Engineering System Integrity

Engineering Specification
Electrical Distribution Unit

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Sydney Trains Electricity Distribution Network Management Plan

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Transport Sydney Trains

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Document control

Version	Date	Author/ Prin. Eng.	Summary of change
1.1	30 November 2019	N. Loveday	Updates to reflect minor changes per below and actions from 2019 ENSMS audit
1.2	30 June 2020	N. Loveday	Minor corrections and remove duplications
1.3	31 December 2020	N. Loveday	Minor updates
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Summary of changes from previous version

Summary of change	Section
Minor grammatical updates	All
Updated refence documents	All
2kV reference removed Section 5 extensive changes Section 5.7.4 and table relocated to Appendix B, and table updated Section 7.2 updated re publication of annual ENSMS Performance Reports Section 10	Various

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1 Introduction

1.1 Purpose

As defined in the *Electricity Supply Act 1995* [1] Sydney Trains is the operator of an electricity distribution network, operating under appropriate exemptions and in this capacity, Sydney Trains is obliged to take all reasonable steps to ensure that the design, construction, commissioning, operation and decommissioning of its network (or any part of its network) is safe[1].

Regulation 7 of the *Electricity Supply (Safety and Network Management) Regulation 2014)* [3] – referred to as "the Regulation" requires Sydney Trains to establish and implement an Electricity Network Safety Management System (ENSMS) which complies with *AS 5577 Electricity network safety management systems* [36].

This plan defines Sydney Trains ENSMS and describes the controls which ensure system safety is assured through all lifecycle phases for all electricity network assets.

All organisations engaged in the design, construction, commissioning, operation and decommissioning of the Transport Asset Holding Entity of New South Wales (TAHE) electricity distribution network are required to comply with this plan. This includes Sydney Trains, Transport for NSW (TfNSW), and their divisions and business units, and Technically Assured Organisation (TAO) engaged by TfNSW and/or Sydney Trains.

Hence this plan:

a. Identifies the statutory and other mandatory requirements that apply:

b. Provides guidance to employees and contractors engaged by Sydney Trains, TfNSW and TAO how to work safely on or near the electricity distribution network, through the application of Sydney Trains safety management system, the Electricity Network Safety Rules and related standards and procedures.

c. Informs non-electrical planners, project managers and engineers, maintenance managers, local councils, developers, neighbours and other external parties of the statutory requirements and procedures for working safely near TAHE electrical assets. This includes activities such as construction work or vegetation clearance.

d. Demonstrates how Sydney Trains fulfils its obligations as the authorised operator of an electricity distribution network in accordance with the regulation and AS 5577.

This plan addresses:

a. The safety of the public, and persons near or working on the electricity distribution network.

b. The protection of property and of assets that are or could be affected by the electricity distribution network.

c. Safety aspects arising from the protection of the environment, including protection from ignition of fires by the electricity distribution network.

d. Safety aspects arising from the loss of electricity supply to the overhead wire, signalling equipment, stations, facilities and electricity customers.

[1] Electricity Supply (Safety and Network Management) Regulation 2014, Regulation 5.

1.2 Objectives

Sydney Trains operates and maintains an electricity distribution network to provide an adequate, safe, and reliable supply of electricity to fulfil the operational needs of the passenger railway. The railway infrastructure (including the electricity distribution network) is regulated by state and federal legislation, as well as a range of standards and codes of practice for which compliance is required of Sydney Trains and TAO engaged for the planning, design, construction, commissioning, operation or maintenance or disposal of electricity distribution network assets.

This Electricity Network Management Plan presents Sydney Trains approach to ensuring the design, construction, commissioning, operation and decommissioning of the electricity distribution network (or any part of its network) is safe. This plan presents Sydney Trains' approach to ensuring:

- the safety of members of the public
- the safety of persons working on networks
- the protection of property (whether or not belonging to a network operator)
- the management of safety risks arising from the protection of the environment (for example, preventing bush fires that may be ignited by network assets)
- the management of safety risks arising from loss of electricity supply.

Presents Sydney Trains' Electrical Network Safety Management System (ENSMS) as the means to accomplish the above.

References are included throughout to relevant documentation including publicly available documents as well as resources within Sydney Trains intranet. Links may change without notice after publication of this plan.

Compliance and implementation of the ENSMS (as required by regulation 8) is verified by external audits as described in Section 7.

1.3 Originating requirement

The 4th paragraph of AS 5577 Section 1.1 states:

> "While this Standard has been developed for electricity supply networks, it is recognized that it may be used in relation to the safety of railway electricity networks. Before using this Standard for an electrified railway system, a rail system operator has to review the Standard to determine the Standard's suitability and applicability to the operator's rail system."

