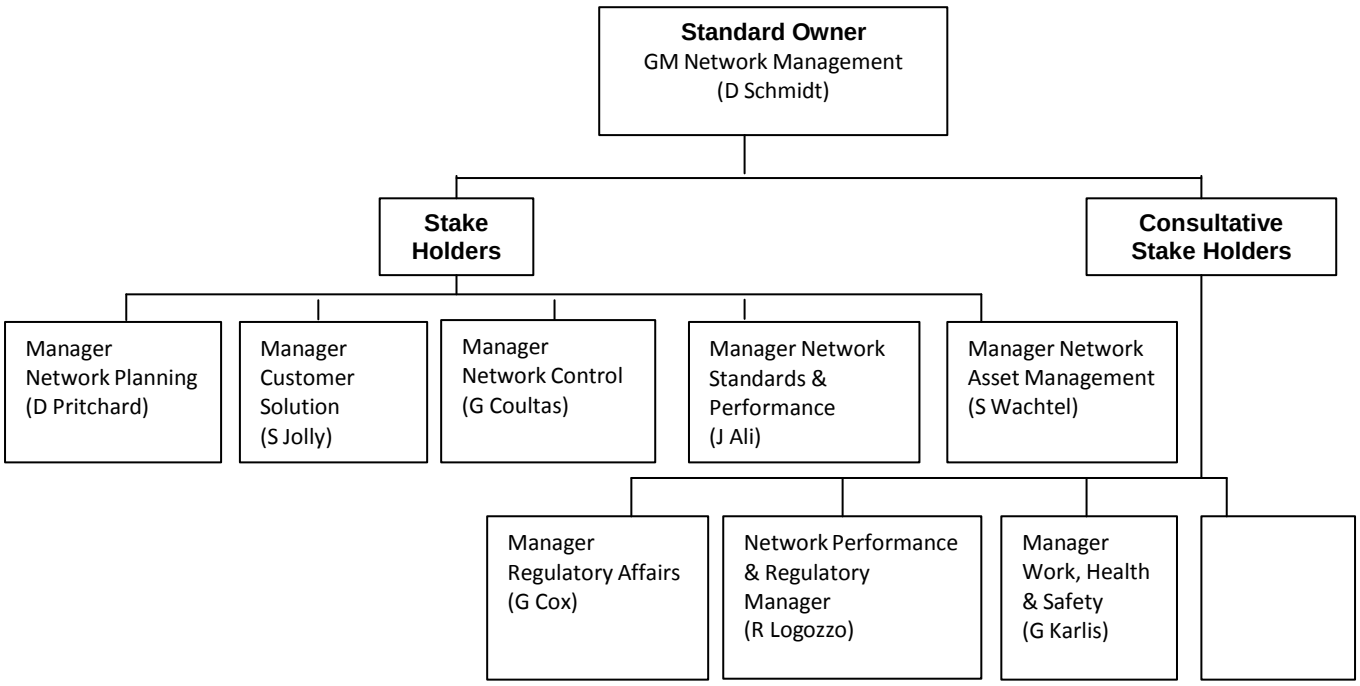
Standard Last Reviewed: February 2014

Standard Last Issued: August 2014

Review Period: 1 Year

Next Review Due: March 2015 *(ie. When the next review process is due to commence)*

STANDARD/MANUAL OWNERSHIP STRUCTURE



OTHER RELATED MANUALS

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COMMENTS

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Contents

Issue Status of Safety, Reliability, Maintenance & Technical Management Plan

Safety & Technical Title		Issue Number	Next Review By Date
Contents		Aug 2014	March 2015
Section 1	**About This Document**		
	About this document	Aug 2014	March 2015
Section 2	**SA Power Networks Systems**		
	SA Power Networks Document Hierarchy	Aug 2014	March 2015
	SA Power Networks Infrastructure	Aug 2014	"
	Policy Statements	Aug 2014	"
	Organisational Roles & Responsibilities	Aug 2014	"
Section 3	**Safety and Technical Operations Management**		
	Management Framework	Aug 2014	March 2015
	Work Instructions	Aug 2014	"
	Network Operati ons Centre	Aug 2014	"
	Skills and Accreditation	Aug 2014	"
	Quality of Supply (Voltage Variations)	Aug 2014	"
	Substation Access	Aug 2014	"
	Network Directives	Aug 2014	"
	Procedures following an Accident	Aug 2014	"
	Work Health Safety and Welfare	Aug 2014	"
	Safety Management – Job Folders/Job Sheets/Safe Work Method Statements and WHS Management Plans	Aug 2014	"
	Work Health and Safety Management – Hazard Logs	Aug 2014	"
	Work Health and Safety Management – Workplace Audit & Observations	Aug 2014	"
	Work Health and Safety Intranet Site and Best Practice Manual	Aug 2014	"
	Incident Reporting Procedures	Aug 2014	"
	Switching Control	Aug 2014	"
	Emergency Response Manual	Aug 2014	"
	NM Risk Management Committee	Aug 2014	"
	Centralised Asset Mapping System	Aug 2014	"
	Bushfire Risk Management	Aug 2014	"
	Community Education	Aug 2014	"
	Safety Management - Contractors	Aug 2014	"
Section 4	**Safety and Technical Maintenance Management**		
	Management Framework	Aug 2014	March 2015
	Network Maintenance Group	Aug 2014	"
	Network Maintenance Manual	Aug 2014	"
	Vegetation Management	Aug 2014	"
	External Reviews	Aug 2014	"
	Asset Performance Review Committee	Aug 2014	"
	Substation Inspection	Aug 2014	"
	Distribution System Inspection	Aug 2014	"
	Service Performance Scheme (SPS) Steering Committee	Aug 2014	"

Safety & Technical Title		Issue Number	Next Review By Date
Section 5	**Safety and Technical Construction Management**		
	Management Framework	Aug 2014	March 2015
	Purchasing and Contracts Equipment Specifications	Aug 2014	"
	Construction Manual – E Drawings	Aug 2014	"
	Construction Compliance Auditing	Aug 2014	"
	Technical Standards	Aug 2014	"
	Field Services Commissioning Procedures	Aug 2014	"
	Plant and Tools Maintenance	Aug 2014	"
	Industry Participation	Aug 2014	"
	De-Commissioning of Electricity Assets	Aug 2014	"
Section 6	**Safety & Technical Performance Indicators**		
	Work Health and Safety Management Indicators	Aug 2014	March 2015
	Reliability Management Indicators	Aug 2014	"
	Technical Management Indicators	Aug 2014	"
	General Information	Aug 2014	"
Section 7	**Safety, Reliability, Maintenance & Technical - Specific Standards Compliance**	Aug 2014	March 2015
Section 8	**Generation Assets (Kingscote Standby Power Station)**	Aug 2014	March 2015

REVISION DETAILS

Section Number	Description	Issue Number
ALL	Complete review of all Sections	July 2008
ALL	Complete review of all Sections	Dec 2009
ALL	Complete review of all Sections	Dec 2010
ALL	Complete review of all Sections	Nov 2012
ALL	Change of name from ETSA Utilities to SA Power Networks only. No other content of this manual has been altered.	Jan 2013
ALL	Complete review of all Sections	Aug 2014

1. ABOUT THIS MANUAL

Contents

1.1 About This Document

1.1.1 What this document is about.

This document details the management framework, key procedures and associated performance indicators for the Safety and Technical management of SA Power Networks electricity infrastructure through it's life cycle from design, construction, operation, maintenance, and alteration.

1.1.2 Who this document is for.

This document is designed for use by the South Australian Technical Regulator, Essential Services Commission of South Australia and SA Power Networks management. It lays out the safety and technical compliance management strategy agreed between the South Australian Technical Regulator and SA Power Networks in compliance with the Regulation under Electricity Act 1996 and Section 8 of the SA Power Networks Distribution License.

1.1.3 How to use this document.

The document is divided into sections each of which contains a brief description of activities applied to the SA Power Networks electricity infrastructure. This includes description of the major risk areas encountered and the management framework explaining the basic approach and philosophy for mitigating those risks. Each section also contains the key processes used in the organisation to implement the philosophy.

The main sections are as follows:

- Section 1 - About this Document
- Section 2 - SA Power Networks
- Section 3 - Management of Operations
- Section 4 - Management of Maintenance
- Section 5 Management of Construction
- Section 6 - Performance Indicators
- Section 7 - Specific Standards Compliance
- Section 8 - Generation Assets (Operational Management)

1.1.4 Related documents.

Other documents which have some relationship to this manual are:

- South Australian Electricity (General) Regulations.
- **NB:**
  This Safety, Reliability, Maintenance & Technical Management Plan does not cover the off-grid areas covered in the addendum to SA Power Networks Distribution Licence ie Aboriginal Lands and RAES towns, as each of these is covered by a specific separate plan which is linked to the contract of engagement by the asset owner.

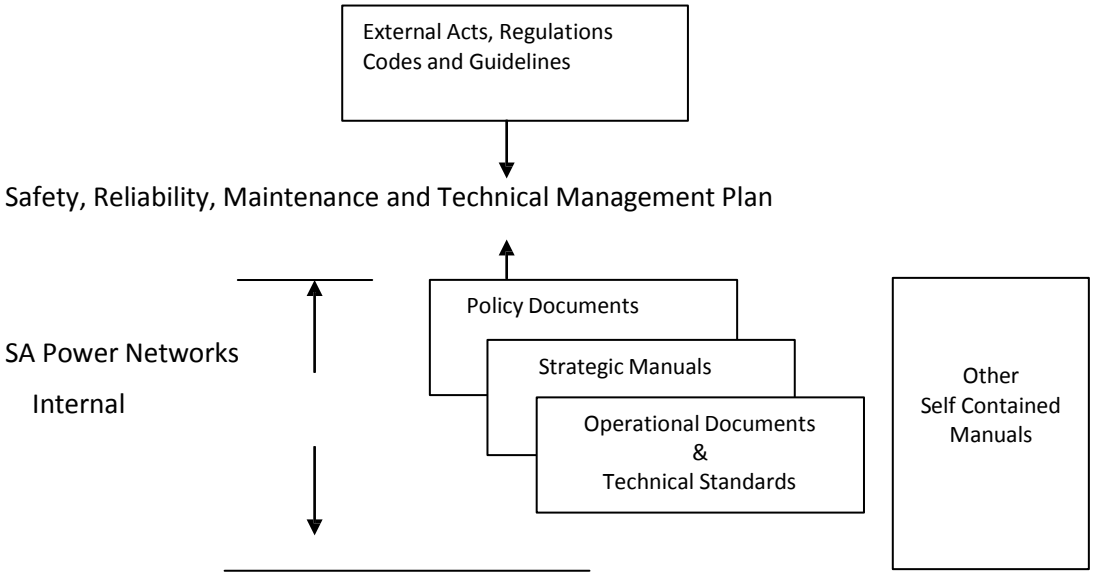
2. SA POWER NETWORKS SYSTEMS

Contents Section

2.1 SA POWER NETWORKS DOCUMENTS HIERARCHY

Hierarchical Categories

SA Power Networks maintains a suite of Policies, Directives, Manuals, Technical Standards, Guidelines, Procedures and Processes. Dependant upon the nature of the document, each is classified under one of four major categories. Separate to these internal SA Power Networks documents sits the external Acts, Regulations, Codes and Guidelines. The SA Power Networks Safety, Reliability, Maintenance and Technical Management Plan exists as a document that addresses the compliance of the internal documents with the external. The diagram below shows the separate categories as well as the hierarchy of the internal categories from the highest to the lowest in descending order.



Naturally the technical detail included in the documents increases toward the lowest category. Some manuals, such as the Bushfire Risk Management Manual, are specifically intended to be used without the need to refer to any other manuals and consequently contain policy, strategy, other self contained manuals and procedures pertaining to specific subjects. A description of each category of documents is given below.

Policy Documents

These documents are aimed at providing high level direction on clearly defined work related issues. They guide in the business decision making process. The content of the document ensures that the planned direction embraces the general goals of the business.

Strategic Manuals

These manuals describe the management, maintenance, inspection and emergency plans for work related topics. Each specifically describes how the process will be conducted and why. They are a high level standard for the initiation, conduct and completion of core business activities.

Operational Documents

These documents detail the business processes that must be followed to complete works or engage in any area of the business that must comply to company standards. They are the lowest level document and as such provide the most detail including step by step operations in some instances.

Document Classification

External Acts, Regulations, Codes & Guidelines

- Electricity Industry of South Australia Acts & Regulations (No. 10).

Safety, Reliability, Maintenance & Technical Management Plan (No. 14).

Policy Documents

- Network Directives (No. 7)
- NM Asset Management Plan (No. 15)
- Best Practice WH&S Manual

Strategic Manuals

- Bushfire Risk Management Manual (No. 8)
- Network Maintenance Manual (No. 12)
- Emergency Response Manual (No. 13)
- Pricing Reference Manual (No. 17)
- Network Tariff & Negotiated Service Manual (No. 18)
- Switching Manual (No. 31)

Operational Documents

- Line Inspection (No. 11)
- Substation Inspection (No. 19)
- Power Quality (No. 24)
- Facilities Access (No. 26)
- Substation Design (No. 28)) *28 & 29 Progressively being superseded by*
- Substation Construction (No. 29)) *Substation Standards Manual (No. 31).*
- Substation Maintenance (No. 30)
- Customer Connections – Service & Installation Rules (No. 32)
- Substation Standards (No. 35)
- Vegetation Management Manual (No. 37)

Technical Standards:

- Trenching/Conduit Standard Underground Distribution Cable Network (TS085)
- Construction Standard Underground Cable Networks (TS087)
- Electrical Design Standard Underground Cable Networks (TS100)
- Public Lighting Standard for Overhead & Underground Networks (TS101)
- Easement Standard Distribution Networks (TS102)
- Test Standard Underground Cable Networks (TS105)
- Overhead Line Design Standard, Trans & Dist. System (TS107)
- Technical Standard for Distribution Transformer Rooms (TS108)
- Earthing of the Distribution Network (TS109)
- Cable Standard for 66kV Underground Cable (TS110)
- Installation of CCTV Equipment on SA Power Networks Poles and Lighting Columns (TS116)

Distribution Construction Drawings:

- Aerial Bundled Cable / Insulated unscreened conductor (No. 1)
- 33kV, SWER, 66kV, 132kV (No. 2)
- Overhead Distribution (No. 3)
- Underground Distribution (No. 4)
- Cable Jointing (No. 4A)
- Public Lighting (No. 5)
- Switching Operators Handbook (No. 6)
- Quality Management System Procedures

Other Self-Contained Manuals

- Environmental Management Plan.
- Environmental Management Plan – Kingscote 6MW Standby Power Station Kangaroo Island:
  - Kingscote Power Station Operating Procedures Overview
  - Kingscote Power Station Routine Operating & Maintenance – Site Inspections & Operating Procedures
  - Kingscote Power Station NOC Operating Procedures Overview
  - Kingscote Power Station Bulk Fuel Delivery Procedures

2.2 SA POWER NETWORKS INFRASTRUCTURE

Distribution Assets

The SA Power Networks Distribution network is a lightly meshed system, serving approximately 841,218 customers and supplying the populated areas of the State of South Australia.

Distribution Lines

The distribution system in South Australia operates at 50 Hz and has a total of 87,999 circuit kilometres of power lines operating at 132 kV, 66kV, 33kV, 19kV - SWER, 11kV, 7.6kV and 400/230 Volts (LV). The lengths of lines for each voltage are given in table below:

Circuit kilometres of Line

Voltage	Overhead Lines	Underground Cables
132kV	11	0
66kV	1,435	48
33kV	3,950	115
19kV SWER	29,088	59
11kV (& 7.6kV)	17,725	3,842
LV	18,968	12,758
Total	71,177	16,822

The distribution network (basically all 66kV and below lines) has been planned and built over the past 60 years and connects the generating resources via the ElectraNet transmission grid and major load centres into a lightly meshed power grid.

Interfaces between generation, transmission and distribution assets have been clearly defined and documented.

Substations

The 404 substations included in the distribution network are primarily of air insulated outdoor construction with some indoor metal clad switchgear. Some distribution substations are within the same fenced areas as ElectraNet SA substations. The number of substations and switchyards is shown in table below:

Number of Substations

Voltage	**Shared Substations**	**Substations not shared**	**Total**
275kV	0	0	0
132kV *	1	1	2
66kV	17	128	145
33kV	26	182	208
11kV	4	44	48
3.3kV	1	0	1
Total	**49**	**355**	**404**

* Licence modified to allow for 132kV distribution assets

Substation layouts are predominantly single busbar configuration but also include some double busbar arrangements.

Distribution Transformers

There are a total of 73,629 distribution transformers on the distribution system ranging from 5kVA to 3,000kVA with a total installed capacity of about 8,407MVA.

Revenue Meters

There are about 1.115 million revenue meters (as at December 2013) which meter electricity supply to 243 HV and 840,975 LV customers. The distribution network comprises of predominantly electro-mechanical meters with magnetic suspension bearings and electro-mechanical time clocks where required. Poly phase meters are used in two and three phase installations and have provided a good operational performance which has not been unduly affected by lightning. All new meters installed are electronic.

Network Operation Centre

A Network Operation Centre is located at Keswick which provides supervisory control & data acquisition facilities (SCADA), to monitor system conditions at Distribution Zone substations, and manage day to day emergency supply restoration and operational matters on the network.

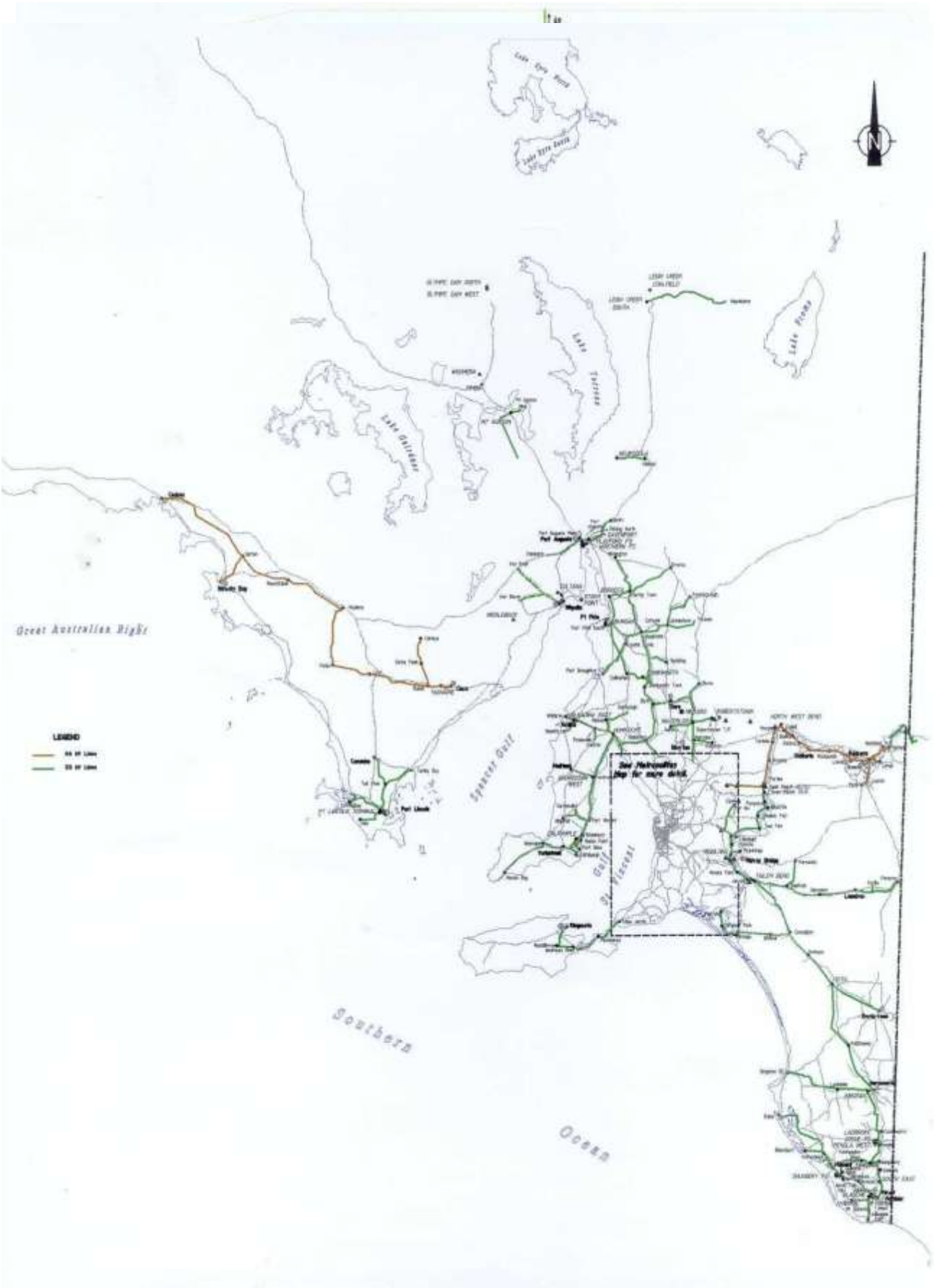
Generation Assets (Kingscote Standby Power Station)

The Kingscote Standby Power Station is located on Kangaroo Island at Brownlow adjacent to the Kingscote Substation. The generation assets provide an alternative source of supply to improve the reliability of supply in the event of loss of supply on Kangaroo Island and also for Network Voltage support.

ElectraNet Lines and Substations

The following summary lists assets owned by ElectraNet SA with which SA Power Networks interfaces:

- All 275kV and 132kV lines including radials (excluding the 132kV line from Middleback to Iron Duke – SD2001);
- The 66kV lines connecting National Electricity Market (NEM) Generators to grid connection assets, including the No. 1 (de-energised), No. 3 and No. 4 Torrens Island Power Station (TIPS) – New Osborne 66kV lines, the No.1 and No.2 New Osborne – LeFevre 66kV lines and the Berri - Monash 66kV line;
- Substation EHV equipment up to and including the secondary side circuit breakers of the step-down transformers (except when part of a GIS switchboard) ; and
- Substation land, buildings, auxiliary supplies etc, associated with the 275kV, 132kV and parts of the 66kV system as defined above.



2.3 POLICY STATEMENTS

2.3.1 Work Health & Safety

The SA Power Networks Board has promulgated its policy on Occupational Health, Safety & Welfare.

In accordance with the Policy the Chief Executive Officer is the Responsible Officer as defined in the Work, Health & Safety Act, 2012 who delegates day to day responsibility to line management and employees through Policy Directives and detailed procedures.

The Board and Chief Executive Officer have made a commitment that SA Power Networks will meet customer expectations while maintaining a workplace which is safe for all personnel. In doing so, SA Power Networks will:

- give priority to the health and safety of employees, contractors & the community before continuity of service;
- identify, assess and control workplace hazards;
- develop safety directions and work procedures when appropriate;
- comply with all relevant legislation, Australian Standards, Codes of Practice and relevant Industry Standards;
- consult with employees, health and safety representatives, committees and other relevant people on matters that may affect their health, safety, welfare and rehabilitation;
- provide a high quality rehabilitation service to employees; provide an effective and equitable claims management system;
- ensure that adequate funds and specialist resources are available to achieve continuous improvement in the health, safety, rehabilitation & claims management systems; and
- Manage safety in accordance with the belief that all injuries are preventable.

2.3.2 Asset Management

It is Board Policy that SA Power Networks manage its assets to a least-total-lifetime cost to produce optimal return while satisfying customer service needs and business performance requirements.

Assets are the tangible or intellectual property (either owned or leased) that provides service potential for future economic benefits and includes plant, equipment, infrastructure, land, systems, computer software, databases, stocks and spares.

In accordance with the Policy total lifetime costs shall be the total cost of owning or leasing and operating an asset throughout its life including:

- costs of ownership such as the costs of planning,
- design, construction, acquisition, maintenance, modification and disposal;
- costs of use such as the cost of energy and/or fuel, labour and materials; and
- support costs such as the cost of asset performance monitoring, data acquisition and data analysis.

In complying with Board Policy General Manager Network Management develops and implements asset management plans for various classes of asset.

2.3.3 Network Directives

To ensure that Board Policy is applied to specific areas of activity General Manager Network Management issues Directives which provide instructions to SA Power Networks personnel. Directives explain the purpose to be achieved, any sources of statutory or other mandatory requirements together with the steps to be taken to ensure compliance. Particular Directives contain forms or details of records to provide evidence of compliance.

The Network Directives addressing safety and technical matters are as follows:

Safety:

Working in Proximity to Power Lines	ND A1
Access to Confined Spaces by Contractors	ND A3
Clearances of Vegetation from Power Lines	ND A6
Flood Mitigation Clearances of Power Lines Over Flooded Areas	ND A7
Post Interruption - Emergency Vegetation Clearance	ND A8
Distribution Transformers Safe Working Precautions	ND V1
Serious Incident Response	ND F3

Technical:

Earthing of the Transmission and Distribution System	ND E1
Distribution Protection Philosophy	ND J1
Asset Refurbishment	ND J2
Construction of New Power Lines	ND J4
Inspection and Maintenance	ND M1
Standard Phasing Arrangements	ND O1
Installation of Customer's Wiring into SA Power Networks Equipment by Contractors	ND U1

2.3.4 Risk Management Framework

SA Power Networks will apply a risk management approach to all business activities in order to ensure that the organisation maximises opportunities while not exposing the business to unacceptable levels of risk.

This will include:

- a corporate Risk Management framework which will provide the structure and tools to be used by the organisation in order to achieve the desired outcomes;
- an annual risk profiling process;
- regular review of the risk profile data;
- regular report to the Risk Management & Compliance Committee providing an analysis of the risk profiling data;
- ongoing audits of the risk profile data including the control regimes to facilitate best practice; and
- the appropriate training in risk management techniques and the policy requirements, in accordance with the approved annual training plan.

SA Power Networks risk management framework will be in line with the Australian Standard on Risk Management AS/NZS ISO 31000.

Risk management considerations are to be incorporated into the planning, design, construction and operational phases of all activities.

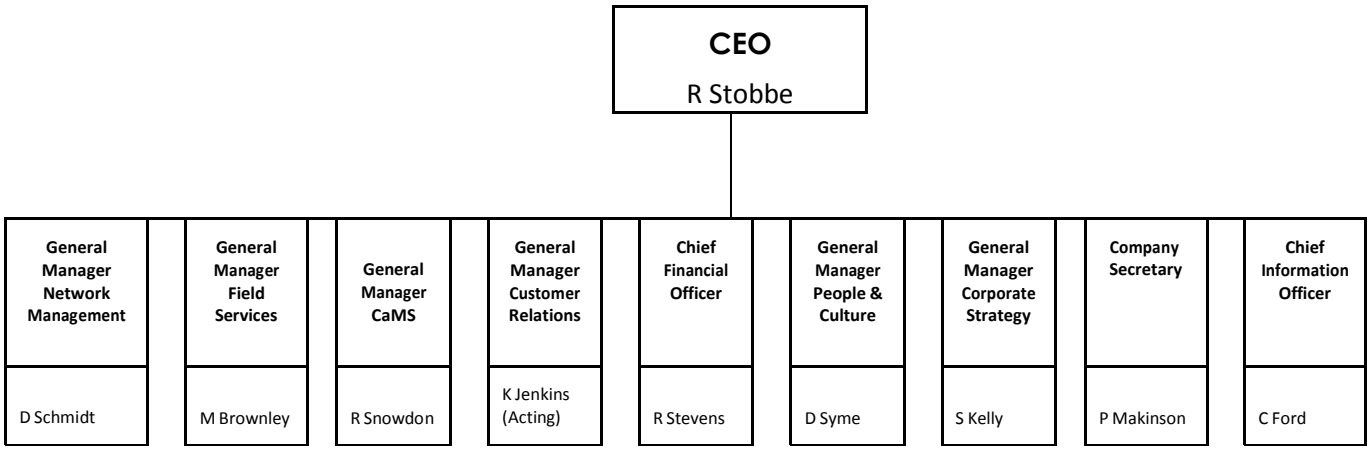
The management of risks will include the purchase of insurance to cover against potential losses associated with some risks.

2.4 ORGANISATIONAL ROLES AND RESPONSBILITIES

2.4.1 Structure

SA Power Networks has adopted an arrangement where the Network Management Group is responsible for the customer interface and specification of works and Field Services is responsible for the carrying out the work in the most cost effective manner. Service support to these two groups dealing with the electricity infrastructure is provided by Services, Customer Relations and Corporate groups.

This organisational structure is shown below:



2.4.2 Responsibilities

Office of the Chief Executive Officer is responsible for the following functions:

- Strategic Planning
- Corporate Communications
- Internal Audit

General Manager Network Management is responsible for the following functions:

- Planning the networks;
- Customer connections, customer management, management of customers quality of supply
- Inspection, maintenance and refurbishment of the networks
- Network operations and control
- Asset information and data records
- Engineering standards, technical standards and manuals
- The development of business opportunities;
- Meeting Customer Service Reliability Performance & Standards
- Identification and implementation of Demand Management issues
- Vegetation Management

General Manager Field Services is responsible for the following functions:

- Maintenance and restoration of Supply
- Engineering and design
- Network construction
- Customer connection
- Work methods
- Pole Construction
- Transformer and Fleet Workshops
- Supply chain and procurement

Chief Financial Officer is responsible for the following functions:

- Financial Management
- Capital Investment
- Management Reporting
- Inventory Control
- Fleet Management
- Taxation and Treasury
- Statutory Report

General Manager People & Culture is responsible for the following functions:

- Human Resources Management
- OH&S Services
- Environmental Management
- Learning & Development
- Property Services

General Manager Corporate Strategy is responsible for the following functions:

- Regulatory Management
- Regulatory Price Determination Submissions
- The SA Power Networks representative for liaising with the Essential Services Commission of SA and the Office of the Technical Regulator
- Customer Network Pricing
- Sales Forecasting
- Innovation & Business Improvement
- Strategic Planning

General Manager Customer Relations is responsible for the following functions:

- Customer enquiries and fault reporting complaint management and customer liaison
- Guaranteed Service Level payments
- Connection Services
- Business Improvement and Planning
- Revenue Management

Company Secretary is responsible for the following functions:

- Risk & Insurance
- Legal

Chief Information Officer:

- Information Technology
- Information & System Security

3. SAFETY and TECHNICAL OPERATIONS MANAGEMENT

Contents Section

3.1 MANAGEMENT FRAMEWORK

Activity

SA Power Networks operates electricity infrastructure to ensure that:

- The electrical system is in a stable condition at all times
- Quality of supply is maintained to customers
- Operational risks and hazards are identified and managed
- The electricity infrastructure is secured to prevent unauthorised access
- Response to the risks presented by accidents and incidents involving electricity infrastructure is adequately and timely

Major Risks Areas

The major risk exposures which SA Power Networks considers when operating electricity infrastructure are associated with:

- Safety of SA Power Networks staff
- Safety of the public and environment
- Non compliance with Legislative and Regulatory requirements
- Reliability and damage to plant

Management Framework

In order to control operational aspects of SA Power Networks electricity infrastructure and provide assurance that Legislative, Regulatory and Business requirements have been met, a framework of procedures has been developed.

The operation of the electricity infrastructure is carried out in accordance with the Corporate Policies for Work Health and Safety (WHS) and Directives authorised by General Manager Network Management.

To comply with these mandatory requirements, procedures have been developed for:

- Providing clear direction to ensure compliance with regulatory and business requirements
- Ensuring sufficient management attention is given to risk management as part of normal operations
- Identifying and developing Internal Best Practice in WHS
- Providing effective consultation with SA Power Networks staff on WH&S matters;
- Safe selection and operation of plant and equipment
- Providing safe access to electricity infrastructure for approved work by user of the Job Folder system which formalises briefing of personnel who perform work on the hazards identified, the risk and the means to be adopted to control them
- Ensuring that personnel utilise the Hazard Log Process when hazards are identified during the course of their work which ensures that risks are reviewed and appropriate management actions carried out
- Incident and service complaint investigations and the monitoring of effective corrective actions

- Identifying initial infrastructure asset problems and developing solutions and strategies for monitoring and improving them
- Notifying the Office of the Technical Regulator when third parties create an unsafe situation by not complying with the requirements of the Electricity Act & Regulations
- Dealing with third parties undertaking earthworks in close proximity to SA Power Networks assets to minimise the risk of damage (underground assets) or structural instability (overhead assets)
- Managing third party access and works within registered easements

3.2 WORK INSTRUCTIONS

3.1.1 Risk

Inconsistent standards and work practices adopted when constructing and maintaining SA Power Networks infrastructure.

3.1.2 Purpose

Field Services is the main provider of construction and maintenance services to SA Power Networks.

The risk of inconsistent standards and work practices is managed by the specification/design/development and provision of Safe Operating Procedures for all personnel involved in constructing and maintaining SA Power Networks electrical infrastructure; this includes Field Directives, Job Safe Work Procedures, Substation Maintenance Instructions and Job Safe Work Methods.

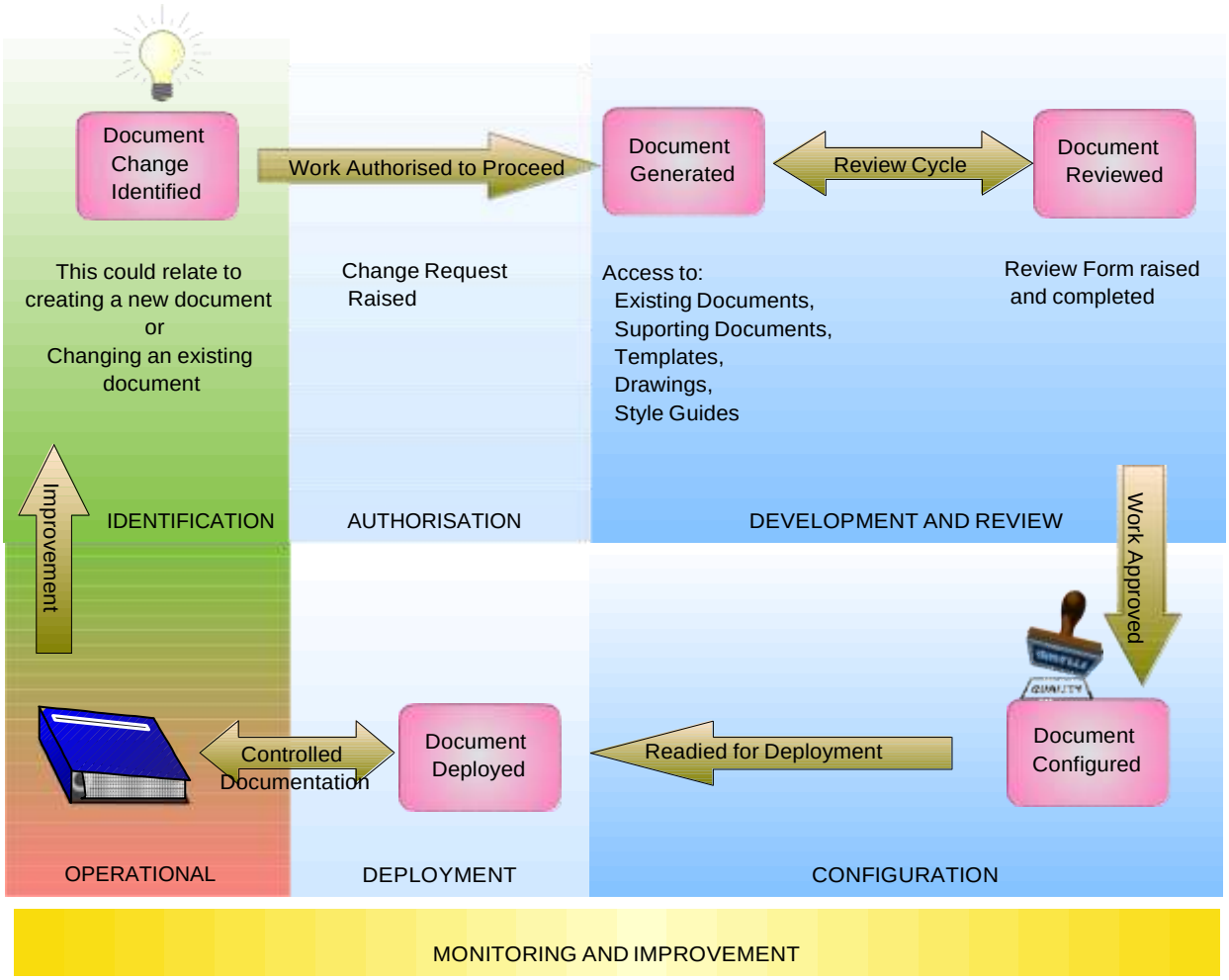
On behalf of Field Services, Engineering & Technical Services manages the specification/design/development of Safe Operating Procedures for Field Services excluding Substation Maintenance Instructions (SMIs).

3.1.3 Description

SA Power Networks Field Services maintenance personnel, perform work to the following procedures and methods:

- Field Directives.
- Bare Hand Live Line Manual – High Voltage.
- Transmission Dead Line Manual.
- Glove & Barrier Live Line Manual.
- Insulated Stick Live Line Manual.
- Drawings that specify standards of construction (including E-Drawings).
- General Job Safe Work Procedures.
- Specific Job Safe Work Methods that have been prepared for each specialised activity.
- Substation Installation, Commissioning & Maintenance Instructions.

3.1.4 Monitoring and Improvement Process



A full list of Job Safe Work Procedures can be found on the Field Services intranet site.

http://intranet/cams/jswp/jswpindex.htm

3.2 NETWORK OPERATIONS CENTRE

3.2.1 Risk

Safety and reliability of supply may be at risk should the Network Operations Centre (NOC) personnel fail to adequately and effectively:

- Monitor and manage network operations;
- Set priorities, coordinate and control field response crews in switching throughout the network.
- Provide technical direction on network operations, including efficient supply restoration; and
- Po-actively serve customers.

3.2.2 Purpose

The Network Control branch is responsible for controlling all operational activities on the SA Power Networks network to ensure compliance with SA Power Networks switching practices and procedures.

The branch manages requests from internal and external Switching Operators for access to the SA Power Networks network to undertake construction and maintenance work of SA Power Networks plant and equipment. Further, the branch also manages requests by third party contractors to isolate the network for them to work on third party electrical plant and equipment connected to the network, or non-electrical work within the clearances specified in the Regulations to the Electricity Act.

The NOC coordinates switching on the SA Power Networks network, either directly or via ElectraNet under a Service Level Agreement.

3.2.3 Description

Supply problems are identified through calls from customers to the Call Centre or through supervisory alarms received by the NOC Controllers. These supply problems are recorded in the Outage Management System (OMS) and then dispatched by NOC Dispatchers to field crews. Jobs are prioritised based on criteria including the nature of the job and the number of customers affected.

The HV controllers direct field crews during the supply restoration process:

(a) Satisfy strict WH&S audit requirements;

(b) Their personnel are accredited to switch in the appropriate categories; and

(c) Contractual arrangements are signed up to between the Contractor and SA Power Networks.

3.3 SKILLS AND ACCREDITATION

3.3.1 Risk

Employees and contractors performing work on the SA Power Networks infrastructure may not perform the work to the required levels of technical competence and safety.

3.3.2 Purpose

The purpose of this section is to identify the typical procedures and programs which ensure that employees are adequately trained and accredited for their work, and that contractors demonstrate a similar level of skills and competency.

Programs are designed to ensure that:

- Employees and contractors understand the WHS and electrical safety requirements associated with SA Power Networks electricity infrastructure work.
- Competency is demonstrated and maintained for the required level of safety and work to be performed.
- The workplace and work practices are sufficiently supervised, audited and observed to ensure satisfactory levels of competency are demonstrated and maintained.
- Adequate records are maintained to demonstrate that the level of skill and competency of the SA Power Networks workforce meets the required standards.

3.3.3 Description

SA Power Networks ensures that only personnel who have completed mandatory components of training are allowed to work on its electricity infrastructure. Mandatory components include:

- Recognised Trade Skill apprenticeship or a period of certified training;
- Licence to drive a motor vehicle;
- Senior First Aid;
- Knowledge of the WHS Act and Regulations;
- Hazard identification Assessment & Control;
- Rescue from Heights;
- EWP escape and victim rescue;
- Substation Access; and
- Live LV Rescue.

In addition, further training may be provided to meet the specific requirements for working on various parts of the electrical system or particular assets. Note that, for some highly specialised positions, some of these components may be mandatory.

- Live Line working;
- Glove and Barrier working;
- HV Switching;
- Fire Fighting;
- Confined spaces;
- Rescue from Heights;
- Manhole rescue;

- Work zone traffic management;
- Road Worker Safety training;
- Slinging techniques/material handling for cranes;
- Crane proficiency;
- EWP Awareness;
- Borer/Bobcat awareness;
- 4WD Training;
- Manual Handling;
- Hazard identification Assessment & Control;
- Environmental Training;
- Explosive Power tools;
- Knowledge of the WH&S Act and Regulations; and
- Bushfire Risk Management Manual briefing.

An inventory of all skills and accreditation of all personnel is maintained in SAP and other databases. Where training has a period of currency, the expiry date is recorded in the relevant database and an employee and their leader are notified prior to expiry of that qualification so that refresher training may be arranged.

Depending on the duties performed, personnel required to work in Substations may receive training selected from the following:

- First Aid.
- Slinging techniques.
- UV protection.
- Use of Personal Protective Equipment.
- Use of Substances & Chemicals.
- Bushfire Regulations.

It should be noted that access to Substations by SA Power Networks personnel and contractors is controlled, in accordance with Section 3.5 of this Manual. Substation gate keys are only issued to personnel who have received the required level of training and demonstrated the required competency.

To achieve the required level of accreditation to access the electricity infrastructure and perform work, all personnel undertake specific training and competency assessment. Training plans consisting of theory and practical competency assessments are developed to meet individual work and personal development needs.

To achieve accreditation students are required to:

- verbally demonstrate a comprehensive understanding of all tasks;
- achieve correct answers to at least 80% of the questions;
- including correct answers to specific mandatory questions; and
- By Observation: Achieve compliance with ESAA codes, ESI National competency standards and Industry Award standards.

Adequate supervision and observation is provided to ensure that the required level of skill and competency are demonstrated and are in accordance with other sections of this manual.

3.4 QUALITY OF SUPPLY (VOLTAGE VARIATIONS)

3.4.1 Risk

Voltage variations result in SA Power Networks failing to meet its regulatory obligations.

3.4.2 Purpose

The purpose of this section is to identify how SA Power Networks ensures that regulatory requirements for Quality of Electricity Supply are met. Section 7 lists the applicable Australian Standards. This section identifies how customer complaints of voltage variations are investigated and timely corrective actions taken.

3.4.3 Description

SA Power Networks distribution design and purchase specifications ensure that supply voltage and utilisation voltage ranges comply with the appropriate Australian Standard.

Voltage monitoring on the electrical distribution system is achieved by automated voltage recording in SCADA and temporarily installed equipment.

Enquiries or complaints relating to quality of electrical supply (low voltage, high voltage, flicker, surges and sags and harmonics) are managed by the Quality of Supply group according to a documented Procedure. The Network Manager Quality of Supply is responsible for the content of this Procedure, its periodic review and implementation. Complaints received from customers at the SA Power Networks Call Centre, are immediately recorded as a Quality of Supply (QS) Notification. Field Services (FS), Customer Relations (S) or Network Management (NM) personnel then initiate an investigation of the customer's complaint. Generally, if the problem is not resolved immediately on site, test equipment is installed to monitor the electrical supply at the customer's premises.

Based upon the results of the investigation, SA Power Networks takes the following action:

No Remediation Required

(Service in accordance with the Distribution Code and Technical Regulations as amended from time to time).

- Customer is advised.

Minor Remediation Required

(Service in accordance with the Distribution Code and Technical Regulations as amended from time to time).

- Customer is advised of work required and expected time (current target: 80 business days) for completion. Remediation work is appropriately prioritised and completed by FS. Customers are advised following completion of remedial works.

Major Remediation Required

(Service in accordance with the Distribution Code and Technical Regulations as amended from time to time).

- Customer is advised that significant works are required. Remediation work is designed and financial approval sought. The work is then appropriately prioritised by Network Management and completed by FS, who provide an expected completion date. Customer is advised of work required and an expected time (current target: 12 months) for completion, and is advised when remedial work is complete.

3.5 SUBSTATION ACCESS

3.5.1 Risk

Access by untrained people to HV switchyards may result in personal injury, damage to electrical infrastructure, loss of supply and quality of supply.

3.5.2 Purpose

The purpose of Substation Access procedures is to control access to substation sites. Substations contain high voltage electrical plant and equipment for the distribution of electricity which may be hazardous to untrained persons. Personnel are required to access these sites and equipment therein for operational, maintenance and construction purposes.

3.5.3 Description

Substation Access controls involved guidelines for:

- The minimum requirements for the induction of personnel to the Substation site, equipment and procedures;
- Approach limits and safety practices to be observed when in substations;
- Procedure to authorise contractors to access substations and the responsibilities of the parties involved; and
- Defining the role and responsibility of a designated Safety Observer in HV substations.

Training is used to skill personnel to:

- Induct non-accredited personnel for substation access;
- Maintain high voltage plant in substations; and
- Switch plant/equipment in substations.

Audit forms are used for:

- Contractor substation access endorsement; and
- Validation of Contractor audit requirements.

Under these arrangements endorsed contractors and SA Power Networks employees with appropriate licences and accreditation are able to access Substations. Personal access keys and authorisation certificates are control mechanisms managed by Network Control.

Work performed in substations is controlled via the procedures detailed in the Switching Manual and field work procedures. The procedures include the production and checking of a Network Switching Request (NSR).

NOC Officers check and approve the NSR which is then converted to a Network Switching Programme (NSP).

The NSP includes the names of those personnel who are to perform the switching. They perform the switching, and in most cases, work on isolated, dead and earthed electricity infrastructure, as per processes detailed in the Switching Manual. However, work may be undertaken on energised plant and equipment as detailed in the SA Power Networks Live Line Manual.

When the switching is to be carried out by SA Power Networks personnel but the work is to be performed by contractors who are not authorised for switching, the NSP names the SA Power Networks Switching Officers who issue an Access Permit for the work. The SA Power Networks Switching Officers complete the steps in the NSP to isolate, prove dead and earth electricity infrastructure and so create the necessary safe work area. The Switching Officers on completion of the isolation, issue the Access Permit to the contractor.

On issuing the Access Permit, the SA Power Networks Switching Officers are required to ensure that the Contractor(s) and the Contractor's work party understand the limits of isolation. The SA Power Networks Switching Officers and Contractor sign the Access Permit on receipt and again on completion. The Contractor signs the Network Access Permit to relinquish it, thereby signifying that their work is complete, and that all tools and equipment have been removed and that the Contractor's personnel have withdrawn from the work zone.

3.6 NETWORK DIRECTIVES

3.6.1 Risk

Employees / Officers may not consistently comply with Corporate and Legislative requirements.

3.6.2 Purpose

Network Directives provide a clear direction to ensure compliance with regulatory and business requirements.

3.6.3 Description

The Network Directives Manual:

- Provides clear understanding of the business areas that are under the control of General Manager Network Management;
- Is used as a reference for documenting and facilitating the improvement in management instructions or policies/processes; and
- Provides one source of information that Network Coordinators and Managers can refer to when addressing a particular problem or complaint.

The General Manager Network Management is responsible for authorising the individual directives.

Managers who report to General Manager Network Management are responsible for the content of individual Directives assigned.

Manager Network Standards & Performance is responsible for documentation, review and update of the Directives.

3.7 PROCEDURES FOLLOWING AN ACCIDENT/INCIDENT

3.7.1 Risk

Assistance to the injured person is delayed, corrective actions not carried out to avoid recurrence, Regulatory, including SafeWork SA, Office of the Technical Regulator or Environmental Protection Authority reporting requirements not met in a timely fashion.

3.7.2 Purpose

To ensure that accidents/incidents are appropriately managed, reported, investigated, evidence retained and analysed in order to prevent recurrence.
Corporate mandates on accident/incident investigation are supported by directives which:

1. Detail the actions and responsibilities of all workers including SA Power Networks contractors who are involved in accidents/incidents, injuries and near misses.
2. Provide instruction on the preservation of evidence at sites of notifiable incidents such as a severe injury, illness or fatality or a dangerous incident.

3.7.3 Description

Network Directives and Work Health and Safety procedures provide the procedures for the investigation and reporting of near misses, injuries and incidents.

The procedures cover:

- Officers to carry out reporting and the timescales for completion.
- Advising Work Health and Safety Consultants and Work Health and Safety Representatives.
- The specific requirements for Notifiable Incidents such as serious injury or illness, dangerous incidents or accidents resulting in a fatality, admission to hospital etc.
- The immediate reporting of Lost Time and Significant Safety Incidents to Senior Officers and the Manager Work Health & Safety in person or by telephone.
- Responsibilities for ensuring that accidents/incidents sites are secured to prevent disturbance of evidence prior to a formal investigation.
- Responsibilities for the conduct of investigations.
- The urgent reporting requirements to the Technical Regulator and the Department of the Premier & Cabinet for accidents or incidents involving electric shock caused by the operation or condition of the electrical infrastructure.
- The recording of relevant details of all accidents/incidents and near misses in the SA Power Networks incident reporting and recording system - CURA.

The related documents upon which Network Directives are based are:

- SA Power Networks WHS Incident Notification and Investigation Procedure.
- Work Health and Safety Act and Regulations 2012.
- Electricity Industry of South Australian Acts & Regulations - Manual 10.

The procedures identified include reporting and to whom reports should be made according to the nature of the accident, incident or near miss of:

- what happened and where;
- the names of any witnesses;
- the involvement of any medical assistance;
- immediate actions taken;
- investigations and analysis of events to establish causes and prevent recurrence;
- assigning of responsibilities for corrective actions;
- entering of the information into the Departmental Hazard Register/Control system/CURA;
- sign off by WHS Consultant; and
- monitoring of corrective actions through the Control System/CURA by the Work Health and Safety Committee.

3.8 WORK HEALTH SAFETY AND WELFARE

3.8.1 Risk

Ineffective consultation between management and workers results in failure to manage risk to as low as reasonably possible (ALARP) a level.

3.8.2 Purpose

Work Health and Safety (WHS) committees provide a forum for management and workers to meet regularly to constructively discuss work health and safety issues.

Committee Role:

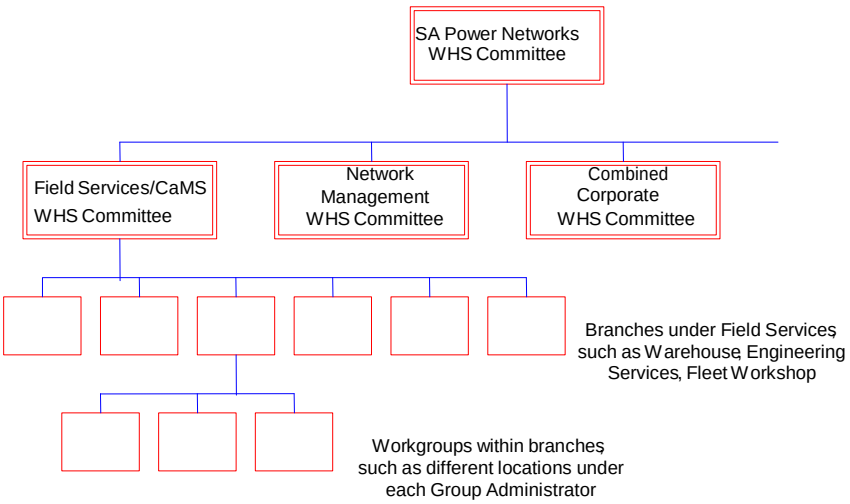
The SA Power Networks WHS Committee is used as the consultative body when determining and reviewing procedures and resolving WHS issues that affect the whole of the organisation.

Departmental WHS Committees are used to determine and review procedures as they impact on the department and resolve WHS issues impacting on individual departments.

3.8.3 Description

SA Power Networks has established a number of WHS Committees to maximise the effectiveness of consultation.

The flow chart below shows the relationship between the various WHS Committees within SA Power Networks.



WHS Committee Membership

The SA Power Networks WHS Committee consists of the Chief Executive Officer (chairperson), General Managers, elected work health and safety representative from each department and Apprentice representatives. The SA Power Networks WHS Committee meets every two months.

Departmental WHS Committees consist of the respective General Manager, Branch Managers and elected health and safety representatives from branches. These Committees meet at least every two months.

The Work Health and Safety Committees are designed to assist management with discharging responsibility for the provision of a safe place of work and safe work arrangements. Work Health and Safety Committees do not have the executive authority to commit resources to resolve a WHS issue but can make recommendations to management who have such authority. Work Health and Safety Committees will discuss and consider recommendations put to them from investigations and other WHS issues and in turn may recommend the assignment of responsibilities for ensuring that recommendations are implemented.

The Work Health and Safety Committees, through the formal production of minutes, monitor the progress of actions undertaken by management in response to their recommendations.

On occasions, management may report by personal presentation to the WHS Committee the outcomes of investigations. The committee may recommend the release of a 'Safety Alert' which is a bulletin notice used throughout SA Power Networks to draw attention to actual or potential hazard identified and the means of mitigating associated risks.

Work Health and Safety Representatives bring issues to the WHS Committee for debate and resolution by recommendation.

3.9 SAFETY MANAGEMENT – PROJECT FOLDERS/PROJECT SHEETS/SAFE WORK METHOD STATEMENTS AND WHS MANAGEMENT PLANS

3.9.1 Risk

Hazards not eliminated or controlled which may cause an injury or illness to workers.

3.9.2 Purpose

The purpose of Project Folders, Project Sheets, Safe Work Method Statements and Work Health and Safety Management Plans is to reduce the risk of injuries by managing hazards and in particular those which may pose a high level of risk. Once a hazard has been identified and the associated risk/s assessed it then can be eliminated or controlled so the hazard then poses less of a risk to personnel.

The Project Folder / Project Sheet as a tool, is used to formalise the pre-work briefing so that all workers on the job site understand the job, the associated hazards and the controls. This process heightens the awareness of all hazards and their control treatments so they are discussed as a routine part of the job. For any work meeting the regulatory definition of construction work, a Safe Work Method Statement is the main tool for managing hazards. A construction project, defined as construction work of over $250,000 in value, requires the principal contractor (which may be SA Power Networks) to prepare a Work Health and Safety Management Plan. SA Power Networks has one over arching Work Health and Safety Management Plan which, in combination with respective Project Folders and Project Sheets, discharges its construction work duties under the Work Health and Safety Regulations 2012.

3.9.3 Description

The Project Folder / Project Sheet assists leaders to fulfil their Work Health and Safety obligations in relation to hazard identification, risk assessment and control.

The Project Folder is used when projects are forwarded from a work initiator to a work group.

This includes:

- All pre-planned work; and
- Follow-up work resulting from breakdowns.

The project sheet is used when:

- The Project Folder may contain one or more tasks with a Project Sheet filled out for each task;
- Work groups use computer generated lists to work from (eg services / cross arm replacements); and
- A larger project has hazards associated with different jobs or tasks within the project (eg breaking the project into manageable steps, with a Project Sheet filled out for each step).

The Project Folder / Project Sheets are not required for short term work requiring minimal time on site and the construction of the equipment is not altered such as:

- Single light out's;
- Meter replacements; and
- Replacement of broken twist grip.

Workgroups undertaking these duties use a different WHS tool to manage the risks associated with multiple and repetitive small jobs. The Take 2/4 Safety Booklet risk assessment may also be used.

For emergency work such as that occurring during storms when conditions are changing rapidly, hazard assessments are carried out on the spot without the formality of completing a Project Folder / Project Sheet.

However, the follow-up work resulting from unplanned emergency breakdowns is placed in a Project Folder for completion.

A Safe Work Method Statement (SWMS) is completed before any construction work is undertaken that involves any high risk work as defined in the SA Work Health and Safety Regulations 2012.

The SWMS must:

1. identify the work that is high risk construction work; and
2. specify the hazards related to the high risk construction work and risks to work health and safety; and
3. describe how the risks will be controlled; and
4. describe how the risk control measures will be implemented, monitored and reviewed.

Construction projects require that a WHS Management Plan be prepared by the principal contractor to manage the WHS hazards associated with the project.

The WHS Management Plan will include:

1. the names, positions and health and safety responsibilities of all persons at the workplace whose positions or roles involve specific health and safety responsibilities in connection with the project;
2. the arrangements in place, between any persons conducting a business or undertaking at the workplace where the construction project is being undertaken, for consultation, cooperation and the coordination of activities in relation to compliance with their duties under the WHS Act and Regulations;
3. the arrangements in place for managing any work health and safety incidents that occur;
4. any site-specific health and safety rules, and the arrangements for ensuring that all persons at the workplace are informed of these rules; and
5. the arrangements for the collection and any assessment, monitoring and review of safe work method statements at the workplace.

SA Power Networks has developed an approach to SWMS and WHS Management Plans which is integrated into the Project Folders and Project Sheets. An over arching WHS Management Plan is also developed which covers all of our operations. Stand alone SWMS and WHS Management Plans for specific projects may also be developed particularly where required by clients.

3.10 WORK HEALTH AND SAFETY MANAGEMENT – HAZARD LOGS

3.10.1 Risk

Hazards not identified, assessed or eliminated or controlled which expose a worker or the public to a risk of an accident which may result in an injury.

3.10.2 Purpose

A system that records identified hazards and assigns responsibility to ensure the hazards are either eliminated or controlled.

3.10.3 Description

Hazard logs are designed to provide a formal recording mechanism to monitor the effective identification, assessment, control and review (close out) of hazards which have been identified. In addition the Hazard Logs provide a systematic common approach to highlighting, recording and prioritising unresolved hazards that may require a coordinated effort by more than one work group.

To strengthen supervisory accountability related to the management of identified hazards, outstanding hazard logs are recorded on a Departmental Hazard Log Register. The General Manager through the Departmental WHS Committee has the responsibility to ensure that hazards recorded on the hazard log are 'closed out'. Outstanding hazards are highlighted in the minutes of each Departmental WHS Committee.

The Hazard Log procedure is:

1. The Hazard Log should be filled out by the worker identifying the hazard, recording the hazard description and immediate temporary control measures.
2. The Hazard Log is then completed by the Work Group Leader from where the hazard exists to ensure permanent control measures are implemented.

IMMEDIATE ACTION should be adopted to control the hazard. This prevents the possibility of injury or damage while awaiting permanent control action (if applicable).

A hazard log is to be raised by the worker who identifies the hazard by filling in the HAZARD DESCRIPTION and what IMMEDIATE TEMPORARY CONTROL MEASURES are taken. The hazard must be RISK RATED (table on reverse side of original copy) to determine a priority to effect permanent controls.

SUGGESTED CONTROL MEASURES are to be selected by the Supervisor / work group leader in consultation with either the safety representative, the person who raised the hazard log and appropriately skilled people. The action taken to control or minimise the risk should be selected from the hierarchy of controls in the order listed below:

1. **ELIMINATE** the risk by REMOVING the hazard.
2. **MINIMISE** the risk of the hazard if it cannot be eliminated. There are a number of control options that can be used alone, or in combination, to minimise the risk. These could be SUBSTITUTION, MODIFICATION, ISOLATION, and ENGINEERING CONTROLS.
3. **BACK-UP CONTROLS.** The options could take the form of ADMINISTRATIVE CONTROLS or PERSONAL PROTECTIVE EQUIPMENT but neither should be regarded as or relied on as a long term primary risk control measure.

3.11 WORK HEALTH AND SAFETY MANAGEMENT – WORKPLACE AUDIT & OBSERVATIONS

3.11.1 Risk

Work practices not conforming to safe operating procedures are not observed meaning appropriate action is not taken causing an accident.

3.11.2 Purpose

To provide leaders with a formal system to identify, record and correct work practices which may cause an accident.

3.11.3 Description

The Audit and Observation procedure provides a tool for leaders to use to facilitate observations and audits of people working in any situation. All issues identified are discussed with the workers being audited as well as their leader or supervisor.

The following guidelines have been provided to all managers and leaders.

Managers' Notes for Auditing and Observing People

1. Make a time commitment in your diary for the visits allocated to each Leader, from the Departmental Schedule.
2. Audit an area of your responsibility and try to cover your entire area each 12 months.
3. Select activities which involve high risk work (as defined in the WHS Regulations). This could relate to the environment, equipment or inexperienced employees (eg apprentices).
4. If you observe any safety violation – NEVER pass it up – ALWAYS speak to the worker.
5. Always recognise workers who are working safely which will reinforce the need to do so.
6. Make a list of your observations, discuss them with the workers involved and then with their supervisor.
7. For each violation, follow up at a later date to check corrective actions have been implemented.
8. Use a combination of announced and unannounced, accompanied and unaccompanied audits as there is benefit in all approaches.
9. Questions to ask yourself while observing:
    - Is any one in danger?
    - What personal protective equipment (PPE) is required?
    - Is it in use?
    - Is it suitable?
    - Are the tools and equipment safe and suitable?
    - What condition is it in?
    - Are the tools improvised, modified or home made?

- What are the procedures?
- Do the people know them?
- What is the general housekeeping like?

10. When auditing and observing:
    - Stop when you first enter or arrive and observe the reaction and work lay out.
    - Decide where to start.
    - If things change when you entered or arrived, start there.
11. Speak to the workers after observing them and inform them about your observations and any corrections required.
12. Speak to the supervisor of the area and inform them of your observations and any corrections required. Do this only after discussing the issues with the workers.
13. Pass the record of your observations on to your manager.
14. Require your supervisor's observations to be passed on to you.

<u>Leaders' Notes for Auditing and Observing People</u>

1. Make a time commitment in your diary. A regular time is recommended. Do Not Change the Time for Anyone!
2. When observing watch for unsafe acts and conditions, ask what might happen unexpectedly?
3. Be inquisitive, look, listen and smell.
4. Use a questioning attitude; ask why, what if, how.
5. Recognise good performance.
6. React immediately to unsafe acts or conditions. **Correct them on the spot.**
7. When auditing:
    - Stop when you first enter or arrive and observe the reaction and work lay out.
    - Decide where to start.
    - If things change when you entered or arrived, start there.
8. Speak to the workers after observing them and inform them about your observations and any corrections required. Do this before leaving.
9. Make note for follow up in the future. This ensures the standard You Set is accepted.
10. Pass the record of your observations onto your manager.

3.12 WORK HEALTH AND SAFETY MANUAL & INTRANET SITE AND BEST PRACTICE MANUAL

3.12.1 Risk

A lack of understanding by workers about the safety standards to be achieved throughout SA Power Networks results in unaddressed risks.

3.12.2 Purpose

The Work Health and Safety Intranet Site sets out SA Power Networks Safety Management System documentation covering:

- Health, Safety and Rehabilitation Policy;
- Directives; and
- Procedures and Guidelines.

These standards form the foundation of SA Power Networks safe work practices.

3.12.3 Description

The WHS Branch Intranet site contains all relevant and required information on the organisation's safety management system. The safety management system policy, directives, procedures and guidelines are controlled documents.

A Best Practice Manual is a 'high level' publication which provides the reader with information about the expected safety standards to be achieved. It is not intended to replace any work instruction or procedure which will provide information on how a task is to be performed. Where appropriate, the responsibilities of the leaders and workers are provided.

An important feature of the Best Practice Manual is the references to internal documents and relevant legislation.

3.13 INCIDENT REPORTING PROCEDURES

3.13.1 Risk

That significant incidents go unreported, or insufficient information or inappropriate information is collected and results in inappropriate management strategies.

3.13.2 Purpose

To report incidents to internal and external customers of an emergency or otherwise significant nature.

Incidents in this category include:

- Injury (eg electric shock) to SA Power Networks personnel or third party person resulting from or associated with the SA Power Networks network;
- Supply interruptions to key customers;
- Power surges; and
- Low Reserve Conditions for National Electricity Market operations.

3.13.3 Description

When the NOC is advised of an incident, depending on its nature, the NOC advises the appropriate SA Power Networks management or field personnel of the details of the incident.

These personnel then respond accordingly, including for shock reports advising the Office of the Technical Regulator in accordance with the requirements under the Electricity Act (Clause 63) and Regulations (Division 4).

Field Crews are responsible for making field incidents safe electrically and then for returning the network to normal under direction from the Network Operations Centre, in accordance with the practices and procedures outlined in the SA Power Networks Switching Manual. Where a notifiable incident has occurred it is important that the incident scene is not disturbed except as required to make the situation safe and restore essential services.

The recording of relevant details of all incidents/accidents, injuries or near misses should be via the SA Power Networks incident reporting and recording system – CURA.

3.14 SWITCHING CONTROL

3.14.1 Risk

Safety of people, plant or reliability of supply is at risk if switching on the SA Power Networks network is not controlled or is not carried out in accordance with SA Power Networks Safe Switching procedures.

3.14.2 Purpose

All low voltage and high voltage switching operations on the SA Power Networks network is controlled in accordance with the policies and procedures detailed in the SA Power Networks Switching Manual and associated specific plant documentation.

The SA Power Networks Switching Manual is derived from the industry manual which was developed in conjunction with the Essential Services Commission of South Australia and other industry members.

3.14.3 Description

SA Power Networks Switching Committee is constituted to:

- Set and review the SA Power Networks Switching principles;
- The publication and distribution of the SA Power Networks Switching Manual;
- Setting guidelines for switching audits;
- Setting the process for operator training and certification including frequency for competency assessment; and
- Setting guidelines for incident investigation and promulgation of information regarding incidents to determine the integrity of switching practices.

All Switching Operators trained and authorised to switch on the SA Power Networks network do so in accordance with specific switching procedures controlled by the Network Operations Centre (NOC). Switching Operators are accredited to switch in specific categories and are issued a Switching Licence which details their accreditations. Before switching can proceed, requests for switching are checked, approved and scheduled by the NOC.

Network Control Manager is responsible for the procedures for obtaining approval to switch on the SA Power Networks network including endorsing contractors to switch on the network.

Manager Network Planning is responsible for procedures for endorsing contractors to work in substations.

Line Managers are responsible for ensuring their personnel are appropriately trained and refreshed (3 yearly) to obtain and maintain their switching licence.

The SA Power Networks Switching Committee is responsible for switching operations on the SA Power Networks network and for:

- Ensuring switching operations on the SA Power Networks network are carried out in accordance with legislative requirements and good industry practice;
- To develop and maintain processes to manage accreditation and authorisation of personnel for switching on the SA Power Networks network;
- To ensure protocols exist to manage the operating interface between SA Power Networks and other relevant South Australian electricity industry participants; and
- To develop and review policies relating the switching operations on the SA Power Networks network.

3.15 EMERGENCY RESPONSE MANUAL

3.15.1 Risk

1. Restoration of the network to a safe and stable state is uncoordinated.
2. The SA Power Networks network remains in an unsafe and unstable state for an extended period of time.
3. Customers deprived of electricity supply for significant period of time.

3.15.2 Purpose

This manual details the procedures and responsibilities for managing network emergencies.

The procedures detailed in the manual apply for network emergencies from initiation to cessation, including those emergencies that escalate to a State Emergency.

3.15.3 Description

The manual details the expected actions in response to major network events, including:

- The roles and responsibilities for the management of an emergency detailed in the *Network Emergencies – Roles and Responsibilities* document);
- Forecasting Emergency Response Levels;
- SA Power Networks operations as part of the State Emergency Organisation – Engineering Functional Services group;
- The prioritisation for restoration of supply;
- The procedures associated with a reportable environmental incident in accordance with the Environmental Protection Act.
- Escalation processes in response to the following emergency events[1]:
  - Storms;
  - Heatwaves;
  - Earthquakes;
  - KI Cable failure;
  - Load shedding;
  - System instability; and
  - Substation or Transmission line failure.
- NM Business Continuity Plan.

SA Power Networks preparedness

To test the effectiveness of SA Power Networks emergency preparedness, Emergency Exercises are carried out periodically.

The manual takes into account the requirements of the following Acts and Regulations:

[1] Actions for FDL Emergency events are described in the Bushfire Risk Management Manual.

Acts and Regulations

- State Emergency Management Act.
- Engineering Functional Services Plan.
- Electricity Act and Regulations (Manual 10).
- Environmental Protection Act and Regulations.

The manual also takes into account the following SA Power Networks Documents:

- Bushfire Risk Management Manual (Manual 8).
- Network Directives Manual (Manual 7).
- Switching Operators Handbook (Manual 6).
- SA Power Networks Switching Manual (Manual 31).

3.16 NETWORK MANAGEMENT RISK MANAGEMENT COMMITTEE

3.16.1 Risk

Insufficient management attention is given to risk management as an integrated aspect of normal operations.

3.16.2 Purpose

Because the essence of network management may involve putting assets at risk, risk assessment is an important function of asset management. In most organisations an intuitive approach is used to assess risk. The purpose of the Network Management Risk Management Committee is to steer the Network Management business towards:

- Fostering the application of sound risk management principles to asset management.
- Developing a formal risk management framework based on recognised systematic standards.

3.16.3 Description

The Network Management Risk Management Committee is responsible for:

- Monitoring compliance with the SA Power Networks Risk Management Policy and Directives;
- Overseeing the development of awareness for risk management in the Network Management business;
- Reviewing the Network Management business;
- Utilising risk identification processes;
- Developing risk management strategies;
- Reporting risk management plans;
- Addressing the findings of risk management reviews; and
- Overseeing compliance with Network statutory requirements.

The General Manager Network Management is responsible for reviewing the composition of the committee on an annual basis and the appointment of members to the Committee.

Manager Network Standards & Performance is responsible for ensuring that the charter of the committee is reviewed periodically to ensure relevance to current business requirements, and for seeking approval for any proposed changes to the charter.

Minutes of the Risk Management Committee are submitted to the Chairman of the Network Management Team (NMT) as soon as practical following each meeting, and selected items are presented to the NMT for decision.

If called upon, the Manager Network Standards & Performance will attend the NMT and report on matters which are relevant to, or affect, the duties and activities of the Network Management Risk Management Committee.

Recommendations accepted by General Manager Network Management are allocated for implementation at the NMT and are incorporated into normal management business.

In addition to any actions identified above, Manager Network Standards & Performance receives requests to facilitate risk assessment workshops with project teams and individuals as the means of developing a risk management culture.

Network Management Risk Management Committee Membership is selected from SA Power Networks as follows:

Role	**Title**
Chairman	General Manager Network Management
Member Network	Manager Network Planning
Member Network	Manager Network Control
Member Network	Manager Network Standards & Performance
Member Network	Manager Network Asset Management
Member Network	Manager Customer Solutions
Member for Field Services	General Manager Field Services (or delegate)
Member Corporate	Manager Risk Management
Member for People & Culture	Manager Health & Safety (or delegate)
Member for People & Culture	Manager Environment & Property (or delegate)

The Network Management Risk Committee meets at least twice annually. One of these meetings is held in conjunction with the annual Risk Profiling Workshop for Network Management.

3.17 CENTRALISED ASSET MAPPING SYSTEM

3.17.1 Risk

Inaccurate or missing information utilised for underground asset locations results in excavation for live underground cables.

3.17.2 Purpose

The purpose of the Centralised Asset Mapping System is:

- Provide a mechanism to accurately record, manage and efficiently retrieve network asset drawings and sketches by providing field officers with direct access to the drawings;
- Provide information to support effective asset management decision making;
- Provide underground asset locations; and
- Ensure drawings are adequately stored.

3.17.3 Description

Network asset drawings and sketches have been scanned and indexed geographically and by drawing number. Spatial map extents for each drawing have been captured to allow a spatial search for information.

Access to information is provided by:

- A textual search with queries including:
  - Suburb and street
  - Drawing number
  - Description
- Spatial search using an area of interest graphically defined within the Geographical Information System (GIS).

Access is available 24 hours a day. Data is backed up.

Project managers, asset locators and other personnel submit new drawings and sketches to the Facilities Systems Branch for processing into the Centralised Asset Mapping System as described in the Network Control Data Management Plan.

Manager Network Control is responsible for maintaining the accuracy, currency and completeness of the Centralised Asset Mapping System in accordance with the Network Management quality system.

3.18 BUSHFIRE RISK MANAGEMENT

3.18.1 Risk

An uncoordinated approach to bushfire risk mitigation throughout SA Power Networks and, the State.

3.18.2 Purpose

The risk of SA Power Networks infrastructure initiating fires on high bushfire risk days is managed through directives issued by the General Manager Network Management. The directives are translated into operational procedures, duties and responsibilities which are contained in the Bushfire Risk Management Manual (BFRMM). The manual details SA Power Networks bushfire risk management policies including SA Power Networks Disconnection Procedure.

3.18.3 Description

The manual is divided into 8 sections as follows:

Section 1 – Describes the purpose of the manual and the roles and responsibilities.

Section 2 – Procedures prior to the Fire Danger Season.

A number of actions are performed each year leading up to the beginning of the Country Fire Service (CFS) declared Fire Danger Season, in order to ensure staff are prepared and information and procedures are current.

The Fire Danger Season operates for periods specified by the CFS in accordance with Division 8, Subdivision 1 of the Fire & Emergency Services Act 2005, and outside the period if abnormally severe weather conditions occur.

The procedures detailed in this section are designed to manage SA Power Networks risk exposure by:

- Assessing the fire start potential of network assets;
- Implementing corrective action; and
- Effecting contingency plans to manage the consequences of bushfire risk mitigation actions which have not been completed.

Section 3 – Procedures during the Fire Danger Season.

This section covers the following:

- Informing personnel of State Fire Ban Districts and Fire Danger Season;
- Broadcasting Total Fire Ban advice to operations personnel;
- Contactability of personnel for responding to FDL events;
- Reporting of fires in proximity of the network;
- Disabling the reclose function on Circuit Breakers and Reclosers;
- Rectifying the defects; and
- Reporting the status of preparedness to management.

Section 4 – Procedures of FDL 1, FDL 2 and FDL 3.

This section describes the operational procedures from the time when FDL 1, FDL 2 or FDL 3 conditions are forecast, to the conditions being realised and then abating.

Forecast FDL 1 conditions are advised to specific operational personnel who assess the need for further action, including establishment of windspeed monitoring.

Where FDL 2 or FDL 3 conditions are forecast, key operations personnel are notified to respond as required, including:

a) Disabling reclose on feeder protection;
b) Monitoring weather conditions;
c) Preparing Disconnection Plans;
d) Notifying customers;
e) Resourcing CFS communications centre; and
f) Preparing media releases.

Where FDL2 or FDL3 conditions are ***Verified***, as described in the Disconnection Procedure in the BFRMM, supply will be interrupted.

Appendix 1 – Details the Critical Contact List.

Appendix 2 – Details the precautionary arrangements which must be taken to reduce the risk of inadvertently starting a fire when driving or working during the Bushfire Danger Season.

Appendix 3 – Details the Use and Issue of Permits for working during the Fire Danger Season.

Appendix 4 – Provides maps of the High Bushfire Risk Areas.

Appendix 5 – Section for local Operations Plans.

Appendix 6 – Provides copies of Log Sheets including the Disconnection Order template.

3.19 COMMUNITY EDUCATION

3.19.1 Risk

The general community may not be aware of risk exposures associated with Electricity Infrastructure, or becomes complacent regarding the use of electricity.

3.19.2 Purpose

The purpose of community education is to raise awareness of the risks and obligations which are attendant with the electricity infrastructure, to the use of electricity and the role of SA Power Networks in that process.

3.19.3 Description

The awareness of the general public needs to be raised in certain areas such as:

- The role of the Technical Regulator to monitor and regulate safety and technical standards within the electricity industry in South Australia;
- The requirements of the Regulations in regard to:
  - What species of trees may be planted under power lines;
  - Which parts of the system belong to the customer and what the customer responsibilities are:
  - How to seek advice about safe clearances from electricity infrastructure when proposing to build, extend buildings or erect sheds, pergolas, use of farm machinery or recreational equipment etc;
- How customer requests are handled and the expected times in which SA Power Networks can be expected to respond;
- In the event that faults occur, the information that need to be conveyed to SA Power Networks to ensure rapid response and correct priorities;
- Which street lights are owned by SA Power Networks and the information which SA Power Networks needs to know when reporting that lights are not working; and
- What customers need to do if there is a power outage.

The above list is simply an indication of some of the areas which SA Power Networks provides information to raise the public's awareness. SA Power Networks responds as the need arises to many other needs or perceived needs.

The means of raising the public's awareness will be addressed according to SA Power Networks management's prioritisation of the issues using various mechanisms such as:

- The broadcast, newsprint and on-line media for:
  - Warning of bushfire danger periods and occurrences;
  - The dangers presented by overhead conductors such as the 'Look up and Live' and other safety campaigns; and
  - Updates on major interruption events (including avoiding contact with 'wires down').

- Partnering with agencies such as the CFS, SES and MFS to reinforce and amplify safety messages.

- Fact Sheets for:
  - Planned Power Interruptions;
  - Meter Reading;
  - Possums and Powerlines;
  - Security Lighting;
  - Tree List;
  - Tree Trimming around Powerlines;
  - Variations in electricity supply;
  - What to do when the power goes out;
  - Electric and magnetic fields;
  - Customer connections;
  - Bushfire Safety;
  - Street Lighting;
  - Underground powerlines;
  - Look up and Live:
    - Safety around powerlines;
    - Farm safety;
    - Heavy machinery safety;
    - Boating safety;
    - What to do if you contact a powerline;
    - Powerline differences;
    - Safe clearance distances from power lines;
  - Guaranteed Service Level payments;
  - Electricity and your life support system;
  - Working safely near powerlines;

    - Customer Brochures for:
  - NICC-802 11kV and 7.6kV to Low Voltage Mk7 Padmount Transformers;
  - NICC-404 Information on Contractor access and working near the Electricity Network;
  - NICC-405 Information on Low voltage line covers;

- Providing booklets produced by the Office of the Technical Regulator:
  - Trees and Powerlines;
  - Building Near Powerlines; and
  - Working Safely Near Overhead Powerlines.

Note: The OTR have an Electricity Safety of Farms webpage in addition to the above.

3.20 SAFETY MANAGEMENT - CONTRACTORS

3.20.1 Risk

Person Conducting the Business or Undertaking (PCBU) not adequately managing Contractor safety, and not appropriately advising the relevant authority of notifiable safety incidents if they occur resulting in risk of harm and/or regulatory non-compliance.

3.20.2 Purpose

For the PCBU to adequately manage the safety of Contractors and to appropriately advise the relevant authority of safety incidents if they occur.

3.20.3 Description

Safety Management:

The purpose of SA Power Networks standard contracts for the engagement of contractors is to ensure that all parties are aware of their responsibilities in relation to work health and safety and in particular, their responsibilities in relation to notifying the relevant authority of any notifiable work health and safety incidents ie The Office of the Technical Regulator and/or SafeWork SA.

SA Power Networks has a Contract for Services for engaging contractors to undertake turn-key projects or services. This process ensures that all parties are aware of their work health and safety responsibilities when contractors are undertaking work for SA Power Networks.

Notifications:

Under the conditions of contract, if the supplier of the services becomes aware of anything which may adversely affect the protection of people or property, that party must forthwith notify SA Power Networks of it.

In addition to notifying other relevant authorities, a Contractor for Services must notify SA Power Networks verbally as soon as reasonably possible, and in writing within 24 hours, of:

- any injury to any person, or to any person's health, which has resulted from an accident/incident or event relating to the Services; and
- any damage to SA Power Networks property or third party property which has resulted from an accident/incident or event relating to the Services.

SA Power Networks Contractor Safety Management Directive clearly outlines work health and safety responsibilities with respect to contractor management.

Depending on the type of safety incident, SA Power Networks may notify The Office of the Technical Regulator in the event of any safety incidents which are required to be reported under the Electricity Act and Regulations.

4. SAFETY and TECHNICAL MAINTENANCE MANAGEMENT

Contents Section

4.1 MANAGEMENT FRAMEWORK

Activity:

SA Power Networks ensures the performance of the electricity infrastructure by the provision of effective asset management strategies and practices.

Major Risk Areas:

The major risk exposures associated with maintaining the SA Power Networks electricity infrastructure in a satisfactory operational condition are:

- The adequacy and effectiveness of asset management strategies to ensure that Legislative, Regulatory and Business requirements are met whilst managing the risk profile of the maintenance work identified
- Incipient failure goes unrecognised until service quality is adversely affected
- Physical injury to public or employees – or property damage, as a result of asset failures

Management Framework:

In order to ensure satisfactory present and future performance of SA Power Networks electricity infrastructure and provide assurance that legislative, regulatory and business requirements have been met a framework of procedures has been developed.

The asset management of electricity infrastructure is carried out in accordance with the Corporate Policy for Asset Management and associated Network Directives authorised by General Manager Network Management.

To comply with these mandatory requirements procedures have been developed for:

- The focusing of management attention on reliability, quality of supply and meeting legislative and regulatory requirements
- The introduction of good practice maintenance strategies based on Condition Based Risk Management Principles, Reliability Centred Maintenance Principles and Condition monitoring
- The provision of standards to ensure that maintenance practices are consistently applied and electricity infrastructure performance assured
- Seeking external advice on the adequacy and effectiveness of SA Power Networks electricity infrastructure condition, performance and the management of risks

SA Power Networks sought and obtained additional funding to implement a more frequent and more detailed asset inspection regime during 2010-2015. SA Power Networks has

- captured significantly more detailed data and conducted analysis of pole and conductor failures, and fire starts
- improved the tools and procedures for asset condition monitoring of major asset classes. Our condition monitoring and life assessment (CM&LA) methodology is used to develop detailed asset management plans for each asset class. More recently, we have also introduced condition based risk management (CBRM) models for priority asset classes
- increased the training and accreditation requirements for all staff and contracted asset inspectors to Certificate 2 in Asset Inspection

- developed mobile data capture tools and business systems to capture improved asset condition and defect data
- improved procedures for prioritising asset defects based on risk value

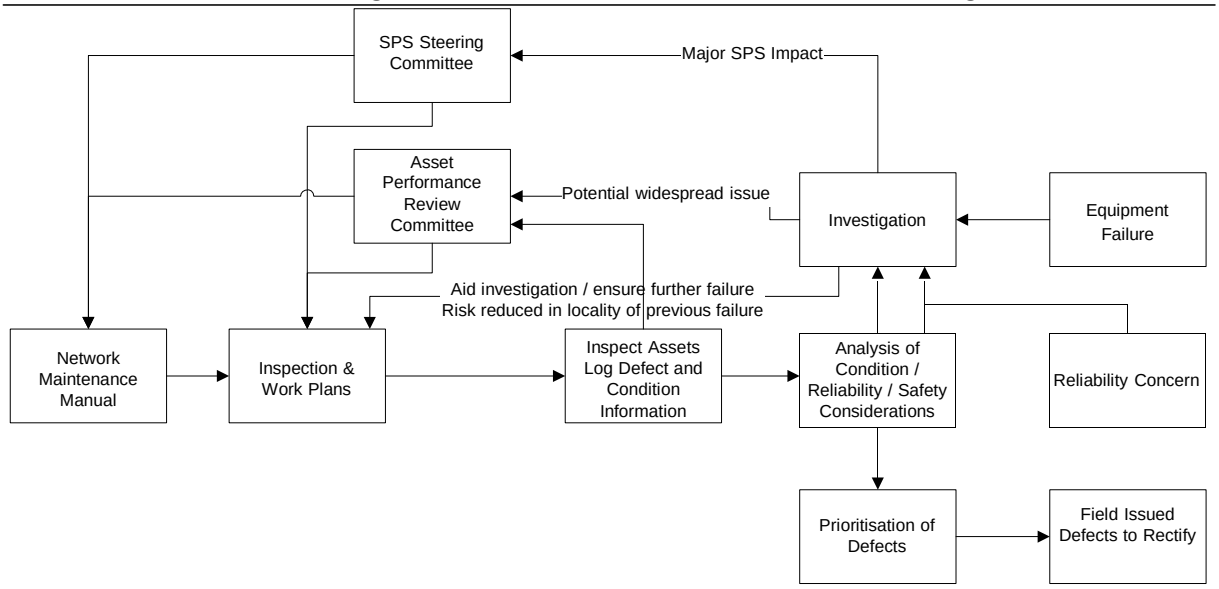
We have been progressively implementing this increased frequency inspection program. The High BFRAs inspections were completed at the end of December 2013. Medium bushfire risk areas will be completed by December 2014. However, experience in the field has shown that with the increased data being captured, the inspections in the non bushfire risk areas is taking longer than estimated, and we now forecast these inspections will be in cycle by December 2018.

The more detailed and frequent asset inspection program, together with the other initiatives outlined above, has resulted in SA Power Networks collecting significantly more asset condition data than was previously available. This has resulted in the identification of a large volume of asset defects requiring rectification that have not previously been identified. To return our asset portfolio to the level of risk that is required for compliance with our regulated obligations and on which the SRMTMP has been historically based, it is essential that the identified asset defects be rectified in a systematic, prudent and efficient manner.

Accordingly, SA Power Networks has focussed on addressing the highest risks associated with the increasing volume of identified asset defects. Our primary focus has been to meet our legislated obligation to operate and maintain a safe electrical network. In particular, we have targeted the rectification of potential fire start and public safety defects, primarily in the areas of pole, conductor, overhead components and switchgear asset replacement.

In addition, a number of significant events that have occurred across Australia including Victorian Bushfire Taskforce findings and recent serious issues encountered in Western Australia (including 'unassisted' pole failures, a conductor failure (resulting in a fatality) and asset-related fire starts). In response, SA Power Networks is proposing to adopt a more frequent inspection regime of overhead powerlines in high bushfire risk areas, with a increase in the inspection frequency to 5 years irrespective of the corrosion zone whilst maintaining our annual pre-summer patrols in high bushfire risk areas. SA Power Networks considers this is consistent with the intent of the Victorian Bushfire taskforce but delivers a more cost effective approach to asset inspections whilst managing the potential fire start risk. This means that the inspection cycles for overhead powerlines will consist of five and ten year cycles. The cycles will be dependent on the environment, consequence of failure etc. The inspection cycles are detailed in the Network Maintenance Manual.

The organisation of maintenance activities detailed to meet the policies and directives above are shown in the flow chart below.



Maintenance procedures showing roles of the:

Asset Performance Review Committee;

and

SPS Steering Committee.

4.2 NETWORK ASSET MANAGEMENT GROUP

4.2.1 Risk

That asset management practices do not adequately address the safety and regulatory requirements or is inconsistent with industry practice.

4.2.2 Purpose

The purpose of the Network Asset Management Group is to develop effective maintenance strategies for maintenance of network assets using a variety of maintenance methodologies, eg Condition Based Risk Management (CBRM) etc.

4.2.3 Description

The Network Asset Management group undertakes a variety of tasks aimed at improving the effectiveness of existing maintenance strategies.

Traditionally, SA Power Networks asset management practices have been time based preventative maintenance regimes. Assets have been inspected, overhauled and/or tested at regular intervals with the aim of preventing failures from occurring.

The goal of the Network Asset Management group is to implement best practice management of assets to minimise whole-of-life costs whilst meeting reliability targets and managing risk.

Equipment failure investigations are undertaken on all high risk failures, and this contributes to detailed knowledge of failure modes being developed, asset management policies, strategies and practices being refined to accommodate CBRM principles into network asset management for all asset classes.

Condition Based Risk Management is a process that develops computer models to predict asset condition, performance and risk for individual assets within a wider asset population. CBRM models can then enable forecasts to be made of future condition, performance and risk, and a quantitative assessment to be made of the effect of any proposed interventions such as asset replacements or refurbishments.

SA Power Networks policy is to apply RCM and CBRM principles to network components and assess the impact on the network as a whole, the environment and employee and community safety.

Each asset or asset class (eg overhead powerlines) and the environment that it operates within is assessed to determine appropriate sampling rates, and inspection requirements. Sampling rates and inspection requirements are determined by failure mode analysis and are independently verified prior to implementation.

This group utilises the specialist support of consultants to conduct asset management reviews and critical analyses as required.

4.2 NETWORK MAINTENANCE MANUAL

4.2.1 Risk

Asset Maintenance requirements are not adequately documented resulting in assets in an unsafe condition.

4.2.2 Purpose

The Network Maintenance Manual details the strategies which govern SA Power Networks maintenance practices. It is a self contained document except where it specifically refers to other related documents.

The Network Asset Management Department is responsible for maintaining the Maintenance.

4.2.3 Description

The manual is designed for use by SA Power Networks employees, from executives to field personnel involved in the maintenance of network assets. It details SA Power Networks network maintenance strategies and also specifies the responsibilities associated with those strategies.

The manual is divided into 10 sections as follows:

- Section 1 - About this Manual and Related Documents.
- Section 2 - Management Policy.
- Section 3 - Management Philosophy and Responsibility.
- Section 4 - Definitions.
- Section 5 - Maintenance Strategies – Substations.
- Section 6 - Maintenance Strategies – Subtransmission and Distribution Mains.
- Section 7 - Maintenance Strategies – Revenue Metering.
- Section 8 - Maintenance Strategies – Street Lighting.
- Section 9 - Maintenance Strategies – Generators.
- Section 10 - Appendices.

4.3 VEGETATION MANAGEMENT

4.3.1 Risk

Interruption to supply and consequential loss to customers with the attendant risk to life and property from the risk of fire starts.

4.3.2 Purpose

The purpose of the vegetation management program is to maintain statutory clearances between trees and power lines as a critical part of bushfire risk mitigation. This involves the clearance of vegetation of all kinds from public supply lines and naturally occurring vegetation from private supply lines in accordance with the Regulations to the Electricity Act 1996 and the requirements of the Native Vegetation Act 1991.

4.3.3 Description

The possibility of trees interfering with new lines is given due consideration at the design stage to minimise potential interference. However, vegetation can occur naturally and plantings are made by owners of private property, which may compromise the proposed clearance distances.

To inform the public of the clearance and vegetation management requirements associated with powerlines, SA Power Networks issues the following fact sheets:

- Tree List
- Tree Planting near Powerlines
- Trees and Powerlines (booklet produced by the OTR)

SA Power Networks power lines are inspected on an appropriate cycle[1] in bushfire risk areas and on up to three year cycles in non-bushfire risk areas to identify vegetation cutting needs using the clearance zones specified in the Regulations to scope cutting work as specified in Vegetation Services Work Instructions.

Notices are sent to the occupier of the land where vegetation cutting is required to inform them of the obligations to cut or remove interfering vegetation. The notice provides 30 days written notice to the occupier of the land:

- stating the reason and the date and time of the proposed entry and
- stating the nature of the clearance work to be carried out or
- informing the occupier of the right to waive the 30 days notice by agreeing to the clearance work.
- an annual patrol of lines in BFRAs can identify any vegetation likely to encroach the clearance zone which is cleared prior to the fire danger season

The procedures ensure that occupiers are informed of rights of appeal to notices served by SA Power Networks together with their rights to seek exemption in accordance with the Regulations.

[1] The cycle is determined based on vegetation growth rates and extent that SA Power Networks is able to clear vegetation away from powerlines to keep vegetation outside the clearance zone until the next scheduled inspection cycle.

SA Power Networks vegetation clearance scoping and cutting is carried out by our vegetation clearance contractors. This work is audited by SA Power Networks Officers to ensure that vegetation has been cleared in compliance with the Electricity (Principles of Vegetation Clearance) Regulations.

In addition, SA Power Networks may agree to a vegetation clearance scheme with a council governing the way in which vegetation is kept clear of public powerlines on land within a council's prescribed area.

Vegetation management is detailed in the Vegetation Management Manual No. 37.

4.4 EXTERNAL REVIEWS

4.4.1 Risk

Asset management and associated business practices are not carried out in a best practice manner leading to unrecognised and unmanaged risks.

4.4.2 Purpose

External reviews of SA Power Networks assets and business operations are sought to ensure that:

1. Assets are acquired, operated and maintained to meet present and future requirements.
2. Business practices meet Legislative and Regulatory requirements and are consistent with the SA Power Networks Vision.
3. SA Power Networks is aware of the risks associated with its activities and has appropriate management strategies and practices in place for mitigating them.
4. SA Power Networks designs, commission, operates and maintains its assets in accordance with good electricity industry practice as required by our electricity distribution licence.

4.4.3 Description

External reviews may be initiated by:

- SA Power Networks Board requests.
- Events occurring elsewhere in the industry.
- Changes in business practices and strategies.
- Programmed confirmation of performance or benchmarking.
- Regulators (eg Office of the Technical Regulator).

The scope of external reviews carried out, are typically to:

- Perform reviews (both high level and/or detailed) of all SA Power Networks specific Policies, Procedures and Instructions to determine gaps for:
  - Consistency with management objectives;
  - Ease of application;
  - Effectiveness in achieving defined goals;
  - Regulatory compliance; or
  - Compliance with this Safety, Reliability, Maintenance and Technical Management Plan.

The scope may also include assistance with developing a management plan for further improvements in the delivery of particular functions identified as a result of the review.

External review recommendations which are accepted by the Board and Senior Managers are incorporated into normal business management procedures for the development of actions plans, monitoring and reporting implementation.

Responsibilities for the development of strategies, plans and implementation programmes are assigned to appropriated managers.

Implementation of recommendations, are monitored as part of the normal business monitoring and reporting procedures.

4.5 ASSET PERFORMANCE REVIEW COMMITTEE
(Formerly: Inspection Planning Working Group)

4.5.1 Risk

Trends and asset failures are not reviewed by the broader stakeholder group and not communicated to the Network Management group which could result in additional unmitigated risk to the network.

4.5.2 Purpose

The purpose of the Asset Performance Review Committee is to monitor asset inspection results, trends and asset failures occurring in the field, which may be symptomatic of emerging problems, and to report the findings to the Network Management group.

4.5.3 Description

The Asset Performance Review Committee (APRC) is responsible for reviewing:

- Interruptions referred by the SPS Steering Committee.
- Equipment failure investigations.
- Asset inspection results.

The APRC reviews this information and reports the findings to the Network Management group so these can be actioned as required by the relevant managers.

Membership of the APRC consists of:

- Network Asset Management:
  - Strategic Asset Management.
  - Operations Asset Management.
  - Asset Assessment.

- Network Planning:
  - Substation Planning.

- Network Standards & Performance:
  - Equipment.
  - Reliability Operations.

4.6 SUBSTATION INSPECTION

4.6.1 Risk

The risk inherent in asset failures are not adequately detected or managed.

4.6.2 Purpose

The purpose of Substation Inspection is to ensure that all substation plant and equipment is in the correct safety and operational state and that auxiliaries are routinely tested.

4.6.3 Description

The Network Maintenance Manual (manual # 12) details the frequency of inspection agreed by the asset owner, together with the tests to be performed and the records to be made. In addition, the adequate control over safe access to substations is maintained, to the requirements of the 'Asset Access Manual'.

Operational checks are performed on:

- AC/DC and emergency lighting;
- Indicator lamps;
- Outdoor lighting;
- Cubicle heaters;
- Locks;
- Air-conditioning systems;
- Water/oil separators; and
- OLTC's and regulators.

Check oil levels and gas pressures of the following:

- Oil levels of transformers, circuit breakers, current transformers and bushings; and
- Gas pressure on circuit breakers.

Record the following operational counters/gauges:

- Transformer OLTC;
- Circuit breakers; and
- Transformer WTI maximum temperature.

Plant condition checks are carried out on the following:

- Transformers and regulators;
- Silica gel breathers;
- WTI temperature indicators;
- Circuit breakers;
- Surge diverters;
- Disconnectors;
- Capacitor banks;
- Control panels and relays;
- Busbar structures;
- Structures and footings; and
- Earth system connections.

Building and property checks are as follows:

- Security
  - Fences and gates;
  - Overhanging trees and external climbing aids;
  - Clearance under fences;
  - Security system including electric fences (where fitted); and
  - Security monitoring and patrols (at nominated substations).
- Building structure and its facilities;
- Yard and surface;
- Vegetation and weed infestation;
- Oil and/or water containment systems; and
- Signage.

Other checks performed include:

- Consumable stock holdings;
- Earthing leads, operating sticks;
- Fire extinguishers;
- Emergency information;
- Substation drawings;
- Battery condition (electrolyte levels, terminal corrosion, voltage test);
- Battery charger output;
- Safety equipment; and
- Equipment labelling.

Diagnostic or condition monitoring testing and maintenance may also be conducted periodically as required. This includes:

- Thermal imaging for high resistance connections; and
- Substation earth system testing.

4.7 DISTRIBUTION SYSTEM INSPECTION

4.7.1 Risk

The risks inherent in asset failures are not adequately detected or managed.

4.7.2 Purpose

The purpose of Network Maintenance Manual is to ensure that the plant and equipment comprising the Distribution System overhead, underground and associated switchgear installations are routinely inspected for correct safety and operational state.

4.7.3 Description

The distribution system inspection procedures are embodied in the Line Inspection Manual. The procedures cover the overhead and underground earthing systems, overhead line support structures, transformers, switchgear and voltage regulating equipment. The procedures include the information to be recorded together with the prioritisation of actions required for defects observed.

For overhead conductors the procedure includes checks for:

- Clearance to ground and structures
- Clearance to trees or other vegetation
- Abrasion and corrosion
- Access to service point
- Poles and pole tops for:
  - Ground level corrosion
  - Tap grip security and corrosion
  - Security of earthing conductors to earth bars and stakes
  - Neutral bonded to pole

Additionally underground distribution checks include:

- Access hole inspection to ensure safe entry and egress including rescue facilities
- Condition of cable supports
- Cables at connection points, deterioration and cracks In sheaths
- Hot or leaking joints
- Personnel access hole drawing for correctness
- Service pillar inspection for mechanical/physical integrity

Switchgear inspection may include the following according to switchgear type:

- Using infra-red scanners to look for hot spots
- Using UHF scanners for evidence of tracking or discharge
- Checking cubicles for:
  - Dust
  - Vermin
  - Condensation
  - Rust and mechanical distortion
  - Signs of flashover
  - The presence of Ozone

Transformer stations and regulators are inspected for:

- Safe working clearances
- Ventilation and vent fan condition
- Oil level and oil leaks
- Condition and gaps of arcing horns
- Condition of bushings
- Condition of cable joints, insulators and busbars
- Earthing cables/joints
- Security against unauthorised entry

The asset inspection cycles are detailed in the Network Maintenance Manual.

4.8 SERVICE PERFORMANCE SCHEME (SPS) STEERING COMMITTEE

4.8.1 Risk

The risk inherent in supply interruptions not adequately investigated or managed for the Service Performance Scheme.

4.8.2 Purpose

The purpose of the SPS Steering Committee is to:

- Deliver optimal reliability and SPS outcomes for SA Power Networks;
- Monitor progress, performance and trends;
- Review high impact events and causes;
- Consider and approve mitigation strategies;
- Identify SPS opportunities and threats;
- Seek strategic management solutions, projects, ideas and innovations;
- Challenge the current norms; and
- Facilitate agreement and provide endorsement.

Decisions from the SPS Steering Committee feed into the Reliability Management Plan. The SPS Steering Committee meets monthly and comprises of GM Network Management, key Network and Field Services Operations Managers.

4.8.3 Description

SA Power Networks is required to operate with a Service Target Performance Incentive Scheme (SPS), in accordance with the National Electricity Rules (NER).

The intent of the SPS is to provide SA Power Networks with a financial incentive to maintain and improve reliability performance. The revenue at risk under the SPS is $\pm$ 3% of SA Power Networks annual revenue.

The SPS is based on SA Power Networks annual unplanned SAIDI and SAIFI performance against targets set in four feeder categories (CBD, Urban, Rural Short and Rural Long), measured over each financial year until 30 June 2015. These targets also include low voltage interruptions.

The SPS targets exclude:

- Transmission / generation / emergency disconnections;
- Momentary interruptions (duration $\leq$ 1 min);
- Planned interruptions; and
- Major Event Days (MED's), where the daily SAIDI > 5.63 mins (this is the threshold for 2013/14).

Any departure from these performance targets will result in an incentive or penalty to SA Power Networks via a distribution revenue adjustment.

A revenue adjustment (increment or decrement) can be delayed in any one regulatory year to smooth customer price variations (referred to as the 's-bank' mechanism).

The SPS Steering Management Committee comprises employees who are appointed by the General Manager Network Management and General Manager Field Services as follows:

Rocco Logozzo	Network Performance & Regulatory Manager / Chair
Kym Williams	Reliability Operations Manager / Secretary
Doug Schmidt	GM Network Management
Jehad Ali	Manager Network Standards & Performance
David Pritchard	Manager Network Planning
Kevin Connell	Manager Country Operations North
Mike Nation	Manager Substation, Transmission, Telecommunications and Technical Services
Grant Cox	Manager Regulatory Affairs
Matthew Napolitano	Network Control Manager
Steven Wachtel	Manager Network Asset Management
Erin Hampton	Reliability Projects Officer

5. SAFETY and TECHNICAL CONSTRUCTION MANAGEMENT

Contents Section

5.1 MANAGEMENT FRAMEWORK

Activity:

SA Power Networks operates and constructs electricity infrastructure comprising:

- Overhead distribution networks;
- Underground networks;
- Substations;
- Telecommunications/SCADA;
- Metering; and
- Public lighting.

In constructing electricity infrastructure SA Power Networks utilises purchased plant and equipment, new and refurbishes transformers and switchgear and SA Power Networks manufactured poles.

Major Risk Areas:

The major risk exposures which SA Power Networks considers when constructing electricity infrastructure are associated with:

- Appropriateness of Australian Standards and ENA guidelines for SA Power Networks operating environment;
- Industry and Regulatory standards for design and installation;
- Meeting operational and technical requirements;
- Service conditions and environmental considerations;
- Purchasing and contracting;
- Safety and regulatory requirements during construction; and
- Commissioning.

Management Framework:

In order to control the construction of SA Power Networks electricity infrastructure and provide assurance that Legislative, Regulative and Business requirements have been met a framework of procedures has been developed.

The construction of electricity infrastructure is carried out in accordance with the Corporate Policy for Asset Management and Directives authorised by General Manager Network Management and General Manager Field Services.

To comply with these mandatory requirements procedures have been developed for:

- Specifying plant and equipment to be acquired;
- Written standards to ensure that external designers and contractors proposing to construct Distribution Network assets meet industry and regulatory standards;
- Auditing contactors work in progress for quality of workmanship and safety in construction;
- The production of standard construction drawings (“E Drawings”), Job Safe Work Procedures and Work Instructions to ensure that SA Power Networks installed or constructed plant and equipment meets Legislative and Regulatory requirements;

- Training of SA Power Networks staff involved with construction of electricity infrastructure who are provided with approved work instructions and adequate supervision for the tasks undertaken. When contractors perform construction and installation work for SA Power Networks that they demonstrate that their staff are adequately trained and authorised to perform the allocated work;
- Ensuring the safety of equipment used in construction such as vehicles, elevating work platforms, cranes and line trucks;
- Specifications and contracts for the acquisition of plant and equipment to ensure that equipment manufacturers and suppliers comply with SA Power Networks internal regulations, industry best practice, the industry codes of practice on safety and the regulatory requirements of South Australia; and
- Newly constructed or altered plant and equipment is brought onto the system without endangering persons or SA Power Networks existing infrastructure.

The procedures also include SA Power Networks staff involvement in National and International committees which place SA Power Networks in a position of influencing industry standards.

5.2 EQUIPMENT SPECIFICATIONS FOR PURCHASING

5.1.1 Risk

Equipment may not meet SA Power Networks operational, technical, safety or regulatory requirements.

5.1.2 Purpose

Equipment specifications are designed to ensure that equipment manufacturers and suppliers comply with SA Power Networks internal regulations, the industry code of practice on safety, the regulatory requirements of South Australia and industry best practice.

5.1.3 Description

Specifications and contracts for the acquisition of plant and equipment used in the construction of SA Power Networks infrastructure are designed to ensure that equipment manufacturers and suppliers comply with SA Power Networks internal regulations, industry best practice, the industry code of practice on safety, and the regulatory requirements of South Australia. To provide assurance that purchased plant and equipment meets specified requirements SA Power Networks gives preference to organisation who are Quality certified. To provide additional assurance of fitness for purpose SA Power Networks may exercise Quality control by witnessing manufacturers' tests or performing inspections during manufacture.

Specifications are drafted to ensure that all equipment and components are designed and constructed so that in normal service, inspection, maintenance activities and tests can be carried out safely.

Specifications, Part 3 of SA Power Networks standard contract documentation requires manufacturers and suppliers to provide independently for each brand of equipment comprehensive assessments relating to:

- Hazard identification;
- Risk assessment of the identified hazards; and
- The means of managing the risks.

Specification also includes all references covered in Section 7 of this manual.

5.2 CONSTRUCTION MANUAL – E-DRAWINGS

5.2.1 Risk

Unsafe arrangements are used when constructing SA Power Networks infrastructure which might pose a risk to the public, SA Power Networks personnel, the remainder of the electricity infrastructure and the environment.

5.2.2 Purpose

When SA Power Networks constructs electricity infrastructure a Construction Manual or 'E-Drawings' are used to ensure that designed, installed or constructed plant and equipment meet Legislative and Regulatory requirements. The Construction Manuals are consistent with recognised standards to facilitate safe operation and maintenance and to ensure that in the event of failure, spares held in stock assist speedy restoration.

5.2.3 Description

The Construction Manual or 'E-Drawings' are produced by SA Power Networks Network Standards and Performance Branch.

Each drawing is allocated a unique number to ensure traceability. Each new draft or revised draft is reviewed by Technical Representatives, Work Health & Safety (WHS) Representatives and Advisers, Field Services Work Methods Group, Project Officers and Linepersons as appropriate. Drawing authorisation for issue is not completed until a formal risk assessment in accordance with the Quality Management System has been completed.

Once authorised, the original drawing is maintained as an electronic file and hardcopy master.

Printing and distribution of the drawings is carried out by SA Power Networks Network Standards and Performance Branch and the Work Methods Officer maintains a register of holders of controlled copies of the Construction Manual or 'E-Drawings'.

In addition, all E-drawings are available electronically on the SA Power Networks intranet and under a secured internet site, providing the latest version.

Issuing instructions to holder of the manual ensures that superseded drawings are removed from the system and that all users are aware of new or revised drawings.

5.3 CONSTRUCTION COMPLIANCE AUDITING

5.3.1 Risk

Unsafe arrangements are used when constructing SA Power Networks infrastructure or poor workmanship may mean assets are constructed in an unsafe manner.

5.3.2 Purpose

Compliance auditing is used to ensure that assets to be vested with SA Power Networks are constructed and tested in accordance with SA Power Networks requirements.

5.3.3 Description

Specifications are issued to contractors and customers. A copy of that Specification and the approved design are then forwarded to the Network Compliance Coordinator.

The contractor must notify the Compliance Coordinator when work is programmed to commence. The Compliance Officers will visit site at various times during the construction to ensure that the asset is being constructed in accordance with the design and SA Power Networks specification.

Any non-conformance is recorded and issued to the contractor. Once these non-compliances are repaired to the Compliance Officers satisfaction, the certificate of compliance is issued. SA Power Networks will then take responsibility for the asset.

Compliance Coordinator is a member of the Network Asset Management Department who keeps the records of non-compliance and corrective actions.

5.4 TECHNICAL STANDARDS

5.4.1 Risk

SA Power Networks assets will not be designed and installed in accordance with its requirements which ensure compliance with industry and regulatory standards and may pose a risk to the public, SA Power Networks personnel, the electricity infrastructure or the environment.

5.4.2 Purpose

The Technical Standards are the medium used to provide internal and external designers and contractors with SA Power Networks standards that relate to the design and construction of its Distribution Network assets. When applying these standards, a risk assessment is performed to cater for the particular service conditions and environment of the design location. These Technical Standards are critical where assets will be vested back to SA Power Networks (ie become SA Power Networks responsibility for the operation, maintenance and replacement).

5.4.3 Description

The Technical Standards currently cover the following areas:

Identifier	Title
TS 085	Trenching & Conduit Standard for Underground Distribution Cable Networks.
TS 087	Construction Standard for Underground Cable Networks.
TS 100	Electrical Design Standard for Underground Cable Networks.
TS 101	Public Lighting Standard for Overhead & Underground Networks.
TS 102	Easement Standard for Distribution Networks.
TS 105	Testing Standard for Underground Cable Networks.
TS 105A	Test Standard Appendix A - Forms
TS 107	Overhead Line Design Standard, Trans & Dist System.
TS 107A	Appendix F & Appendix G.
TS 108	Technical Standard for Distribution Equipment and Transformer Rooms.
TS 109	Earthing of the Distribution Network.
TS 110	Cable Standard for 66kV Underground Cable.
TS 116	Installation of CCTV Equipment on SA Power Networks Poles & Lighting Columns.
TS 201	Technical Standard for Telecommunications Systems.
TS 206	Telecommunications DC Power Systems.
TS 220	The Inspection & Maintenance of Radio Communication Sites.
TS 221	Signage at Telecommunication Sites.

5.5 FIELD SERVICES COMMISSIONING PROCEDURES

5.5.1 Risk

Inappropriate or poorly conceived commissioning procedures pose safety risks to people, poor performing assets and a failure to protect the electrical infrastructure from poorly designed or constructed plant.

5.5.2 Purpose

When SA Power Networks constructs electricity infrastructure Design Drawings, a Construction Manual or 'E-Drawings' are used to ensure that installed or constructed plant and equipment meet Legislative and Regulatory requirements. The Construction Manual is consistent with recognised standards to facilitate safe operation and maintenance and to ensure that in the event of failure, spares held in stock assist speedy restoration.

5.5.3 Description

Field Services, Services and Construction & Maintenance Services provides a commissioning service based on their customer's specific requirements.

Underpinning customer requirements for commissioning are a set of commissioning instructions, used in conjunction with supplier/manufacturers requirements. At the commissioning phase of a project, these instructions are followed in order to both, prove performance, and provide a benchmark against which future maintenance can be monitored.

The following is a list of Policies and Procedures used during commissioning and maintenance:

- Plant Maintenance Policies can be found in SA Power Networks Technical Standard – Substation Maintenance, SA Power Networks Technical Standard – Substation Construction and SA Power Networks Technical Standard – Substation Design. (*The Substation Design & Substation Construction Technical Standards are being progressively superseded by the Substation Standards Manual*).
- Plant Maintenance Procedures can be found in SA Power Networks Substation Installation, Commissioning & Maintenance Instructions (with reference to Manufacturers' Manuals).
- Substation commission procedures can be found in the Substation Commissioning Instructions SCI-01. Relay Protection General Testing Procedure can be found in SA Power Networks Substation Maintenance Instruction, SMI PRO 08/001 – General Maintenance of Protection & Control Circuits.
- All switching operations required, to isolate plant for commissioning and maintenance, are carried out in accordance with the SA Power Networks Switching Manual.
- High Voltage Phasing Tests can be found in SA Power Networks Switching Manual. HV phasing training is included in Switching Accreditation.
- JSWP 7023 Phasing of HV Mains and Apparatus up to and including 33kV Using 'Taplin Phasing Stick Type D61' or 'CATU Phasing Tester – Detex CL-8-36'.

- Trip Risk Assessment can be found in documents, FD C1 – Inadvertent Trip Management Procedure, FD C2 – Inadvertent Trip Response & Investigation Procedure and SMI PRO 019/3 – Substation Maintenance Instruction for The Isolation of Protection and Control Circuits.
- Reclosers and Regulators are commissioned in the Marleston Workshop to supplier requirements prior to installation.
- JSWP 618 - Installation & Testing of a Replacement 11kV Recloser in a Substation.
- JSWP 624 - Installation & Testing of a Replacement 33kV Recloser - Pole Mounted.
- JSWP 185 - Commissioning & Testing of Low Voltage ABC Cable.
- JSWP 128 - Connecting New & Altered Installations.
- JSWP 157 - Testing of Distribution Transformers that have been disconnected for some time and are required back in service.

5.6 PLANT AND TOOLS MAINTENANCE

5.6.1 Risk

Inappropriate or poorly maintained plant, tools and test equipment pose safety risks to people, damage to assets and poor performance in responding to incidents affecting customer supply.

5.6.2 Purpose

Field Services is a service provider to the asset manager Network Management and Construction & Maintenance Services. Plant maintenance in this context concerns the maintenance of vehicles, elevating work platforms, cranes, line trucks, used in the day to day business operation.

5.6.3 Description

The maintenance regimes for the various categories of plant are outlined below:

- Elevating Work Platforms - are inspected every 3 months by dedicated SA Power Networks inspectors. An electrical test is conducted every 6 months at the Depots by a mobile H.V. test unit. A 6 monthly service is carried out by the local trade. A major inspection is conducted on an annual basis. The user of the EWP checks the status of the inspection, before use every day or change of shift, as part of the prescribed pre use checks.
- Cranes - are inspected every 3 months by dedicated SA Power Networks inspectors. Services are conducted according to Manufacturer's recommendations. This is conducted by the local trade.
- Tippers and Line trucks - are inspected and serviced every 6 months for country locations, and every 12 months for metro locations.
- Cars and 4WD's - are inspected and serviced by the nominated user in line with the manufacturer's recommendations.

<u>Tool Maintenance</u>

The requirements for the inspection and testing of portable electrical equipment are contained in the SA Power Networks Best Practice WHS Manual; refer 4.2 Portable Electrical Equipment.

The requirements for the inspection and testing of plant & equipment can be found in Field Directive FD F5.

The maintenance requirements for the following tools & equipment can be found in SA Power Networks Field Directives, Job Safe Work Procedures and Substation Installation, Commissioning & Maintenance Instructions and E-Drawings;

- Ladders;
- Live Line Testers;
- Chain Lever & Wire Hoists;
- Operating Sticks - High Voltage; and
- AP30 Plasma Cutter SCP 06.

All other tool maintenance is under the responsibility of operators and Area Administrators at the depot level.

Calibration of test instruments is conducted by an appropriate NATA, or equivalent, laboratory. It is the responsibility of the operator to ensure that the equipment being used is in calibration.

Audits are conducted on a regular basis by the relevant Operations Supervisor, to ensure, among other things, compliance with the above requirements.

Training and Accreditation

Area Administrators maintain a database which details the training undertaken and accreditation level of their work crews. This ensures that the appropriate training and accreditation are provided for the tasks undertaken.

5.7 INDUSTRY PARTICIPATION

5.7.1 Risk

Reviews and changes to Industry Standards, Codes and Guidelines and Australian Standards on which SA Power Networks relies may not be appropriate for SA Power Networks operating environment.

5.7.2 Purpose

To influence Australian Standards & ENA guidelines, SA Power Networks maintains representation on relevant sub-committees which produces draft standards and guidelines before they are published and written into legislation.

5.7.3 Description

Nominated Officers input SA Power Networks views via attendance at meetings, written submissions, research, comment on draft documents and participation in expert working groups.

The following representatives have been nominated:

Sample of ENA Committees and Working Groups

Committee	Title	Nominee
ENA C(b) 1 (AS 7000)	Design & Maintenance of Overhead Transmission and Distribution Lines Working Group.	T Gregory
ENA - RPQWG	Reliability & Power Quality Committee	K Williams/ R Logozzo/ P Driver
ENA - AMC	Asset Management Committee	S Wachtel
ENA - ETRC	Electricity Technical Regulatory Committee	J Ali
EL-052-01	Electrical Energy Networks, Construction and Operation Working Group	Vacant
EL-054-02	Demand Response Enabling Device	S Webb
WG-PPFC	Power Pole Committee	C Davey

Standards Australia

Committee	Title	Nominee
EL/03/01	General Electric Cables	D Just
EL/8	Power Transformers	N Ridings
EL/8/5	Loading Guide for Power Transformers	N Ridings
EL/9/11	IEC TC88 Liaison	Vacant
IT/6/5	IEC TC57 Liaison	

CIGRE Australian Panels and Other international committees

Committee	Title	Nominee
A1	Rotating Machines	
A2	Transformers	N Ridings
A3	Switching Equipment	
B1	HV Insulated Cables	J Whaites
B2	Overhead Lines	
B3	Substations	C Davey
B4	HVDC Links and AC Power Electronic Equipment	
B5	Power System Protection & Local Control	M Doherty
C1	Power System Planning and Development	
C2	Power System Operation and Control	
C3	Power System Analysis and Techniques	
C4	Power System Insulation Coordination	
C5	Power System Electromagnetic Compatibility	
C6	Distribution Systems And Dispersed Generation	
D1	Materials for Electro-technology	
D2	Power System Communications and Tele-control	

Other Committees

Committee	Title	Nominee
DMEGC	Demand Management & Embedded Generation Committee	M O'Connor / S Webb
DMEGRG	Demand Management Embedded Generation Reference Group	
DBYD	Dial Before You Dig	A Lee
EMFC	Electric & Magnetic Fields Committee	T McCullough
ISTRG	Industry Skills & Training Reference Group	P Driver
LANDMGTWG	Land Management Guidelines Working Group	P Chapple
NEWPF	Work Practices Forum	J Tuck
NHVLWF	National High Voltage Live Work Forum	C W Davey / R Slager
OHS	Health Safety & Environment Committee	G Karlis / P Chapple
PTWG	Pilot & Trials Working Group	S Webb
RAC	Regulatory Affairs Committee	S Kelly / G Cox / J Bennett
SBCC	State Bushfire Coordination Committee	F Crisci
SEEFS	State Emergency Engineering Functional Service	F Crisci
SF6WG	HSE – SF6 Working Group	J Ali / P Chapple

5.8 DE-COMMISSIONING OF ELECTRICITY ASSETS

5.8.1 Risk

Unused and/or de-commissioned electricity infrastructure assets may still pose risks to safety of people and/or have an impact on the environment or reliability if not maintained in a suitable condition.

5.8.2 Purpose

Where SA Power Networks de-commissions an electricity asset and the asset is not fully removed then that asset needs to be inspected and maintained to ensure that it does not present a safety, environmental or reliability risk.

5.8.3 Description

Field Services, Services, and Construction & Maintenance Services provide a construction and commissioning service based on their customer's specific requirements. The appropriate Network asset management group issues these requirements via a project specification and/or job folder.

Requirements to be considered include, as applicable:

- Whether the assets are removed or left on site (decommissioned);
- Property disposal or release of easement - involvement of the Real Estate Group;
- Update of SSD and/or Feeder diagrams;
- Update of Substation Design drawings;
- Update of SAP asset information;
- Retention of asset inspection/maintenance where the assets remain; and
- Site contamination review – involvement of the Environment Group.

6. SAFETY and TECHNICAL PERFORMANCE INDICATORS

Contents Section

6.1 PERFORMANCE INDICATORS

Work Health and Safety Management Indicators

Annual cumulative numbers of:

- lost time injuries and near misses involving SA Power Networks personnel.
- medical treatment injuries involving SA Power Networks personnel.

Lost Time Injury Frequency Rate.

Medical Treatment Injury Frequency Rate.

Number of at fault motor vehicle incidents.

Number of in progress hazard logs per month.

Number of Hazard logs greater than 30 days old.

Actual workplace inspections carried out per annual inspections planned.

Number of shock reports per 1000 km of mains.

Number of damage claims per 1000 km of mains.

Number of fire starts per 1000 km of mains.

Number of switching incidents and switching incident frequency rate.

Number of completed emergency plan exercises.

Reliability Management Indicators

SAIDI.

SAIFI.

Severe Weather Events.

Low reliability distribution feeders.

Cause of Interruptions.

Major Interruptions.

Planned Interruptions.

GSL: Frequency and Duration of Supply Interruptions.

SPS (STPIS) performance (SAIDI and SAIFI for each feeder category – reported annually to the AER).

Technical Management Indicators

Compliance with the Distribution Code for the repair of street lights.

% of meters within tolerance (per planned sample).

Number of voltage enquiries received.

Quality of Supply and Quality of Supply (Voltage Variations)

(NB: for off-grid areas service standards are specified by contract and reported to the asset owners).

General Information

Number of requests for underground locations provided per year.

Number of revenue metering investigations carried out per year.

Audited compliance against internal safety and technical procedures.

Audited compliance against internal vegetation clearance procedures and vegetation clearance agreements.

Number of network access permits requested and issued.

7. SAFETY, RELIABILITY, MAINTENANCE and TECHNICAL Specific Standards Compliance

Contents: Section

7.1 MANAGEMENT OVERVIEW

Management Overview:

This section details SA Power Networks arrangements for complying with the requirements of the Electricity Act and associated Regulations with respect to specific Australian and industry standards.

SA Power Networks participates in a number of committees with the expressed intention of contributing to the development of standards in Australia. The committees in which a participation is maintained, is detailed in Section 5.7.

Reviews are conducted on a routine basis of the Australian Standards publication the 'Monthly Review of Australian Standard'. New standards as they are released are reviewed to ensure that any impacts on SA Power Networks business are understood and managed.

There are standards where SA Power Networks has chosen not to adhere to specific requirements. Where such alternatives are used a justification for the alternative is included in this plan document.

Assurance of compliance is mostly achieved through the specification of requirements for items purchased.

7.2 AS1025 (Superseded by AS/NZS 60265) Substation High Voltage Switchgear

This Australian Standard applies to high voltage switches designed for use outdoors or indoors on alternating current systems having a voltage rating exceeding 1000V. It also applies to the operating devices of the switches and to their auxiliary equipment.

Note: The following are NOT covered by this standard.

1. Switches in which a fuse is an integral part.
2. Contactors.
3. Motor starting switches.
4. Earthing switches.
5. Ratings and tests for switches used in insulated neutral systems.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Ratings;
- Design and Construction;
- Performance Classification of tests;
- Details of Type test;
- Details of Routine tests; and
- Markings.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Where deemed necessary an SA Power Networks representative will witness testing performed.

3. Test Certificates are required for all equipment purchased for use in Zone Substations.

4. Inspection and testing is performed prior to or during installation and commissioning.

5. Equipment is rejected where any significant non-compliance is detected.

6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.3 AS/NZS 1026
Electric Cables - Impregnated Paper Insulated – For working voltages up to and Including 19/33 (36kV)

This standard specifies the requirements for non-draining mass-impregnated paper insulated and lead alloy sheathed cables for working voltages up to and including 19/33 kV.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Operating voltages;
- Maximum conductor temperatures;
- Conductors and conductor screening;
- Insulation;
- Core identification;
- Laying up;
- Impregnation;
- Lead alloy sheathing;
- Bedding;
- Armour;
- Non-metallic sheath or serving;
- Compounds for lapped bedding and serving;
- Sealing and preparation for delivery; and
- Tests.

The standard also includes many tables and appendices to assist with selection, installation, testing and information required for ordering of cables.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.4 AS/NZS 1125 Conductors in: Insulated Electric Cables and Flexible Cords

This standard specifies the requirements for conductors in insulated electric cables and flexible cords used for general wiring cables.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Conductor types such as plain tinned annealed copper, silver plated annealed copper and aluminium;
- Form of conductor;
- Joints in conductors; and
- Construction, dimensions and resistance of conductors.

Tables for the various cable types are provided to assist selection.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to certify that their cables comply with this Australian Standard.

2. Visual inspection is carried out at receiving and upon the detection of non-compliance SA Power Networks rejects the shipment of cable from the supplier.

7.5 AS1154
Insulator and Conductor: Fittings for Overhead Power Lines

This Australian Standard sets out the performance and general requirements for insulator and conductor fittings other than helical fittings which are covered in AS 1154 Part 3, for use on overhead electric power lines, excluding insulated service lines.

Part 1: Performance, material, general requirements and dimensions.

Part 3: Insulator and conductor fittings for overhead power lines – performance and general requirements for helical fittings.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Specification details for insulator pins and their mechanical type testing;
- Insulator fittings and earth conductor fittings;
- Anchor and tension fittings, mechanical and electrical testing;
- Non-tension and support fittings;
- Electrical and control protection fittings; and
- Appendices including calculation of test currents for short time current tests, calculation of vibration damper efficiency and mechanical impedance testing.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard by requiring all cables supplied confirm to this standard. It is a required condition of the materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify compliance with this Australian Standard.

3. Where deemed necessary, an SA Power Networks representative may witness testing performed.

4. Type Test certificates are required for all fittings and equipment types purchased.

7.6 AS/NZS 1170
Structural Design Actions – General Principles

This standard is in four parts; - Part 1 sets out the requirements for establishing the minimum dead, live, wind and snow loads, as well as load combinations to be used in the limit state design of structures and members. Part 2 is intended to be used for the determination of the minimum wind loads in structural design and is in a limit states format. Part 3 Concerns snow loading and Part 4 earthquake loads.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Loads and load strength for strength, stability and serviceability;
- Dead loads, partitions and removable dead loads;
- Live loads including:
  - Movable partitions, partial loading, impact and inertia loading, braking and horizontal impacts, crane, hoist and lift loading, roof and balcony live loading.
- Movement effects; and
- Procedures for dynamic and static analysis.

Compliance Status

Relevant elements of this standard are incorporated into the SA Power Networks asset design standards.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Substations designed by SA Power Networks Field Services Design Group are checked by appropriately qualified personnel and approved by an SA Power Networks Civil Engineer.

2. Substations and Transmission lines designed by contractors are required to be certified as complying with this Australian Standard.

3. Transmission lines designed by SA Power Networks are checked by appropriately trained SA Power Networks personnel. Approval of the design is by an SA Power Networks Engineer who is trained and qualified to do so.

4. Distribution lines are designed to prescribed SA Power Networks standards based on this Australian Standard with the assistance of a software package (PLF-CAD). The designs are checked and approved by SA Power Networks personnel who are trained and qualified to do so.

7.6 AS 1222.1
Steel Conductors – Bare Overhead: Galvanised

The Australian Standard specifies the tests and requirements for bare electrical conductors and stays for overhead power transmission purposes, constructed from galvanised steel wire.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Material requirements and wire properties;
- Conductor requirements;
- Selection of test specimens;
- Packing and marking; and
- Appendices including calculation of conductor properties, coefficient of linear expansion and the modulus of elasticity impedance testing, resistivity tests and purchasing guidelines.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard by requiring all conductor supplied conform to this standard. It is a required condition of the materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.7 AS 1222.2
Steel Conductors – Bare Overhead: Aluminium Clad (SC/AC)

The Australian Standard specifies the tests and requirements for bare electrical conductors and stays for overhead power transmission purposes, constructed from aluminium - clad steel wire.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Material requirements and wire properties;
- Conductor requirements and joints in finished wires;
- Selection of test specimens and testing for:
  - Mechanical properties, coating thickness, resistivity and ratio;
- Packing and marking; and
- Appendices including calculation of conductor properties, coefficient of linear expansion and the modulus of elasticity and purchasing guidelines.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard by requiring all conductor supplied, conform to this standard. It is a required condition of the materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.8 AS 1243 (Superseded by AS 60044) Voltage Transformers for: Measurement and Protection

This standard specifies the general requirements and tests for all types of VTs and, in separate sections, specific requirements for single-phase VTs, for CVTs, for three-phase VTs and for Designation L VTs. Deals specifically with accuracy and short-term and long-term overvoltage ratings and applies the rated voltage factor to the VT as an entity, as well as to individual secondary windings. Primary windings are classified as 'uniformly insulated' or 'non-uniformly insulated'. Categories of performance (A and B) are specified for three-phase VTs only. Includes many explanatory appendices and enlarges on the determination of primary and secondary currents and of temperature coefficients of error, and on the determination of errors under different conditions.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Application, service conditions, insulation levels, primary voltage, overvoltage ratings, accuracy, current density, secondary windings, routine and special tests;
- Single phase electromagnetic voltage transformers;
- Capacitor voltage transformers;
- Designation “L” voltage transformers; and
- Appendices including guidance in selection and ordering.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have or are in the process of seeking accreditation for a system of Quality Assurance.

2. Test Certificates are required for all equipment purchased.

3. Equipment is rejected where any significant non-compliance is detected upon receipt inspection.

4. Inspection and testing is performed prior to or during installation and commissioning.

5. Minor deviations may be included after review and acceptance by SA Power Networks.

7.9 AS 1265 (Superseded by AS/NZS 60137) Insulated Bushings for Alternating Voltages Over 1kV

This Australian Standard applies to bushings supplied separately for use in the construction of indoor and outdoor electrical equipment, transformers and electrical installations that are connected to a c. systems having a rated voltage above 1000 V and frequencies between 15Hz and 60Hz. The bushings are capacitance graded or non-capacitance graded. It is technically identical with IEC 60137, modified to suit Australian conditions.

The standard is NOT applicable to bushings for use with rectifiers, rotating machines, testing transformers, or to terminals for power cables (potheads).

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Definition of the various bushing types;
- Ratings;
- Ordering characteristics and markings;
- Operating conditions;
- Test requirements;
- Type tests; and
- Routine tests.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their bushings comply with this Australian Standard.

3. Type test certificates are required for bushings purchased.

4. Inspection and testing is performed prior to or during installation and commissioning.

5. Equipment is rejected where any significant non-compliance is detected.

6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.10 AS 1284
Electricity Metering – socket mounting system

This Australian Standard specifies requirements in multiple parts for watthour meters.

Part 1	General purpose induction watthour meters.
Part 2	*Portable alternating current rotating standard watthour meters. (Withdrawn)*
Part 3	*Induction watthour meters – Energy demand type. (Withdrawn)*
Part 4	Socket mounting system.
Part 5	*General purpose electronic watthour meters. (Superseded by AS62053.21)*
Part 6	*Ripple control receivers for tariff and load control. (Superseded by AS62054.11)*
Part 7	*Internal clocks for meters and load control devices. (Superseded by AS62054.21)*
Part 8	Polyphase multifunction demand watthour meters.
Part 9	*Electronic watthour meters (Classes 0.2S and 0.5S). (Superseded by AS62053.22)*
Part 10	Data exchange for meter reading, tariff and local control.
Part 11	Single phase multifunction watthour meters.
Part 12	Polyphase multifunction (non-demand) watthour meters.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Definition of the various meter types;
- Constructional requirements;
- Electrical requirements;
- Performance requirements;
- Programming;
- Testing;
- Meter circuits and terminations;
- Data storage;
- Energy measurement; and
- Type and routine tests appendices, covering information to be supplied when ordering meters.

Compliance Status

SA Power Networks ensures compliance with these Standards when their requirement is called for.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their meters comply with these Australian Standards.

3. On request, type test certificates are required for meters purchased.

4. Inspection of a sample of meters is performed prior to or during installation and commissioning.

5. Equipment is rejected where any significant non-compliance is detected.

6. Minor deviations may be included after review and acceptance by SA Power Networks based on NEMMCO compliance.

7.11 AS 1289 A Series of Standards: Methods of Testing Soils for Engineering Purposes

This standard is a series of more than 50 methodologies for testing of soils for engineering purposes.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Preparation of soil samples.
- Soil moisture content tests.
- Soil classification tests.
- Soil chemical tests.
- Compaction and density tests.
- Soil strength and consolidations tests.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in contracts placed with soil testing specialists and Geotechnical Engineers.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

SA Power Networks does not undertake this activity directly and employs on an as needs basis the expertise of qualified testing organisations who are required to certify that they conduct soil testing in accordance with this Australian Standard.

7.12 AS 1306 (Superseded by AS62271.102) High Voltage a.c. Switchgear & Controlgear Disconnectors (Isolators) & Earthing Switches

This Australian Standard specifies the requirements for disconnectors (isolators) and earthing switches designed for indoor and outdoor use at service frequencies up to and including 60 Hz in systems having rated voltages exceeding 1kV.

Standards Compliance

Requirements of the Standard:

The Standard includes service conditions, definitions, ratings, design and construction requirements, type and routine tests, guide to the selection of switching devices, information to be given with enquiries, tenders orders, requirement for transport, storage, erection and maintenance, and a recommendation for quality control during manufacture.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary, an SA Power Networks representative will witness testing performed.
3. Type test certificates are required for all equipment types purchased.
4. For earthing switches test certificates are required to be supplied for all switches supplied.
5. For switches other than earth switches, the manufacturer is required to certify compliance with this Australian Standard.
6. Inspection and testing is performed prior to or during installation and commissioning.
7. Equipment is rejected where any significant non-compliance is detected.
8. Minor deviations may be included after review and acceptance by SA Power Networks.

7.13 AS 1307
Surge Arresters – Metal-Oxide Type without Gaps for a.c. Systems

This Australian Standard (Part 4) specifies the minimum criteria for the requirements and testing of metal oxide type gapless surge arresters for overhead power distribution purposes.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Definition of surge arrestor parameters;
- Identification and Classification;
- Standard Ratings;
- Type Tests; and
- Routine tests & Acceptance tests.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard by requiring all surge arresters supplied conform to this standard. It is a required condition of the materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their surge arresters comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.14 AS/NZS 1429
Electric Cables - Polymeric Insulated for working voltages 19/3.3kV up to and including 19/33kV

Specifies the requirements for cross-linked polyethylene (XLPE) and ethylene propylene rubber (EPR) insulated cables for fixed installations for electricity supply, with or without armour, including single-core and three-core cables comprising individually screened cores and three-core cables comprising collectively screened cores.

Part 1: Electric cables – polymeric insulated - For working voltages 1.9/3.3 (3.6) kV up to and including 19/33 (36) kV.

Part 2: Electric cables – Polymeric insulated – for working voltages above 19/33 (36) kV up to and including 87/150 (170) kV.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Definitions;
- Construction details such as:
  - operating voltages, temperatures, conductor and screening, insulation and screening, armouring and non-metallic sheathing, water-blocking and protection from boring insects.
- Type and routine tests;
- Specifics for individually screened cores;
- Specifics for collectively screened cores; and
- Appendices including testing after installation.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard by through conditions in the materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.15 AS 1531
Conductors - Bare Overhead - Aluminium and Aluminium Alloy

Sets out requirements and tests necessary for homogeneous bare electrical conductors for overhead power transmission and constructed of all aluminium and aluminium alloy wires. A range of wire sizes, 2.50 mm to 4.75 mm, and their properties are provided.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Material requirements and properties;
- Conductor requirements such as:
  - construction, identification of aluminium alloy conductors, joints in wires of conductors, lay and standards sizes and calculated properties;
- Type and routine tests;
- Packing and marking;
- Appendices including calculation of conductor properties and coefficients of expansion.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard by through conditions in the materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their cables comply with this Australian Standard.
3. Visual inspection is carried out prior to installation.

7.16 AS 1657
Fixed Platforms, Walkways, Stairways and Ladders – Design, Construction and Installation

This standard specifies the requirements for the design, construction and installation of fixed means of access to, and safe working at places normally used by operating, inspection, maintenance and servicing personnel. Included in Appendices are methods for testing guardrails and posts, as well as typical component dimensions and spacings for guard railing.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Structural design, materials and welding;
- Platforms, continuous walkways and steps with ladders;
- Stairways, landings, guard railing and handrails;
- Fixed ladders, step ladders and rung ladders; and
- Appendices including testing of guard rails and their posts.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in the materials purchase specifications and SA Power Networks substation design and construction standards.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Type test certificates are required for platforms, ladders and railings purchased.
3. Inspection and testing is performed prior to or during installation and commissioning.
4. Equipment is rejected where any significant non-compliance is detected.
5. Minor deviations may be included after review and acceptance by SA Power Networks.
6. Platforms, ladders and railings designed by contractors for installation in substations are required to be certified as complying with this Australian Standard.

7.17 AS/NZS 1668.1 for the use of Ventilation & Air-conditioning in Buildings – Fire & Smoke Control in Multi-compartment Buildings

This standard sets out the requirements for those aspects of design, construction, installation and operation of air-handling systems with a view to minimising the spread of smoke and fire through buildings by way of the air-handling systems.

Standards Compliance

Requirements of the Standard:

The standard covers:

- General requirements;
- openings in fire-resisting construction;
- Smoke control;
- Central air handling systems;
- Individual air-handling plants - Zone smoke control; and
- Air pressurisation systems for fire isolated exits.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in the materials purchase.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Type test certificates are required for ventilation and smoke control equipment purchased.
3. Inspection and testing is performed prior to or during installation and commissioning.
4. Equipment is rejected where any significant non-compliance is detected.
5. Minor deviations may be included after review and acceptance by SA Power Networks.
6. Ventilation and smoke control equipment designed by contractors for installation in substations is required to be certified as complying with this Australian Standard.

7.18 AS 1675 (Superseded BY AS60044.1) Current Transformers – Measurement and Protection

This standard specifies requirements for the designation, rating, performance, marking, and testing of current transformers (CTs). Covers aspects common to all CTs (Section 1), and specific requirements for Class M and Class ME measurement CTs (Section 2) and for Class P, Class PL, and Class PS protection CTs (Section 3). Provides extensive explanatory material in appendices.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Scope and general requirements such as:
- service conditions, rated current and insulation levels, temperature rise, short-time current withstand, type tests.
- Specific requirements for measurement current transformers.
- Specific requirements for protection current transformers.

Appendices include information for ordering, guidance in the application of current transformers and testing.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in the materials purchase.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their bushings comply with this Australian Standard.

3. Type test certificates are required for bushings purchased.

4. Inspection and testing is performed prior to or during installation and commissioning.

5. Equipment is rejected where any significant non-compliance is detected.

6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.19 AS 1746
Conductors - Bare Overhead - Hard-drawn Copper

This standard sets out requirements and tests necessary for homogeneous bare electrical conductors for overhead power transmission, and constructed of hard-drawn copper wires. A range of wire sizes and their properties are provided.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Material requirements and properties;
- Conductor requirements such as:
  - construction, identification of aluminium alloy conductors, joints in wires of conductors, lay and standards sizes and calculated properties;
- Type and routine tests;
- Packing and marking; and
- Appendices including calculation of conductor properties and coefficients of expansion.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in the materials purchase.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.20 AS 1767.1
Insulating Liquids - Specification for unused mineral insulating oils for transformers and switchgear

This standard sets out the specification and test methods for unused insulating liquids, as delivered, with or without additives, intended for use in transformers, switchgear and similar electrical equipment in which liquid is required as an insulant or for heat transfer. Includes details of bulk transport sampling, specification and laboratory testing. This Standard is based on but is not technically equivalent to and has been reproduced from IEC 60296:1982 and IEC 60296:1982/Amd.1:1986.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Composition and appearances of pure hydrocarbon mineral oils;
- Characteristics including electric strength;
- Packaging for transport; and
- Appendices covering testing for:
- sludge, electric strength, corrosive sulphur, viscosity, resistivity and water content.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in the materials purchase.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Test certificates are required for oils purchased directly or indirectly through transformer suppliers/manufacturers.

3. Testing is performed prior to use.

4. Oils are rejected where any significant non-compliance is detected.

5. Minor deviations may be included after review and acceptance by SA Power Networks.

7.21 AS 1795.1
Sheets and Boards for Electrical Purposes Classification and General Requirements

This is not a current Australian Standard

7.22 AS 1824.1
Insulation Coordination – Definitions, Principles and Rules

This standard is in two parts. Part 1 being the standard for three phase equipment having a highest voltage above 1 kV. Part 2 provides guidance on the selection of the electric strength of equipment, of surge diverters or protective gaps, and of the most suitable degree of switching overvoltage control.

Standards Compliance

Requirements of the Standard:

The standard covers:

- The basic principles of insulation coordination;
- Standard insulation levels for equipment;
- Voltage stresses in service;
- Insulation withstand;
- protective devices;
- Testing procedures; and
- Appendices providing examples of application.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in the materials purchase.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

SA Power Networks maintains an Insulation Coordination Manual which incorporates the requirements of this Australian Standard. The manual translates the Standards into operational requirements.

7.23 AS 1852
International Electrotechnical Vocabulary – Generation, Transmission and Distribution Electricity, Power System Planning and Management

This Australian Standard specifies the international electrotechnical vocabulary to be used in Power System Planning.

Standards Compliance

Requirements of the Standard:

The standard defines the terminology in three languages in separate volumes as follows:

- Chapter 601 General
- Chapter 602 Generation
- Chapter 603 Power system planning and management
- Chapter 604 Operation
- Chapter 605 Substations

Compliance Status

SA Power Networks generally complies with this Standard.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

Document produced for use by external or foreign organisations are checked for accurate terminology prior to release.

7.24 AS 1883
Guide to Maintenance and Supervision of Insulating oils in Service

This Australian Standard provides guidance in monitoring, evaluating and maintaining the condition of mineral insulating oils used in electric power equipment by recommended standardised tests, procedures and treatments.

Standards Compliance

Requirements of the Standard:

The standard provides guidance on:

a) Properties and deterioration of oil, oil tests and their significance, sampling of oil from equipment, evaluation of mineral insulating oil in new equipment.

b) Evaluation of used oil identifying, frequency of examination, testing procedures, classification of oils in service and corrective actions.

c) Mutual compatibility of mineral insulating oils.

d) Handling and storage.

e) Reconditioning, reclaiming and re-refining.

f) Hygiene and environmental precautions.

Compliance Status

SA Power Networks ensures compliance with all mandatory requirements. However, consideration is given to recommendations which may not be adopted in their entirety based on SA Power Networks experience.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Assurance for meeting the technical requirements for insulating oils in service, are embodied in the Technical Standard for Substation Maintenance.

2. The safe handling requirements for insulating oils including personal protection, storage, spillages and disposal are contained in the Substation Instructions for hazardous materials.

7.25 AS 1939
Degrees of Protection Provided by Enclosures for Electrical Equipment

This Australian Standard specifies an alphanumeric code for classifying the degrees of protection provided by enclosures for electrical equipment rated up to 72.5 kV. It covers protection of persons against access to hazardous parts of the equipment against ingress of solid foreign objects, dust, and harmful quantities of water. Tests, access probes and object probes and other test equipment are specified.

Standards Compliance

Requirements of the Standard:

The standard also is accompanied by two supplements which are wall charts specifying text, diagrams and basic details of protection.

The object of the standard is to give:

- Definitions for degrees of protection provided by enclosures of electrical equipment as regards:
  - protection of persons against access to hazardous parts inside the enclosure;
  - protection of the equipment inside the enclosure against ingress of solid foreign objects; and
  - protection of the equipment inside the enclosure against the harmful effects due to ingress of water.
- Designations for the degrees of protection.
- Requirements for each designation.
- Tests to be performed to ensure that enclosures meet the requirements.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil Required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their enclosures comply with this Australian Standard.

3. Minor deviations may be included after review and acceptance by SA Power Networks.

7.26 AS 1940 Storage and Handling of Flammable and Combustible Liquids

Provides requirements for the planning, design, construction, and safe operation of all installations in which flammable or combustible liquids are stored or handled. In separate sections it deals with minor storage, package storage and handling, storage in tanks, fuel dispensing, piping and tank auxiliaries, operations and fire protection facilities. Appendices deal with tank venting, combustion characteristics, fire exposure protection, gas-freeing precautions and principles, and power station and grid transformers.

Standards Compliance

Requirements of the Standard:

The object of the standard is to give guidance on:

- New designs and innovations in the storage of flammable materials;
- Interpretations, classification and exclusions;
- Minor storage applications;
- General requirements;
- Package storage and handling areas;
- Storage tanks;
- Fuel dispensing;
- Systems for piping, valves, pumps and tank heating;
- Tank vehicle loading facilities;
- Operations; and
- Fire protection facilities.

Compliance Status

SA Power Networks ensures complies on all new significant developments.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Retrospective assessment of requirements for AS 1940 is in progress.

Compliance Assurance

1. Installations designed by specialist contractors are required to be certified as compliant with this Australian Standard.

2. SA Power Networks designs in line with AS 1940 are reviewed by our Environmental Scientists and independent consultants.

3. Field Services Work Methods Group maintain procedures and practices for storing and handling flammable materials.

7.27 AS 2006 (Superseded by AS62271.100) High Voltage a.c. Switchgear and Controlgear – Circuit Breakers for rated voltages above 1kV

This Australian Standard applies to circuit breakers designed for indoor and outdoor service for operation in systems with frequencies up to 60 Hz and voltages higher than 1kV.

Standards Compliance

Requirements of the Standard:

Sections are included covering service conditions, definitions, ratings, design and construction, type and routine tests, the selection of circuit breakers for service, information to be given with enquiries, tenders and orders, transport and storage, erection, maintenance, a guide for commissioning tests and quality control during manufacture Nine appendices giving supplementary information are included.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance

2. Where deemed necessary, an SA Power Networks representative will witness testing performed.

3. Testing certificates are required for all equipment purchased.

4. Inspection and testing is performed prior to or during installation and commissioning.

5. Equipment is rejected where any significant non-compliance is detected.

6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.28 AS 2024
High Voltage a.c. Switchgear and Controlgear – Switch-Fuse Combinations

This Australian Standard specified the requirements for three-pole switch-fuse combinations having rated voltages above 1 kV and up to but not including 52 kV, for use on 50 Hz three-phase a.c. systems. It covers functional assemblies of switches or switch-disconnectors complying with AS combination with current-limiting fuses complying with AS 1033.2 with strikers, which together are able to interrupt currents up to the rated short-circuit breaking current of the switch- fuse combination.

The standard also covers combinations forming part of ring main units.

Standards Compliance

Requirements of the Standard:

Sections are included covering Service conditions, ratings design and construction, type tests, routine testing, coordination of switch and fuse, information to be given in tenders and orders together with the requirements for transport, storage, erection and maintenance.

Compliance Status

SA Power Networks has not prepared specifications for switch-fuses since this standard was introduced in 1991. However, to ensure compliance with all sections of this Standard, conditions of supply will include reference to AS 2024-1991 in future materials purchase specifications.

Compliance Gap Analysis

Nil. The specification previously used to purchase fuse-switches quote the same standards referenced in AS 2024-1991.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance

2. Where deemed necessary, an SA Power Networks representative will witness testing performed.

3. Testing certificates are required for all equipment purchased.

4. Inspection and testing is performed prior to or during installation and commissioning.

5. Equipment is rejected where any significant non-compliance is detected.

6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.29 AS 2067
Substations and High Voltage Installations Exceeding 1kV a.c.

This Australian Standard specifies the requirements for indoor and outdoor switchgear assemblies for alternating voltages above nominal1 kV such as employed in connection with generation, transmission and distribution of electric power. It also applies to ancillary equipment used in conjunction with switchgear.

The standard should be read in conjunction with AS 2650.

Standards Compliance

Requirements of the Standard:

Sections are included covering:

- rating of equipment, busbars and connections;
- design and construction;
- identification of insulated and bare conductors and terminals;
- control, indication and relay equipment;
- auxiliary systems (Electrical and Air);
- electrical clearances for switchgear and assemblies;
- clearances for safety purposes; and
- tests (type, routine and site).

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance
2. Where deemed necessary, an SA Power Networks representative will witness testing performed.
3. Testing certificates are required for all equipment purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.30 AS 2086 (Superseded by AS62271.200) High Voltage a.c. Switchgear and Controlgear

This Australian Standard is split into two sections as follows:

- AS 62271.200-2005 - High Voltage switchgear and controlgear. a.c. metal enclosed switchgear and controlgear for rated voltages above 1kV and up to and including 52kV.
- AS 62271.203-205 – High voltage switchgear and Controlgear – gas insulated metal enclosed switchgear for rated voltages above 52kV.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Rated characteristics.
- Design and Construction.
- Type tests.
- Routine tests.
- A guide to selection of switching devices.
- Information to be give to tenderers.
- Transport, Storage, Erection and Maintenance.
- Quality Control during Manufacture.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance
2. Where deemed necessary, an SA Power Networks representative will witness testing performed.
3. Testing certificates are required for all equipment purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.31 AS 2159
Piling Design and Installation

This standard specifies the minimum requirements for the design, calculation and testing of piled foundations for civil engineering and building structures, on land and immediate inshore locations.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Site investigations;
- Design calculations;
- Durability of concrete, steel and timber piles; and
- Testing.

Compliance Status

SA Power complies with this standard.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

SA Power Networks does not undertake this activity directly and employs on an as need basis the expertise of qualified organisations who are required to certify that they conduct soil testing in accordance with this Australian Standard.

7.32 AS 2264 (Superseded by AS62271.201) Enclosed Switchgear 1 to 38kV

This standard applies to factory-assembled insulation-enclosed switchgear and controlgear for alternating current of rated voltages above 1 kV and up to and including 52 kV for indoor installation and for service frequencies up to and including 60 Hz. This Standard is equivalent in technical content but does not fully correspond in presentation to IEC 466:1987 and Amendment 1:1994.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Ratings for:
  - voltage, insulation, frequency, normal current, short time withstand current, peak with stand current, duration of short circuit, supply voltage for open/closing devices and auxiliary circuits, rated pressures for compressed gas supply for operation;
- Design and construction for:
  - liquids and gases in switchgear and control gear, earthing, auxiliary equipment, power and stored energy closing, operation of releases, interlocking devices, degree of protection, internal faults, insulation enclosure, shutters etc.
- Type routine tests; and
- Guide to selection for service.

Compliance Status

SA Power ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Test Certificates are required for all equipment purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.33 AS 2279 (Superseded by AS/NZS 61000) Disturbances in: Mains Supply Network

This Standard has been superseded by the AS61000 Series

7.34 AS 2374 Power Transformers

This Australian Standard specifies the technical requirements for single and three phase power transformers, including auto transformers, but excludes single phase transformers rated at less than 1kVA, three phase transformers rated at less than 5kVA, and certain special transformers such as instrument, starting, testing and welding transformers, transformers for static converters and those mounted on rolling stock.

Standards Compliance

Requirements of the Standard:

The Standard is in multiple parts as follows:

AS 2374.1.2 Power transformers – minimum energy performance standard (MEPS) requirement for distribution transformers.

AS 2374.2 Specifies temperature rise limits and methods of test for measuring temperature rise.

AS 2374.3.0 Specifies the general requirements for insulation levels and dielectric tests. *(Superseded by AS/NZS 60076.3.2008)*

AS 2374.3.1 Sets out the minimum clearances in air between live parts of bushings on oil-immersed power transformers and objects at earth potential. *(Superseded by AS/NZS 60076.3.2008)*

AS 2374.5 Specifies the design requirements necessary for power transformers to withstand short-circuit and the means for demonstrating that ability. (*Superseded by AS/NZS 60076.5 Power Transformers – Ability to withstand short-circuit)*.

AS 2374.6 Defines sound power versus sound pressure and sets out the methods by which the sound power levels of transformers, reactors and their associated cooling equipment shall be determined. *(Superseded by AS/NZS 60076.10.2009)*

AS 2374.7 Provides guidance on determining the acceptable relationship between transformer rating and proposed load cycle when considering the effect of operating temperatures on life expectancy due to insulation deterioration and thermal aging.

AS 2374.8 Power Transformers – Application Guide.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Test Certificates are required for all equipment purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.
7. Ongoing load management is governed by SA Power Networks Quality Management System in Network Planning based on the requirements of this Australian Standard.

7.35 AS 2467
Maintenance of Electrical Switchgear

This Australian Standard sets out the recommendations and procedures for the maintenance of electrical switchgear designed for voltages not greater than 145kV.

In practice, this standard applies to all circuit breakers, reclosers, ring main units, disconnectors and all auxiliary plant including protective fuses and relays.

Standards Compliance

Requirements of the Standard:

The objective of this Standard is to ensure that indoor and outdoor electrical switchgear and auxiliary plant is kept in an acceptable condition.

The scope of the standard covers:

- General provisions for safety.
- Design specification and work methods that ensure safe operation of electrical switchgear and associated equipment.
- Maintenance regimes appropriate to the duty and the equipment.
- Specific work procedures for maintenance of various types of switchgear including:
  - Regime of diagnostic testing.
  - Maintenance of auxiliary plant.
  - Maintenance of protective devices.

Compliance Status

SA Power Networks exceeds the requirements of this standard.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. This Safety, Reliability, Maintenance and Technical Management Plan details the framework for managing:
   - Safety of personnel Section 3; and
   - Maintenance as detailed in Section 4.

2. The progressive adoption of Reliability Centred Maintenance methodologies is being used to determine the frequency of maintenance activities.

3. The record of maintenance carried out is provided through SA Power Networks software package SAP.

7.36 AS 2481
All – or – Nothing Electrical Relays

This is not a current Australian Standard

7.37 AS 2490
Sampling Procedures and Charts for Inspection by Variables for Percent Non-Conforming

This Australian Standard sets out the recommendations and procedures for the maintenance of electrical switchgear designed for voltages not greater than 145kV.

In practice, this standard applies to all circuit breakers, reclosers, ring main units, disconnectors and all auxiliary plant including protective fuses and relays.

Standards Compliance

Requirements of the Standard:

The objective of this Standard is to ensure that indoor and outdoor electrical switchgear and auxiliary plant is kept in an acceptable condition.

The scope of the standard covers:

- General provisions for safety.
- Design specification and work methods that ensure safe operation of electrical switchgear and associated equipment.
- Maintenance regimes appropriate to the duty and the equipment.
- Specific work procedures for maintenance of various types of switchgear including:
  - Regime of diagnostic testing.
  - Maintenance of auxiliary plant.
  - Maintenance of protective devices.

Compliance Status

SA Power Networks exceeds the requirements of this standard.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. This Safety, Reliability, Maintenance and Technical Management Plan details the framework for managing:
   - Safety of personnel Section 3; and
   - Maintenance as detailed in Section 4.

2. The progressive adoption of Reliability Centred Maintenance methodologies is being used to determine the frequency of maintenance activities.

3. The record of maintenance carried out is provided through SA Power Networks software package SAP.

7.38 AS 2629
Separable Insulated Connectors for Power Distribution Systems above 1kV

This standard provides sampling plans and procedures for inspection by variables. Three methods of determining acceptability are included ie. the 's' method, the 'o' method and the 'r' method. Appendices cover basic statistical theory, calculation of the estimated standard deviation and the use of the 'r' range method as an alternative to the 's' method.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Scope and field of application;
- Choice of sampling plan including:
- Choice between variables;
  - Choice of method.
  - Choice of inspection plan.
  - Choice of sampling plan.
- Operation of a variables sampling plan including:
  - Standard procedures for ‘s’ and ‘o’ methods.
  - Records.
  - Switching rules.
  - Acceptance curves.

Compliance Status

The use of this standard is restricted to meter class sampling as required by the SA Metering Code.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

Sample selection and results are independently checked by a Professional Engineer to ensure compliance with this Australian Standard. For more information, refer to the SA Power Networks Metering Asset Management Plan.

7.39 AS 2650 (Superseded by AS 62271.1) Common Specifications for High Voltage Switchgear and Controlgear Standards

This standard specifies requirements common to most high voltage a.c. switchgear and controlgear equipment Standards. It is intended to be used as a base document in conjunction with those equipment Standards that make extensive reference to its clauses and its requirements become effective as specified in or as modified by those Standards.

Standards Compliance

Requirements of the Standard:

The requirements of the standard specifically apply to the following standards:

AS 1025, 1306, 2006, 2067, 2086, 2263 and 2264.

The following documents are also referred to in the standard:

AS 1102, 1767, 1861, 1824, 1852, 1931, 2467, 2752, 2768, 60270, IEC 376, 507 and CISPR 16.

The standard covers:

- Normal service conditions for indoor and outdoor switchgear and control;
- Types of insulation;
- Equipment Ratings;
- Design and Construction;
- Type tests; and
- Routine tests.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Type test certificates are required for equipment purchased.

3. Inspection and testing is performed prior to or during installation and commissioning.

7.40 AS 2676
Guide to the Installation, Maintenance, Testing and Replacement of Secondary Batteries in Buildings

This Australian Standard sets out the recommended practices for the installation, maintenance, testing and replacement of vented or sealed secondary batteries permanently installed in buildings.

Standards Compliance

Requirements of the Standard:

The standard is in two parts:

- Part 1 for vented cells; and
- Part 2 for sealed cells.

The standard provides:

a) Design considerations for battery size, methods of connection, operating conditions, short circuit current, voltage drop, earth fault protection and alarms.
b) Battery accommodation, ventilation, access, floor loadings and battery stands.
c) Methods of charging.
d) Installation, commissioning, inspection, maintenance and records.

Compliance Status

SA Power Networks ensures compliance with this Standard through conditions in materials purchase specifications for batteries.

SA Power Networks ensures compliance with all mandatory requirements.

SA Power Networks considers recommendations but does not necessarily adopt them such as the recommended period between inspections which is based on SA Power Networks experience.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Type test certificates are required for all batteries purchased.
3. Inspection and testing is performed prior to or during installation and commissioning.
4. Equipment is rejected where any significant non-compliance is detected.
5. Minor deviations may be included after review and acceptance by SA Power Networks.
6. Substation and Telecommunications installations are designed to the SA Power Networks Design, Construction and Maintenance Standard.
7. Routine inspection and maintenance is performed in accordance with Substation Instructions.

7.41 AS 2841
Galvanised Steel Wire Strand

This Australian Standard Specifies the requirements for the designation, manufacture, and testing of galvanised steel wire strand for structural, guying, and general purpose applications.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Wire grade, galvanising and lubrication;
- Manufacture including;
- Wire core, direction of lay, length of lay, forming, joints, freedom from defects, finished dimensions, mass of strand, lubrication, seizing and packing; and
- Appendices include testing of strands, completed wires and certification.

Compliance Status

SA Power Networks ensures compliance with all mandatory requirements.

SA Power Networks considers recommendations but does not necessarily adopt them such as the recommended period between inspections which is based on SA Power Networks experience.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Type test certificates are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior installation.

7.42 AS 2926 (Superseded by AS 60038) Standard Voltages

This Standard has been superseded by AS 60038

7.43 AS/NZS 2947 Insulators – Porcelain and Glass for Overhead Power Lines Greater than 1000V a.c.

This standard is in two parts. Part 1 being Test methods (insulator units) and Part 2 Test methods (strings and sets).

The standard specifies requirements for testing insulators of ceramic material or glass for use on ac. Overhead power and traction lines with a nominal voltage greater than 1000V and a frequency not greater than 100Hz.

It applies to string insulator units, insulator strings, insulator sets, pin insulators, line post insulators, shackle insulators and to insulators of similar design when used in sub-stations.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Insulator classes, types and dielectric materials;
- Test classifications;
- Test schedules;
- Requirements for electrical and mechanical tests;
- Mounting arrangements;
- Particulars for String, Line post and Pin insulators; and
- Dimensions for:
  - ball and socket couplings, clevis and tongue couplings, and locking devices.
  - Type tests, routine tests and site tests.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Type test certificates are required to for equipment purchased.

3. Inspection and testing is performed prior to or during installation and commissioning.

7.44 AS/NZS 3000 – Electrical Installations - section 5 Earthing Arrangements & Earthing Conductors

This section of the Australian Standard sets the requirements for earthing of electrical installations to ensure that safety requirements of the standard are satisfied.

Standards Compliance

Requirements of the Standard:

Section 5 of the standard covers:

- Earthing Arrangements;
- Multiple Earth Neutral (MEN) System;
- Earthing Requirements;
- Earthing Conductors;
- Earthing System Parts;
- Earthing of Electrical Equipment;
- Equipotential Bonding;
- Protection by Electrical Separation; and
- Other Earthing Arrangements.

Compliance Status

The Standard covers electrical installations, however where SA Power Networks interfaces with the customers installation all construction complies with the SA Power Networks Construction Standards, which meet or exceed the Australian Standard.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Construction complies with the SA Power Networks Construction Standards which meet or exceed the Australian Standard.

2. A program of inspection and testing, as required by the Network Maintenance Manual – Section 6.9, provides assurance that the integrity of the Distribution earthing system is maintained.

7.45 AS/NZS 3000 Electrical Installations (for Customer Installations)

This section of the Australian Standard sets the requirements for earthing of electrical installations to ensure that safety requirements of the standard are satisfied.

Standards Compliance

Requirements of the Standard:

Section 5 of the standard covers:

- Earthing Arrangements;
- Multiple Earth Neutral (MEN) System;
- Earthing Requirements;
- Earthing Conductors;
- Earthing System Parts;
- Earthing of Electrical Equipment;
- Equipotential Bonding;
- Protection by Electrical Separation; and
- Other Earthing Arrangements.

Compliance Status

The Standard covers electrical installations, however where SA Power Networks interfaces with the customers installation all construction complies with the SA Power Networks Construction Standards, which meet or exceed the Australian Standard.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

SA Power Networks does not connect a customer's installation without sighting a certificate of compliance which is applicable and current for the required connection.

7.46 AS/NZS 3001 Electrical Installations - Transportable Structures and Vehicles including their Site Installations

This standard applies to electrical installations in all types of movable premises (including caravans, relocatable homes, commercial vans and construction huts). It also applies to caravan parks providing facilities for the connection of movable premises. It covers the internal wiring and connection of electrical equipment in movable premises, and the method of distribution and supply to socket-outlets in caravan parks. It also covers the methods of connection between a movable premises and its site supply.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Caravan Park site supplies:
  - method of supply, maximum demand, voltage drop, provision for connecting caravans, protection from weather and mechanical damage, supplementary protection devices, supply to caravans, tents and annexes;
- Moveable premises installation:
  - control and protection, numbers of points for independent circuits, annexes, wiring, earthing, protection from damage, fixings and accessories, appliances, extra-low voltage transformers, isolation and segregation of low voltage wiring, earth leakage current protection.
- Connection of moveable premises to a site supply; and
- Non-Caravan park sites.

Compliance Status

Nil required.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

When SA Power Networks uses relocatable accommodation, it requires the supplier to certify compliance with this Australian Standard and supply connection is made to AS 3000.

7.47 AS/NZS 3008 Electrical Installations - Selections of Cables for Alternating Voltages up to and Including 0.6/1kV – Typical Australian Installation

This standard sets out the procedures to be followed for the selection of cables to satisfy typical Australian installation conditions where the ambient air temperature is 40 degrees Celsius and ambient soil temperature is 25 degrees Celsius. Criteria given are current-carrying capacity, voltage drop and short-circuit temperature rise.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Cable selection based on current carrying capacity, voltage drop, short circuit temperature considerations;
- Current carrying capacity by ratings, type of conductor, type of cable, installation conditions, external influences on the cable;
- Voltage drop determination;
- Short circuit performance factors and temperature limits; and
- Appendices including examples of selection to satisfy the standard criteria and recommended circuit configuration of single core cables in parallel.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. The requirements of this Australian Standard have been incorporated into SA Power Networks Technical Standards.

2. This Australian Standard is used as a guide to the selection of cable.

3. Cable ratings are selecting using IEC 287.

7.48 AS 3011 Electrical Installations – Secondary Batteries Installed in Buildings

This Australian Standard specifies the requirements for the installation of secondary batteries permanently installed in buildings. This standard is in two parts:

Part 1 – Vented Cells; and

Part 2 – Sealed cells.

Standards Compliance

Requirements of the Standard:

The standard covers:

- General requirements for:
  - hydrogen emission and ventilation, alarms, battery accommodation, arrangement of cells;
- Battery room requirements for:
  - room layout and floor area, battery terminals and outgoing busbars and cables, tier and row connections, cell connections, location of luminaires and outlets;
- Battery enclosure requirements for:
  - enclosure construction, busbar and terminal insulation, circuits within the battery compartment; and
- Installation requirements for:
  - connections, overcurrent protection, warning notices, switchgear earth-leakage detection, main and section isolating switches and fire and safety warning signs.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. SA Power Networks Design and Construction Standard complies with this Australian Standard.
2. The Design and Construction Standard details the requirements for checking and approval of designs.

7.49 AS/NZS 3560 Electric Cables – XLPE insulated – ABC for working voltages up to and including 0.6/1 (1.2) kV

Specifies the construction, dimensions and tests for two, three and four core aerial bundled cables. This standard is in two parts:

Part 1 – Aluminium conductor sizes between 16 mm^2 and 150 mm^2; and

Part 2 – Copper conductor sizes of 6 mm^2, 10 mm^2, 16 mm^2 and 25 mm^2.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Conductors;
- Insulation;
- Identification of cores;
- Metre marking of cables;
- Lay-up of cores;
- Additional cores;
- Manufacturers identification;
- Drums;
- Preparation for delivery;
- Marking of drums; and
- Appendices including purchasing guidelines; and
- Tests

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.50 AS/NZS 3599
Electric Cables – Aerial Bundled – Polymeric insulated – Voltages 6.35/11 (12) kV to 12.7/22 (24) kV

Specifies construction, dimensions, and test requirements for catenary supported, three-core aerial bundled cable, insulated with cross-linked polyethylene. This standard is in two parts:

Part 1 – Metallic screened; and

Part 2 – Non-metallic screened.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Designated voltages
- Maximum conductor temperature;
- Conductors;
- Conductor screen;
- Insulation;
- Insulation screening;
- Bedding tape;
- Metallic screen;
- Separator tapes;
- Sheath;
- Phase identification;
- Bundled cable identification;
- Water Blocking;
- Meter marking;
- Support catenary;
- Lay-up;
- Manufacturers identification, drums, preparation for delivery;
- Marking of drums; and
- Appendices including testing and purchasing guidelines.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their cables comply with this Australian Standard.
3. Visual inspection is carried out prior to installation.

7.51 AS 3600 Concrete Structures

This standard sets out the minimum requirements for the design and construction of concrete structures and members which contain reinforcing steel, or tendons, or both. It also sets out the requirements for plain concrete pedestals and footings.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Design procedures, actions and loads;
- Loads and load combinations for stability;
- Design for durability;
- Design for fire resistance;
- Design properties of materials;
- Methods of structural analysis;
- Strut-and-tie modelling;
- Design of beams for strength and serviceability;
- Design of, slabs, columns and walls;
- Design of non-flexural members, end zones and bearing surfaces;
- Stress development and splicing of reinforcement and tendons;
- Joints, embedded items and fixings;
- Plain concrete pedestals and footings;
- Concrete pavements, floors and residential footings;
- Material and construction requirements.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in transformers purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Transformers manufacturers specify slab requirements which are detailed in SA Power Networks Standard Construction Drawings.

2. Assurance of compliant installation is provided by the SA Power Networks Compliance Coordinator.

7.52 AS 3607 Conductors – Bare Overhead, Aluminium and Aluminium Alloy – Steel Reinforced

Specifies requirements and tests for composite electrical bare conductors, incorporating aluminium or aluminium alloy wires and steel wires for overhead power transmission.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Material requirements and wire properties;
- Conductor requirements:
  - construction, identification of aluminium alloy conductors, joints in wires of conductors, lay, standard sizes and calculated properties of conductors.
- Testing:
  - selection of specimens, mechanical tests, coating tests, resistivity tests, lay ratio, place of testing, inspection and test certificates. Identification of cores; and
- Packing and marking.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.53 AS 3608
Insulators – Porcelain and Glass, Pin and Shackle Type – Voltages not exceeding 1000V a.c.

Specifies requirements for pin and shackle insulators, in which the insulating material is of porcelain or glass, for outdoor use at a nominal voltage not exceeding 1000 V a.c. Dimensions, material, and mechanical performance are specified.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Verification of dimensions and visual inspection;
- Mechanical strength test for pin insulators and shackle insulators;
- Porosity test for porcelain insulators;
- Tests - type sample and routine; and
- Standard characteristics for dimensions and mechanical strength.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.54 AS 3609
Insulators – Porcelain Stay Type for: Voltages Greater than 1000V a.c.

Stay type insulators are not used by SA Power Networks

7.55 AS/NZS 3675 Conductors – Covered Overhead – for Working Voltages 6.35/11 (12) kV up to and including 19/33 (36) kV

Specifies the construction, dimensions and test requirements for water blocked covered conductors, suitable for overhead lines for working voltages 6.35/11kV up to and including 19/33kV.

Standards Compliance

Requirements of the Standard:

The standard covers:

- Conductors;
- Covering;
- Water blocking;
- Identification on covered conductors;
- Tests-routine special and type tests; and
- Appendices including - Purchasing guidelines and further testing.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Visual inspection is carried out prior to installation.

7.56 AS 3766
Mechanical Fittings for Low Voltage Aerial Bundled Cables

This standard specifies the performance and general requirements for fittings designed specifically for use with the insulated aerial cables, manufactured to AS 3560, Electric cables - Aerial bundled - Voltages up to and including 0.6/1 kV.

Standards Compliance

Requirements of the Standard:

The standard covers:

- General requirements such as:
  - Tests, dimensions and tolerances, cable parameters;
- Strain clamps;
- Tension joints;
- Suspension clamps;
- Pole fittings; and
- Electrical tests.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their cables comply with this Australian Standard.

3. Where deemed necessary an SA Power Networks representative may witness testing performed.

4. Type Test certificates are required for all fittings and equipment types purchased.

7.57 AS/NZS 3947.3 Low Voltage Switchgear and Controlgear – Switches, Disconnectors, Switch-Disconnectors and Fuse-Combination Units

This standard applies to switchgear and controlgear intended to be connected to circuits, the rated voltage of which does not exceed 1000 V a.c. or 1500 V d.c. This Standard is identical with, and has been reproduced from, IEC 60947.

Standards Compliance

Requirements of the Standard:

Sections are included covering service conditions, ratings, design and construction, type tests, routine testing and information to be given in tenders and orders together with the requirements for transport, storage, erection and maintenance.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their cables comply with this Australian Standard.
3. Visual inspection is carried out prior to installation.

7.58 AS 3995
Design for Steel Lattice Towers and Masts

This Standard sets out procedures for the determination of design wind speeds and wind loads to be used in the structural design of steel lattice towers and masts for communication purposes. It further sets out the basis for the strength assessment of members and connections of lattice towers and masts. This Standard incorporates design and analysis of guyed lattice towers and masts, design of cable tension members, footing design and criteria for assessment of existing structures. Guidance relating to maintenance and inspection, and access to steel lattice towers and masts is given in the Appendices. It is not intended to apply to the structural design of transmission line structures. The design of aluminium and cold-formed steel, other than those complying with AS 1163, is not covered by this Standard, except in relation to access to the lattice towers and masts.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Types of structure;
- Loading;
- Stability, strength and serviceability;
- Wind loading specifications;
- Structural analysis and design;
- Footing design;
- Criteria for assessing existing structures; and
- Appendices including maintenance and inspections and earthquake design.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through specifications placed on Contractors.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Steel lattice towers and masts are designed by contractors who are required to certify that their designs comply with this Australian Standard.

2. Manufacturers are required to have a system of Quality Assurance.

3. Manufacturers are required to certify that their tower and masts comply with this Australian Standard.

7.59 AS/NZS 4026
Electric cables – for Underground Residential Distribution Systems

This Australian Standard specifies the construction of a rationalised range of 0.6/1, 6.35/11 and 12.7/22 kV cables for use by electricity supply authorities in underground residential systems.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Polymeric insulated 6.35/11 (12) kV and 12.7/22 (24) kV distribution network cables;
- Paper insulated 6.35/11(12) kV distribution network cables;
- XLPE insulated 0.6/1 (1.2) kV distribution cables;
- XLPE insulated 0.6/1 (1.2) kV service cables; and
- The various sections include construction of cables, cores, screens, insulation, impregnation, fillers and binders, non-metallic sheathing, testing and preparation for delivery etc.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in specifications for the purchase of paper insulated 6.35/11 kV.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Test certificates are required for all cable purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.60 AS/NZS 4029 – in three parts Stationary Lead Acid Batteries

This Australian Standard in 3 parts specifies the requirements for the construction and performance of lead-acid cells and batteries for use in fixed location and which is permanently connected to the load and the dc. power supply whether they are :

- Vented;
- Sealed valve regulated; and
- Pure lead positive paste plate type.

The standard specifies minimum safety, performance, maintenance and replacement requirements and provides test methods.

Standards Compliance

Requirements of the Standard:

The Standard covers:

The Standard is in three parts and covers the battery types:

- Vented;
- Sealed valve regulated; and
- Pure lead positive paste plate type.

The three parts cover:

- Operating conditions;
- Design and construction criteria;
- Functional and performance requirements;
- Test equipment and the preparation of cells and batteries for testing;
- Test methods; and
- Accessories.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Manufacturers are required to certify compliance with this Australian Standard.
4. Test Certificates are required for equipment purchased.
5. Inspection and testing is performed prior to or during installation and commissioning.
6. Equipment is rejected where any significant non-compliance is detected.

Note:

SA Power Networks may also use equivalent International Standards such as Japanese Standard JIS C8707 and IEC 60896-2.

7.61 AS 4100 Steel Structures

This Standard sets out minimum requirements for the design, fabrication, erection, and modification of steelwork in structures in accordance with the limit states design method. The standard should also be read in conjunction with its Supplement 1 produced in 1999 & HB 48 – Steel Structures Design Handbook.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Materials;
- General design considerations;
- Methods of structural analysis;
- Members subject to bending, compression, tension or to combined actions;
- Connections;
- Brittle fracture and Fatigue;
- Fire and Earthquake;
- Fabrication and Erection;
- Modifications to existing structures; and
- Testing of structures or elements.

Compliance Status

With the exception of Stobie poles SA Power Networks ensures compliance with all sections of this Standard by through conditions in materials purchase specifications and requiring all steel structures designed by SA Power Networks be checked by a Structural Engineer.

Compliance Gap Analysis

Stobie Poles.

Action Proposed

Addressing the Compliance Gap

As Stobie poles incorporates steel beams and concrete, their design criteria are not well covered by this Standard. SA Power Networks utilises empirically derived information for the design and testing of Stobie poles.

Compliance Assurance

1. Substations designed by SA Power Networks Construction and Maintenance Services Design Group, are checked by appropriately qualified personnel and approved by an SA Power Networks Structural or Civil Engineer.
2. Substations and Transmission lines designed by contractors are required to be certified as complying with this Australian Standard.
3. Transmission lines designed by SA Power Networks are checked by appropriately trained SA Power Networks personnel. Approval of the design is by an SA Power Networks Engineer who is trained and qualified to do so.
4. Distribution lines are designed to prescribed SA Power Networks standards based on this Australian Standard with the assistance of a software package (PLF-CAD). The designs are checked and approved by SA Power Networks personnel who are trained and qualified to do so.

7.62 AS 4398
Insulators – Ceramic or Glass – Station Post for Indoor and Outdoor use – Voltages Greater than 1000V a.c.

This Standard is applied to:

- post insulators;
- post insulator units constructed from ceramic material or glass intended for indoor or outdoor service; and
- post insulators of organic material intended for indoor service in electrical installations or equipment operating on a.c. systems with a nominal voltage greater than 1000V and a frequency not greater than 100Hz.

The insulators encompassed by this standard are primarily intended for use in isolators (disconnectors) or as busbar or fuse supports.

Standards Compliance

Requirements of the Standard:

The Standard is applied to five types of post insulators:

1. indoor post insulators made of ceramic or glass material and utilising internal metal fittings;
2. indoor post insulators made of organic material and utilising internal metal fittings;
3. outdoor cylindrical post insulators made ceramic or glass material and utilising internal metal fittings;
4. outdoor cylindrical post insulators made ceramic or glass material and utilising external metal fittings; and
5. outdoor pedestal post insulators made ceramic or glass material.

Compliance Status

SA Power Networks uses this Australian Standard when purchasing equipment and specifying required insulators to be used for the electricity infrastructure.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their equipment complies with these Australian Standards.

3. Inspection is performed prior to or during installation and commissioning.

4. Guidance of these Australian Standards is used when advising suppliers on the type of equipment installed on SA Power Networks Distribution System.

7.63 AS/NZS 4961
Electric Cables – Polymeric Insulated – for Distribution and Service Applications

This Australian Standard is applicable to the construction of a range of electric cables for use in distribution and service applications at working voltages up to and including 0.6/1(1.2)kV. The standard also provides purchasing guidelines, recommended installation bending radius for a cable and installation recommendations.

Standards Compliance

Requirements of the Standard:

The Standard provides requirements for cables in the following sections:

- PVC or XLPE insulated neutral screened cables for use in both overhead and underground installations ≤ 0.6/1kV;
- XLPE insulated waveform concentric wire neutral cables for use in electrical installations;
- PVC or XLPE insulated single-core distribution and service cables for use in electrical installations;
- XLPE insulated bundled distribution and service cables for use in underground electrical installations; and
- XLPE insulated single-core distribution and service cables for use in electrical installations.

Compliance Status

SA Power Networks uses this Australian Standard when purchasing and specifying requirements of electric cables to be used for the electricity infrastructure.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their electric cables comply with this Australian Standard.

3. Inspection is performed prior to or during installation and commissioning.

4. Guidance of these Australian Standards is used when advising suppliers on the type of electric cables that are used in the SA Power Networks Distribution System.

7.64 AS/NZS 5000 Electric Cables – Polymeric Insulated

These Australian Standards specify construction, dimensions and tests for single and multicore cables that are insulated with polymeric materials intended for use in electrical installations at voltages up to and including 0.6/1(1.2)kV. The standards also provide purchasing guidelines.

These standards do not apply to polymeric insulated cables for special installations and service conditions or for which there are separate Australian/New Zealand Standards.

Standards Compliance

Requirements of the Standard:

The Standards provide requirements by making reference to numerous other AS and AS/NZS titles/documents.

Compliance Status

SA Power Networks uses these Australian Standards when purchasing and specifying requirements of electric cables to be used for the electricity infrastructure.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.

2. Manufacturers are required to certify that their electric cables comply with this Australian Standard.

3. Inspection is performed prior to or during installation and commissioning.

4. Guidance of these Australian Standards is used when advising suppliers on the type of electric cables that are used on the SA Power Networks Distribution System.

7.65 AS 60038 Standard Voltages

This Standard specifies:

1. Standard voltages for Transmission, distribution and utilisation systems having a nominal voltage greater than 100V 50 Hz a.c;
2. Standard voltages for a.c. and d.c. traction systems; and
3. Nominal voltages for equipment rated less than 120 V a.c. or 750 V d.c.

Standards Compliance

Requirements of the Standard:

The Standard sets out voltages and voltage ranges in tabular form, such as:

- The nominal voltage by which a system is designated.
- Highest and lowest value of voltage which occur under normal operating conditions at any time and at any point on the system, excluding transient conditions.
- The phase to phase or phase to neutral voltage at the point of supply.
- The voltage range at the point of supply.
- Rated voltages of equipment.
- Highest voltage for equipment.

Compliance Status

SA Power Networks uses this Australian Standard when purchasing equipment and specifying required voltage and voltage ranges for electricity infrastructure.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. The required voltages for equipment purchased, is included in purchase specification in accordance with this Australian Standard.
2. Infrastructure design is to the voltages and voltage ranges in this Australian Standard which is incorporated in SA Power Networks Design and Construction Standards.

7.66 AS/NZS 61000 Electromagnetic Compatibility (EMC)

This Australian Standard is in multiple parts and is designed to provide designers, manufacturers and testers of equipment incorporating electrical or electronic operation with methods of test for ascertaining immunity to electromagnetic disturbances.

Standards Compliance

Requirements of the Standard:

The Standard covers:

- Radiated and non-network frequency related conducted phenomena;
  - Coupling between emitting and susceptible devices;
  - Emission levels and the environment;
  - Intentional emitters.
- Classification of electromagnetic environments;
- Limits of harmonic current emissions;
- Limits of voltage fluctuations and flicker;
- Assessment of emission limits for distorting loads;
- Assessment of emission limits for fluctuating loads;
- Testing and measurement techniques:
  - Overview of immunity tests;
  - Radiated radio frequency electromagnetic field immunity; and
  - Surge immunity tests.

Compliance Status

SA Power Networks distribution design and purchase specifications ensure that supply voltage, utilisation voltage ranges comply with these Australian Standards.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their equipment complies with these Australian Standards before connection to SA Power Networks network.
3. Inspection is performed prior to or during installation and commissioning.
4. Guidance of these Australian Standards is used when advising customers on the type of equipment and appliances that they wish to couple to the SA Power Networks Distribution system.
5. Where complaints of voltage fluctuation, flickering or harmonic distortion are received, SA Power Networks investigates and recommends appropriate remedial action.

7.67 AS/NZS 60265
High Voltage Switches – Switches for Rated Voltages above 1kV and less than 52kV

This Australian Standard applies to three-phase, alternating current switches and switch disconnectors which have making and breaking current ratings. The switches can be for indoor and outdoor installations. This standard is in two parts:

Part 1 – for rated voltages above 1kV and less than 52kV; and

Part 2 – for high voltage switches for rated voltages of 52kV and above.

This standard is also applicable to the operating devices of these switches and their auxiliary equipment.

Standards Compliance

Requirements of the Standard:

The principles and provisions of this Standard may also be applied to single pole switches that are intended for use in single-phase systems. Any requirements for dielectric tests and making and breaking tests shall be in accordance with the requirements of the specific application.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Type test certificates are required for equipment purchased.
3. Inspection and testing is performed prior to or during installation and commissioning.

7.68 AS 60529
Degrees of Protection Provided by Enclosures (IP Code)

This Australian Standard applies to the classification of degrees of protection provided by enclosures for electrical equipment rated up to 72.5 kV. It covers protection of persons against access to hazardous parts of the equipment, against ingress of solid foreign objects, dust, and harmful quantities of water. Tests, access probes and object probes and other test equipment are specified.

Standards Compliance

Requirements of the Standard:

The Standard also is accompanied by two supplements which are wall charts specifying text, diagrams and basic details of protection.

The object of the standard is to give:

- Definitions for degrees of protection provided by enclosures of electrical equipment as regards:
  - protection of persons against access to hazardous parts inside the enclosure;
  - protection of the equipment inside the enclosure against ingress of solid foreign objects; and
  - protection of the equipment inside the enclosure against the harmful effects due to ingress of water.
- Designations for the degrees of protection.
- Requirements for each designation.
- Tests to be performed to ensure that enclosures meet the requirements.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their enclosures comply with this Australian Standard.
3. Minor deviations may be included after review and acceptance by SA Power Networks.

7.69 AS 60947.1
Low Voltage Switchgear and Controlgear – General Rules

This standard applies to switchgear and controlgear intended to be connected to circuits, the rated voltage of which does not exceed 1000 V a.c. or 1500 V d.c. This Standard is identical with, and has been reproduced from, IEC 60947-1:1996.

Standards Compliance

Requirements of the Standard:

Sections are included covering service conditions, ratings design and construction, type tests, routine testing and information to be given in tenders and orders together with the requirements for transport, storage, erection and maintenance.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard through conditions in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their equipment complies with this Australian Standard.
3. Visual inspection is carried out prior to installation.

7.70 ENA C(b)1 – Guidelines for: Design and Maintenance of Overhead Distribution and Transmission Lines (Obsolescent – Transitioning to AS/NZS 7000)

ENA document C(b)1 guidelines give recommended practices for the design, ongoing life and routine maintenance of existing overhead lines, including existing overhead service lines. They have been compiled to cover the average climatic conditions applicable in non-cyclonic areas of Australia.

However, where existing overhead lines are to be altered such that elements may be overloaded or overstressed to the original design then the overhead line shall be assessed by a competent person for compliance with AS/NZS 7000.

ENA Recommendations

Content

The recommendations cover:

- Structural Design;
- Electrical Design;
- Insulators;
- Conductors;
- Conductor tension;
- Clearances from the ground;
- Clearances from structures;
- Spacing of conductors;
- Prospective step and touch voltages;
- Earthing;
- Maintenance;
- Clearances between trees and overhead conductors;
- Identification of aerial lines by airborne craft;
- LV ABC;
- HV ABC;
- CC Systems;
- Appendices addressing:
  Wind loading and component strength, selection of conductors, conductor sag and tension calculations, conductor temperature measures risk management of conductor clearance, insulators, pole foundations, some guidelines for water crossings, some references about clearances from trees; and
- Tables and figures.

Compliance Status

SA Power Networks Design and Construction Standards comply with C(b)1.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. SA Power Networks ensures compliance with the recommendations by issuing Technical Standard and Distribution & Construction drawings based on C(b)1, to all SA Power Networks personnel involved with the design of overhead distribution power lines.
2. Transmission and Distribution lines designed by contractors are required to be certified as complying with ENA recommendation.
3. Transmission lines constructed and designed by SA Power Networks are checked by appropriately trained SA Power Networks personnel. Approval of the design is by an SA Power Networks Engineer who is trained and qualified to do so.
4. Distribution Lines are designed to prescribed SA Power Networks standards based on this Australian Standard with the assistance of a software package (PLF-CAD). The designs are checked and approved by SA Power Networks personnel who are trained and qualified to do so.

7.71 ENA C(b) 2 – Guidelines for: The installation of Cables Underground

Not a current ENA Guide

7.72 ESAA D(b)5 - Current Rating of: Bare Overhead Line Conductors. *(Obsolete – for reference only)*

ESAA document D(b)5 applies to all aluminium alloy, and aluminium alloy steel reinforced conductors and provides their current carrying capacity for metric sized to Australian Standards for bare conductors.

ESAA Recommendations

Content

The recommendations cover:

- The provision of tables relating currents to temperature rise above ambient temperature, for conductors during night and day under various conditions of surface discolouration and air movement, which have been selected to provide a reasonable coverage of the prospective conditions throughout Australia;
- Basic formulae and calculation of current ratings; and
- Selection of values for parameters in formulae as follows: ambient temperature, solar radiation, emissivity and solar absorption coefficients, air movement, conductor operating temperature and determination of effective resistance.

Compliance Status

SA Power Networks ensures compliance with the recommendations by issuing copies of the tables of conductor current carrying capacities calculated in accordance with the methodology provided in D(b)5 to all SA Power Networks personnel involved with the design of overhead distribution power lines.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. SA Power Networks ensures compliance with the recommendations by issuing Technical Standard and Distribution Construction drawings based on D(b)5, to all SA Power Networks personnel involved with the design of overhead distribution power lines.
2. Transmission and Distribution Lines designed by contractors are required to be certified as complying with this Australian Standard.
3. Transmission lines designed by SA Power Networks are checked by appropriately trained SA Power Networks personnel. Approval of the design is by an SA Power Networks Engineer who is trained and qualified to do so.
4. Distribution Lines are designed to prescribed SA Power Networks standards based on these recommendations with the assistance of a software package (PLF-CAD). The designs are checked and approved by SA Power Networks personnel who are trained and qualified to do so.
5. Assurance is provided after checking and approval by the asset manager appropriate to the area undergoing installation or modification, that conductors are designed in accordance with D(b)5 and are appropriate for the required service.

7.73 ESAA D(b)29 Fire Protection of Substations

Not a current ESAA Guide

7.74 ESAA D(b)30 – Guidelines for: Separable Connectors

ESAA D(b) 30 guidelines are not used by SA Power Networks, however:

- ANSI/IEEE 48 HV cable joints; and
- ANSI/IEEE 404 HV cable terminations

are used in its place.

These are covered in Sections 7.76 and 7.77 of this Safety, Reliability, Maintenance & Technical Management Plan.

7.75 ESAA D(b) 31 – Guidelines for: Guide for the Maintenance of high Voltage Paper / Oil Cables and Accessories

Not a current ESAA Guide

7.76 ENA EG1 Substation Earthing

The purpose of this ENA EG1 guide is to establish a design methodology aimed to integrate the various phenomena affecting the performance of earthing systems with appropriate analytical procedures.

ENA Guide

Content

The guide covers:

- The functions of an earthing system.
- Co-ordinated design techniques.
- Information gathering and hazard appraisal.
- Allowable voltage criteria.
- Effect of electric current on the human body.
- Development of realistic safety criteria.
- Soil resistivity testing, interpretation and modelling.
- Current distribution.
- Power frequency voltage design
  - Earthing impedance.
  - Earth grid potential..
  - Touch and Mesh voltages.
  - Transfer and voltage gradients.
  - Voltage mitigation methods.
- Transient voltage design.
- Direct current system earthing.
- Installation techniques.
- Equipment selection.
- Designing the installation.
- Testing methods.
- Maintenance and refurbishment.

Compliance Status

SA Power Networks substation earthing methodology complies with ENA Guide EG1.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Substation earthing designs are produced by SA Power Networks personnel which are checked and approved by the Senior Protection Engineer prior to implementation.
2. To assist Engineers and Technical Officers with the application of the IEEE 80 guide a propriety software programme is used.
3. Routine testing and maintenance is performed in accordance with the SA Power Networks Maintenance Manual and the Technical Standard for Substations complying with this guide ENA - EGI.

7.77 IEC 60287
Electric Cables Calculation of the Current Rating

The International Electrotechnical Commission (IEC) publication 60287 recommends the method of calculation of the current rating of power cables on the basis of thermal criteria, independent of considerations of economic loading.

IEC Standard

Content

The standard covers:

- Permissible ac ratings of cables.
- Calculation methods for losses:
  - AC resistance of conductor;
  - Dielectric losses;
  - Sheath loss factor;
  - Armour reinforcement losses.
- Calculation methods for thermal resistance.

Compliance Status

SA Power Networks current ratings for overhead and underground cables comply with IEC 60287.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. SA Power Networks ensures compliance with the recommendations through the Demand & Network Management Quality Management System for the calculation of current ratings in accordance with IEC 60287.
2. To assist engineers and technical officers with the application of the IEC 60287 recommendations, a conductor rating calculator software programme has been created and incorporated in the Quality Procedure.
3. Manufacturers are required to have a system of Quality Assurance.
4. Manufacturers may certify that their cable and conductors comply with IEC 60287.

7.78 IEC 60502
Power Cables with Extruded Insulation & their Accessories for Rated Voltages 1 to 30kV

The International Electrotechnical Commission (IEC) publication 60502 (in four parts) specifies the construction, dimensions and test requirements of power cables with extruded solid insulation of rated voltages 1 to 30kV for fixed installations such as distribution networks or industrial installations.

IEC Standard

Content

Parts 1 to 3 of the standard covers:

- Voltage designation and materials.
- Conductors.
- Insulation.
- Assembly of multicore cables, inner coverings and fillers.
- Metallic layers for single-core and multicore cables.
- Metallic screening.
- Concentric conductors.
- Lead sheath.
- Metallic armour.
- Oversheaths.
- Test conditions and routine tests.
- Sample tests.
- Type tests.
- Electrical tests after installation.

Part 4 includes the test requirements on cable accessories such as:

- separable connectors;
- terminations;
- straight or branch joints; and
- stop ends.

Compliance Status

SA Power Networks ensures compliance with all section of this Standard through requirements in material purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their cable products are tested to this IEC Standard.
3. Type test certificates are required for cable products purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Cable is rejected where any significant non-compliance is detected.
6. Minor deviations may be accepted after review by SA Power Networks.

7.79 IEC 60664
Insulation Coordination for Equipment within Low Voltage Systems

The International Electrotechnical Commission (IEC) publication 60664 deals with insulation coordination for equipment within low voltage systems. It applies to equipment for use up to 2000 metres above sea level having rated ac. voltage up to 1kV and rated dc. Voltage up to 1.5kV.

IEC Standard

Content

The standard specifies the requirements for clearances, creepage distances and solid insulation for equipment based upon its performance criteria. It includes methods of electric testing with respect to insulation coordination.

The standard includes an application guide with dimensioning worksheets and dimensioning examples.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through requirements in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their alternating and direct current cable products are tested to this IEC Standard.
3. Type test certificates are required for alternating and direct current cable products purchased.
4. Inspection and testing is performed prior to and during installation and commissioning.
5. Cable is rejected where any significant non-compliance is detected.
6. Minor deviations may be accepted after review by SA Power Networks.

7.80 IEC 60840
Power Cables with Extruded Insulation and their Accessories for Rated Voltages 30 to 150 kV – Test Methods and Requirements

The International Electrotechnical Commission (IEC) publication 60840 specifies test requirements for power cables with extruded insulation and their accessories for fixed installations for voltages above 30 up to 150kV.

IEC Standard

Content

The requirements apply to single core cables and to three core cables with separate cores and to their accessories for usual conditions of installation and operation, but not to special cables such as submarine cables, for which modifications to the standard tests may be necessary or special test conditions may need to be devised.

Compliance Status

SA Power Networks ensures compliance with IEC 60840 all sections of this standard through requirements in materials purchase specifications.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their alternating current cable products are tested to IEC 60840.
3. Type test certificates are required for alternating current cable products purchased.

7.81 IEC 60949
Calculation of Thermally Permissible Short-Circuit Currents (non-adiabatic heating)

The International Electrotechnical Commission (IEC) publication 60949 recommends the method of calculating the short-circuit rating of any current carrying component of cable based on the assumption that the heat is retained inside the current carrying component for the duration of the short-circuit (ie adiabatic heating) The standard gives a simple method for incorporating non-adiabatic heating effect when calculating short-circuit ratings.

IEC Recommendations

Content

The recommendations cover:

- Permissible short-circuit current.
- Calculation of adiabatic short circuit current.
- Calculation of short-circuit temperature.
- Calculation of non-adiabatic factor for conductors and spaced wire screens.
- Calculation of non-adiabatic factor for sheaths, screens and wires.

Compliance Status

SA Power Networks short circuit calculation methodology complies with IEC 60949.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. SA Power Networks ensures compliance with the recommendations through the Network Management Group QMS (Quality Management System) Quality Procedure for the calculation of short circuit current ratings in accordance with IEC 60949.
2. To assist Engineers and Technical Officers with the application of the IEC 60949 recommendations a conductor short circuit current rating calculator software programme has been created and incorporated in the Quality Management System.
3. Manufacturers are required to have a system of Quality Assurance.
4. Manufacturers are required to certify that their cable and conductors comply with the IEC 60949 recommendations.

7.82 IEEE 48
Standard Test Procedures for Alternating Current Cable Terminations 2.5kV to 765kV or Extruded Insulation Rated 2.5kV through 500kV

This standard covers all indoor and outdoor cable terminations used on alternating current cables having laminated or extruded insulation rated 2.5kV to 765kV, except separable insulated connectors, which are covered by IEEE Std 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600V.

Standards Compliance

Requirements of the Standard

The Standard covers:

- Service conditions;
- Rating;
- Test requirements:
  - Design tests, dielectric and pressure leak;
  - Routine tests;
  - Dielectric field.
- Test Procedures:
  - Specimen preparation;
  - Test conditions;
  - Power frequency and dc testing;
  - Duration of withstand testing;
  - Test equipment and voltage measurement.
- Application Guide including:
  - Effect of solar radiation;
  - Environmental exposure;
  - Accelerated contamination testing.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard by requiring all cable termination products supplied conform to this standard. It is a required condition of the materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their alternating current cable termination products are tested to this Standard.
3. Type test certificates are required for alternating current cable termination products purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be accepted after review by SA Power Networks.

7.83 IEEE 404
Standard for Extruded and Laminated Dielectric Shielded Cable Joints 2.5kV – 500kV

Electrical ratings and test requirements of cable joints used with extruded and laminated dielectric shielded cable rated in preferred voltage steps from 2,500V to 500,000V are established in this standard. In addition, test requirements for cable jacket and cable shield restoration devices are defined. A variety of common joint constructions are also defined. This standard has been designed to provide uniform testing procedures that can be used by manufacturers and users to evaluate the ability of underground power cable joints, and associated cable shield and cable jacket restoration components, to perform reliably in service.

Standards Compliance

Requirements of the Standard

The Standard covers:

- Service conditions;
- Rating; voltage, current and temperature limitations;
- Construction;
- Testing requirements:
  - Production tests;
  - Design tests and testing sequence;
  - Design test conditions;
  - Dielectric integrity tests;
  - Withstand tests;
  - Short time current tests;
  - Cyclic aging tests;
  - High voltage time tests;
  - Sectionaliser tests;
  - Shielding tests;
  - Connector thermal and mechanical tests; and
  - Accelerated contamination testing.

Compliance Status

SA Power Networks ensures compliance with all sections of this Standard by requiring all cable jointing products supplied conform to this standard. It is a required condition of the materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their cable joints are tested to this Standard.
3. Type test certificates are required for alternating current cable termination products purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be accepted after review by SA Power Networks.

7.84 IEEE 80
Guide for: Safety in Alternating Current Substation Grounding

Outdoor a.c. substations, either conventional or gas-insulated, are covered in this guide. Distribution, transmission and generating plant substations are also included. With proper caution, the methods described herein are also applicable to indoor portions of such substations, or to sub-stations that are wholly indoors. No attempt is made to cover the grounding problems peculiar to d.c. substations. A quantitive analysis of the effects of lightning surges is also beyond the scope of this guide.

IEEE Guide

Content

The guide covers:

- Safe grounding, accidents and tolerable limits of body current.
- High speed fault clearance.
- Step and touch potential.
- Design procedure.
- Investigating soil characteristics.
- Determination of maximum ground current.
- Preliminary designing.
- Calculation of resistance of grounding system, maximum grid potential, peripheral and internal step voltages.
- Investigation of transferred potentials and danger points.
- Refinement of designs and construction of the grounding system.
- Field measurement of potential contours.
- Checking the safety of existing stations.
- Model tests.
- Periodic checks.

Compliance Status

SA Power Networks substation grounding methodology complies with IEEE 80.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Substation grounding designs are produced by SA Power Networks personnel, which are checked and approved by the appropriate Protection Engineer prior to implementation.
2. To assist Engineers and Technical Offices with the application of the IEEE 80 guidance, a propriety software programme is used.
3. Routine testing and maintenance is performed in accordance with the SA Power Networks Maintenance Manual and the Technical Standard for Substations complying with this guide IEEE 80.

7.85 PUACC
A Code for Placing Infrastructure Services in Streets

The Public Utilities Advisory Coordinating Committee (PUACC) acts as a forum for service agencies and Local Government to develop cooperative protocols for planning placement and maintenance of services, plant and infrastructure within streets and roadways.

Code Compliance

Requirements of the Code

The Code of Practice has been designed to:

- Improve co-ordination and co-operation between agencies and individual bodies with an interest in the use of roads.
- Maximise the scope for the practical installation of services underground.
- Facilitate attractive streetscapes by providing greater opportunities for street tree planting.
- Provide cost effective services on a “user/benefactor pays” principle.
- Provide reasonable accessibility to in-road services by the operating agencies for maintenance and replacement.
- Provide safe installation, operation and maintenance of all services by facilitating safe work practices, and confidence in physically locating services.
- Ensure a level of consistency whilst providing for different solutions necessary to allow for different types of streets and different urban design conditions.

Compliance Status

SA Power Networks is a party to the PUACC “Services in Streets” Code and supports the performance based approach to the requirements by incorporating them in Technical Standards.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. SA Power Networks incorporates PUACC requirements into its Technical Standards.
2. PUACC requirements are incorporated in specifications for Contractors supplying SA Power Networks with in road services.

7.86 AS 60076.1 Power Transformers - General

This Australian Standard specifies the general technical requirements for single and three phase power transformers, including auto transformers, but excludes single phase transformers rated at less than 1kVA, three phase transformers rated at less than 5kVA, and certain special transformers such as instrument, starting, testing and welding transformers, transformers for static converters and those mounted on rolling stock.

Standards Compliance

Requirements of the Standard

The Standard covers general requirements such as:

- Ratings;
- Tapped windings;
- Connections;
- Phase displacement;
- Testing; and
- Markings.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Test certificates are required for all equipment purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.
7. Ongoing load management is governed by SA Power Networks Quality Management System in Network Planning based on the requirements of this Australian Standard.

7.87 AS/NZS 60137
Insulated Bushings for Alternating Voltages above 1kV

This Australian Standard applies to bushings supplied separately for use in the construction of indoor and outdoor electrical equipment, transformers and electrical installations that are connected to a c. systems having a rated voltage above 1000 V and frequencies between 15Hz and 60Hz. The bushings are capacitance graded or non-capacitance graded. It is technically identical with IEC 60137, modified to suit Australian conditions.

The standard is NOT applicable to bushings for use with rectifiers, rotating machines, testing transformers, or to terminals for power cables (potheads).

Standards Compliance

Requirements of the Standard

The Standard covers general requirements such as:

- Definition of the various bushing types;
- Ratings;
- Ordering characteristics and markings;
- Operating conditions;
- Test requirements;
- Type tests; and
- Routine tests.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their bushings comply with this Australian Standard.
3. Type test certificates are required for bushings purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.88 AS 60044.1
Instrument Transformers - Current Transformers

This standard specifies requirements for the designation, rating, performance, marking, and testing of current transformers (CTs). Covers aspects common to all CTs and additional requirements for measuring current transformers and protective current transformers including Class PR and Class PX. Provides extensive explanatory material in appendices.

Part 1: Instrument transformers – current transformers

Part 2: Instrument transformers – inductive voltage transformers

Part 3: Instrument transformers – combined transformers

Part 5: Instrument transformers – capacitor voltage transformers.

Standards Compliance

Requirements of the Standard

The Standard covers:

- Scope and general requirements such as :
- service conditions, rated current and insulation levels, temperature rise, short-time current withstand, type tests.
- Specific requirements for measurement current transformers.
- Specific requirements for protection current transformers.

Appendices include information for ordering, guidance in the application of current transformers and testing.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Manufacturers are required to certify that their bushings comply with this Australian Standard.
3. Type test certificates are required for bushings purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.
7. Testing of current transformers is to a method approved by NEMMCO and to their minimum specific frequency.

7.89 AS 62271.102 High Voltage Switchgear & Controlgear – a.c. Disconnectors & Earthing Switches

This Australian Standard specifies the requirements for disconnectors and earthing switches designed for indoor and outdoor use at service frequencies up to and including 60 Hz in systems having rated voltages exceeding 1 kV. It also applies to the operating devices of those disconnectors and earthing switches and auxiliary equipment.

Standards Compliance

Requirements of the Standard

The Standard includes service conditions, definitions, ratings, design and construction requirements, type and routine tests, guide to the selection of switching devices, information to be given with enquiries, tenders orders, requirement for transport, storage, erection and maintenance, and a recommendation for quality control during manufacture.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Type test certificates are required for all equipment types purchased
4. For earthing switches test certificates are required to be supplied for all switches supplied.
5. For switches other than earth switches the manufacturer is required certify compliance with this Australian Standard.
6. Inspection and testing is performed prior to or during installation and commissioning.
7. Equipment is rejected where any significant non-compliance is detected.
8. Minor deviations may be included after review and acceptance by SA Power Networks.

7.90 AS 62271.100 High Voltage Switchgear & Controlgear – High Voltage a.c. Circuit Breakers

This Australian Standard applies to circuit breakers designed for indoor and outdoor service for operation in systems with frequencies up to 60 Hz and voltages higher than 1000V.

Standards Compliance

Requirements of the Standard

Sections are included covering service conditions, definitions, ratings, design and construction, type and routine tests, the selection of circuit breakers for service, information to be given with enquiries, tenders and orders, transport and storage, erection, maintenance, a guide for commissioning tests and quality control during manufacture. Appendices giving supplementary information are included.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Test certificates are required for all equipment purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.91 AS 62271.200 High Voltage Switchgear & Controlgear – a.c. Metal-Enclosed Switchgear & Controlgear for Rated Voltages above 1kV up to and including 52kV

This Australian Standard applies to factory assembled metal-enclosed switchgear and controlgear for alternating current of rated voltage above 1 kV up to and including 52 kV for indoor and outdoor installations and for service frequencies up to and including 60 Hz.

Standards Compliance

Requirements of the Standard

The Standard covers:

- Rated characteristics.
- Design and Construction.
- Type tests.
- Routine tests.
- A guide to selection of switching devices.
- Information to be given to tenderers.
- Transport, Storage, Erection and Maintenance.
- Quality Control during Manufacture.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Test certificates are required for all equipment purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.92 AS 62271.201
High Voltage Switchgear & Controlgear – a.c. Insulation - Enclosed Switchgear & Controlgear for Rated Voltages above 1kV up to and including 52kV

This standard applies to factory-assembled insulation-enclosed switchgear and controlgear for alternating current of rated voltages above 1 kV and up to and including 52 kV for indoor installation and for service frequencies up to and including 60 Hz. This Standard is equivalent in technical content to IEC 62271-201 Ed 1.0.

Standards Compliance

Requirements of the Standard

The Standard covers:

- Ratings for;
  - voltage, insulation, frequency, normal current, short time withstand current, peak with stand current, duration of short circuit, supply voltage for open/closing devices and auxiliary circuits, rated pressures for compressed gas supply for operation;
- Design and construction;
  - for liquids and gases in switchgear and control gear, earthing, auxiliary equipment, power and stored energy closing, operation of releases, interlocking devices, degree of protection, internal faults, insulation enclosure, shutters etc.
- Type tests;
- Routine tests; and
- Guide to selection for service.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Where deemed necessary an SA Power Networks representative will witness testing performed.
3. Test certificates are required for all equipment purchased.
4. Inspection and testing is performed prior to or during installation and commissioning.
5. Equipment is rejected where any significant non-compliance is detected.
6. Minor deviations may be included after review and acceptance by SA Power Networks.

7.93 AS/NZS 2053
Conduits and Fittings for Electrical Installations

This Australian Standard specifies general requirements for both metal and non-metal conduits and fittings to protect cables used in electrical installations. Mechanical properties, electrical characteristics and material requirements are given. Requirements for particular types of conduits and fittings are covered in the other parts of the AS/NZS 2053 series.

Standards Compliance

Requirements of the Standard

The Standard covers:

- General Requirements;
- Type Tests;
- Classification;
- Marking;
- Dimensions and Forms;
- Construction;
- Mechanical Properties;
- Resistance to Heat;
- Resistance to Burning;
- Electrical Characteristics;
- External Influences; and
- Electromagnetic Compatibility.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Manufacturers are required to have a system of Quality Assurance.
2. Technical Data Sheets and/or Type Test Certificates are required for non-standard materials or when materials are purchased outside of SA Power Networks.
3. Inspection is performed prior to or during installation and commissioning.
4. Materials are rejected where any significant non-compliance is detected.
5. Minor deviations may be included after review and acceptance by SA Power Networks.

7.94 AS/NZS 3835
Earth Potential Rise – Protection of Telecommunications Network Users, Personnel and Plant

This Australian Standard specifies means of identifying and minimising hazards to telecommunications personnel, users and plant from Earth Potential Rise (EPR) arising from earth faults on high voltage power systems. It also provides a guide on the application of the standard to protect persons and plant.

Standards Compliance

Requirements of the Standard

The standard is in two parts:

- Part 1 is the code of practice
- Part 2 is the application guide.

The standard provides:

a) A description of the hazards associated with EPR.

b) EPR limits and a basis for calculating EPR.

c) Methods and equipment required to minimise potential hazards associated with telecommunications equipment installed in areas associated with EPR.

Compliance Status

SA Power Networks ensures compliance with all sections of this standard through conditions in materials purchase specification.

SA Power Networks ensures compliance with all mandatory requirements.

Compliance Gap Analysis

Nil.

Action Proposed

Addressing the Compliance Gap

Nil required.

Compliance Assurance

1. Inspection and testing is performed prior to or during installation and commissioning.
2. Substation and telecommunication installations are designed to the SA Power Networks Planning, Design, Construction and Maintenance Standards for communications and SCADA sites.
3. Routine inspection and maintenance is performed in accordance with Substation Instructions.

7. SAFETY, RELIABILITY, MAINTENANCE and TECHNICAL Specific Standards Compliance

Contents: Section

OVERHEAD LINES

AS 4398 Insulators – Ceramic or Glass – Station Post for Indoor and Outdoor Use – Voltages Greater Than 1000V ac 7.62

INSULATOR and CONDUCTOR FITTINGS

AS 1154 Insulator & Conductor Fittings for Overhead Lines 7.4

THERMAL LIMITS

ENA C(b)1 Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines *(Obsolescent – for reference)…* **..... 7.70**

ESAA D(b)5 Current Rating of Bare Overhead Line Conductors *(Obsolete – for reference only)* **..... 7.72**

SHORT CIRCUIT CAPACITY

ENA C(b)1 Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines *(Obsolescent – for reference)…* **..... 7.70**

MECHANICAL LOADING CONDITIONS

ENA C(b)1 Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines *(Obsolescent – for reference)…* **..... 7.70**

AS/NZS 1170 Structural Design Actions 7.5

CONDUCTOR TENSIONS

ENA C(b)1 Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines *(Obsolescent – for reference)…* **..... 7.70**

STRUCTURES and FOOTINGS

ENA C(b)1 Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines *(Obsolescent – for reference)…* **..... 7.70**

AS 1289 A Series of Standards: Methods of Testing Soils for Engineering Purposes..... 7.11

AS 2159 Piling Design and Installation 7.31

AS 3600 Concrete Structures 7.51

AS 3995 Design for Steel lattice Towers and Masts 7.58

AS 4100 Steel Structures 7.61

GROUND CLEARANCES - CLEARANCES FROM STRUCTURES - SPACING OF CONDUCTORS - DESIGN and MAINTENANCE

ENA C(b)1 Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines *(Obsolescent – for reference)* **..... …7.70**

(Also refer to Electricity Act – Regulations, Schedule 2 Regulation 12, Requirements for Aerial Lines)

UNDERGROUND LINES

HIGH VOLTAGE CABLES

AS/NZS 1026 Electric Cables - Impregnated Paper Insulated - Up To and Including 19/33kV 7.2

AS/NZS 1429 Electric Cables - Polymeric Insulated 19/3.3kV up to and including 19/33kV 7.14

AS/NZS 4026 Electric Cables For Underground Residential Distribution Systems 7.59

IEC 60502 Power Cables with Extruded Insulation & their accessories for rated voltages 1 to 30kV 7.78

IEC 60840 Power Cables with Extruded Insulation & their accessories for rated voltages 30 to 150kV – Test Methods and requirements 7.80

LOW VOLTAGE CABLES

AS/NZS 1026 Impregnated Paper Cables Up To and Including 19/33kV 7.2

AS/NZS 1125 Conductors in Insulated Electric Cables & Flexible Cords 7.3

AS/NZS 4026 Electric Cables For Underground Residential Distribution Systems 7.59

HIGH VOLTAGE CABLES ACCESSORIES

AS 2629 Separable Insulated Connectors for Power Distribution Systems above 1kV .. 7.38

IEEE 48 Standard test Procedures for Alternating Current Cable Terminations 2.5kV to 765kV or Extruded Insulation Rated 2.5kV through 500kV 7.82

IEEE 404 Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5kV – 500kV 7.83

CONTINUOUS CABLE RATINGS

AS/NZS 3008 Electrical Installations – Selections of Cables for Alternating Voltages Up To and Including 0.6/1kV – Typical Australian Installation 7.47

IEC 60287 Electric Cables Calculation of the Current Rating 7.77

SHORT CIRCUIT CURRENTS

IEC 60949 Calculation of Thermally Permissible Short-circuit Currents (non adiabatic heating) 7.81

INSTALLATION

ENA C(b)2 Guidelines for the Installation of Cables Underground 7.71

ESAA D(b)30 Guidelines for Separable Connectors (Obsolescent) **..... 7.74**

PUACC A Code for Placing Infrastructure Services in Streets 7.85

MAINTENANCE

ESAA D(b)31 Guidelines for the Maintenance of High Voltage Paper/Oil Cables and Accessories (*Obsolescent)* **..... 7.75**

SUBSTATIONS

ELECTRICAL DESIGN

AS 2067 Substations and High Voltage Installations Exceeding 1kV a.c 7.29

CIRCUIT BREAKERS and ANCILLARY EQUIPMENT

AS 1939 Degrees of Protection Provided by Enclosures for Electrical Equipment 7.25

AS 2006 High Voltage a.c. Switchgear and Controlgear – Circuit Breakers for Rated Voltages Above 1kV (*Superseded by AS62271.100*) **..... 7.27**

AS 62271.100 High Voltage Switchgear & Controlgear - High Voltage a.c. Circuit Breakers 7.90

SWITCHGEAR ASSEMBLIES and ANCILLARY EQUIPMENT

AS 1025 High Voltage Switches *(Superseded by AS60265)* **..... 7.1**

AS 1306 High Voltage A.C. Switchgear and Controlgear – Disconnectors (Isolators) and Earthing Switches *(Superseded by AS62271.102)* **..... 7.12**

AS 1767 Insulating Liquids (Insulating oils for transformers and switchgear) 7.20

AS 1939 Degrees of Protection Provided by Enclosures for Electrical Equipment 7.25

AS 2024 High Voltage a.c. Switchgear and Controlgear – Switch-fuse Combinations 7.28

AS 2067 Substations and High Voltage Installations Exceeding 1kV a.c 7.29

AS 2086 High Voltage A.C. Switchgear and Controlgear – Metal-enclosed – Rated Voltages Up To 72.5kV *(Superseded by AS62271.200)* **..... 7.30**

SAFETY CLEARANCES

BUILDINGS and ENCLOSURES

SWITCHYARD STRUCTURES, FOOTINGS & FOUNDATIONS

MAINTENANCE

PROTECTION and EARTHING

PROTECTION

EARTHING

MAINTENANCE

TESTING

Standards referenced by the Distribution Code

Standards referenced by the Metering Code

8. GENERATION ASSETS (Operational Management - Kingscote Standby Power Station)

Contents Section

8. GENERATION ASSETS (Operational Management)

8.1 Background

SA Power Networks owns and operates a 6 MW Diesel Standby Power Station at Brownlow on Kangaroo Island. The generation assets are designed to operate as an unmanned standby generating system providing automatic emergency backup supply for Kangaroo Island in the event of loss of electricity supply from the main land and remote NOC control for Network Support (eg voltage control).

The Kingscote Power Station is located adjacent to the Kingscote Substation with secure chain wire mesh fence and locked gates providing secure isolation between the substation environment of HV infrastructure of an air insulated design and the Power Station designed to incorporate all dead front and fully enclosed equipment.

The Kingscote Power Station consists of 3 x 2 MW x 415V diesel generating units providing a standby capacity of 6 MW with a prime (continuous) rating 5.4MW and includes fuel storage and unloading facilities, NOx control (including urea storage facilities), 11/0.433kV step-up transformers, low voltage control and a SCADA system providing remote monitoring and control facilities via SA Power Networks NOC.

Kingscote Substation and Kingscote Power Station to left

8.2 Asset Risk & Management

SA Power Networks manages the Kingscote Power Station in an identical manner to which it manages other substations and distribution infrastructure under its control. These are detailed elsewhere in the SA Power Networks Safety & Technical Management Plan.

The Standby Kingscote Power Station is under the control of the Network Operations Centre (NOC) and normal access restrictions apply as per SA Power Networks Substation Access Rules, refer Section 3 Safety and Technical Operations Management.

All activities that involve inspections and / or maintenance on the Generation Assets including balance of plant that will impact on the operational requirements of the Generation Assets and/or Network employ Network Switching Plans (NSP) or Contingency Switching Plans (NCP), which have been specifically developed for this installation.

8.3 Work Instructions

8.3.1 SA Power Networks Employees Operational and Maintenance

A complete set of Operational and Maintenance manuals are available on site for both operational and maintenance activities, which were provided by the Engineer, Procure and Construct Contractor (EPC).

In addition to the Operating and Maintenance manuals provided under the terms of the EPC contract for the delivery of the Kingscote Standby Power Station the Operating Procedure Overview Manual and the Routine Operating & Maintenance procedures for both site and the NOC were developed to provide familiarisation and overview of the facility plant and equipment and for ongoing training of new personnel. These specific Work Instructions include:

- Kingscote Power Station Operating Procedures Overview;
- Kingscote Power Station Routine Operating & Maintenance - Site Inspections & Operating Procedures; and
- Kingscote Power Station NOC Operating Procedures Overview.

These detailed operating and maintenance - inspection and operating procedures and NOC (SCADA) remote operating procedures have been developed for both site and NOC personnel.

In addition to SA Power Networks comprehensive range of Occupational Health and Safety policies, procedures and guidelines, SA Power Networks has a number of detailed instruction manuals and operating procedures in relation to the Kingscote Standby Power Station. These include:

- Environmental Management Plan – Kingscote 6MW Standby Power Station Kangaroo Island.
- Kingscote Power Station Bulk Fuel Delivery Procedures.

All the plans and procedures have been developed following consultation with experts with extensive experience in operating and maintaining generation assets.

The Kingscote Standby Power Station is under the control of the NOC and normal access restrictions apply as per SA Power Networks Substation Access Rules, Section 3.5.

Procedure NOC-235 was developed for the NOC use, which describes the operating philosophy of the Kingscote Power Station and the process for operating and managing the standby Diesel Generators at Kingscote on Kangaroo Island.

Appendix C of procedure NOC-235 provides the current list of NCP's and NSP's which have been developed in compliance with SA Power Networks Switching Manual and are available for:

- Routine monthly inspection and maintenance;
- The generating units inspection service and maintenance (6 and 12 monthly);
- Annual EPA compliance testing;
- Network support (NOC remote control);
- Contingency events, eg Auto start and connecting generating system to 33kV Network to supply all KI substations & restoration of supply on return to Normal.

The Network Contingency Plans and Network Switching Plans are controlled by the NOC.

8.3.2 Specialist Contractor Access

It has been recognised that from time to time specialist subcontractors will require access to the power station for maintenance and inspections of the diesel generating units, generating units control system, NOx control system and the air compressor and receiver, who will not necessarily be licensed or familiar with the substation access requirements.

The power station has been designed with all dead front fully enclosed equipment and secured from the adjacent substation via a 2 metre high chain wire mesh fence and locked gates.

Using existing procedures under the Network Access rules the specialist contractor is inducted into the substation, the plant is isolated using prepared network switching plans to accommodate the scope of work and the necessary access permit identifying the limits of isolation for the proposed works.

In accordance with existing SA Power Networks procedures the contractor is advised of the limits of isolation, the limitations of the work area and any other special requirements. The contractor must familiarise themselves with the requirements and limits of isolation and accept the conditions and obligations imposed by signing the Access Permit prior to commencing any work.

Under the Access Permit the generation assets are configured so that they cannot be connected to the Network whilst still providing the specialist contractor access to be able to test the generation assets in isolation of the Network.

The contractor must relinquish the Access Permit before SA Power Networks will re-configure the generation assets for testing and being placed back into service under the control of the NOC.

8.3.3 Fuel Delivery

Fuel delivery personnel have been instructed and provided with detailed instructions (Bulk Fuel Delivery Procedures) to access the fuel unloading area and fill the bulk fuel storage tank, as and when required.