Sydney Trains has reviewed AS 5577 for suitability and applicability and attention is drawn to the following aspects.

Both the *Rail Safety National Law (RSNL)* [9] and AS 5577 require consideration of alternative solutions and evaluation of the relative risks posed by the alternatives, and the adoption of a solution which minimises risk.

The electricity distribution network forms part of the infrastructure essential to the safe operation of the passenger rolling stock and the primary "customer" is the operation of the railway, i.e. passenger rolling stock and the passengers conveyed, not retail electricity consumers. Accordingly, the safety management system employed by Sydney Trains is in accordance with the requirements of the RSNL.

The safety management system utilises the Sydney Trains corporate SMS to the extent practicable; it focusses on demonstrating that risk is or will be reduced "so far as is reasonably practicable" (SFAIRP) as required by the RSNL and the *Work Health and Safety Act 2011 (NSW)* [45].

Sydney Trains applies a safety change assessment process to determine the extent of the change, whether to demonstrate risk will be reduced SFAIRP, and the need to predict the safety performance through a risk analysis. The risk analysis may take the form of a Safety Assurance Report, Safety Assurance Statement, Hazard Assessment or a Project Hazard Log as determined by the initial analysis.

In RSNL Section 99 (1) (d) it outlines that a safety management system must, amongst other things, provide for the comprehensive and systematic assessment of any identified risks. Risks are assessed according to a process outlined in section 100 of the RSNL. Risks are assessed at the level of the network and asset classes, as well as being assessed for individual assets when new or modified assets are constructed.

In AS 5577 Appendix A3 it outlines elements of a risk identification process that must form part of a Formal Safety Assessment. Sydney Trains' procedure involves consideration of the following:

a. Risks related to the safe operation of the railway must be considered when determining which controls will be adopted for the design, construction, operation and maintenance of electricity network assets.

b. Some risks which arise in the context of the Electricity distribution network have consequences, causes and controls beyond the scope of the high voltage distribution network and which must be considered in the context of the enterprise as a whole.

c. The controls required to ensure the safe operation of trains may lead to decisions concerning design, operation and maintenance different to those that might be concluded by considering the Electricity distribution network alone.

Sydney Trains *Enterprise Risk Management - Risk Ranking* is used to assess risks and determine risk acceptance; this matrix has been benchmarked to provide meaningful results when risks are assessed in relation to all risks the level of the enterprise. In addition to safety risks, this integrates financial, environmental, customer experience and operational performance, and reputation. Sydney Trains also follows the guidance of the Office of the National Rail Safety Regulator "Guideline Major Works". This is the approach to implementing the requirements of AS 5577 Appendix A, B1 and B2.

Risk management responsibilities, accountabilities and authorities are defined in the Sydney Trains SMS, this differs from the requirement of AS 5577 para 4.4.4.

1.4 Implementation by TfNSW, TAOs and contractors

In accordance with Regulation 8 (1) and AS 5577 4.1 para 2, TfNSW, TAOs and contractors must comply with this plan and Sydney Trains ENSMS for the asset lifecycle phases for which they are engaged, their scope of work, responsibility and authority.

As described in the Service Installation Rules of NSW, the requirements of the electricity distributor (Sydney Trains) must be satisfied by all electrical installations which are either:

a. on TAHE land

b. to be supplied from the railway system

c. to be operated or maintained by Sydney Trains.

Installations on railway land which will not be supplied from the TAHE network must be low-voltage connections and comply with the earthing and isolation requirements of Sydney Trains. Sydney Trains stipulates the use of a Direct Earthing system, not the Multiple Earthed Neutral (MEN) system as specified in those Rules. This is to avoid the flow of DC traction current into the low voltage distribution system.

The specific requirements are set out in *TfNSW Standard T HR EL 12004 ST Low Voltage Installations Earthing*. This applies to all:

- Installations supplied from the Sydney Trains distribution system.
- All installations near the 1500 Volt DC track, including those of Sydney Trains and external parties, such structures constructed over the rail corridor.

Installations on railway land must not be supplied as high-voltage connections from another electricity distributor (i.e. not supplied from the distribution network).

High voltage network-to-network connections to another electricity distributor are permitted (i.e. bulk supplies to the distribution network).

All installations to be operated or maintained by Sydney Trains must comply with TfNSW requirements (i.e. use type-approved equipment) and comply with Sydney Trains requirements for operation, maintenance, spare parts, supportability and maintainability.

All work on the electricity distribution network must be in accordance with this plan and Sydney Trains electricity network safety rules. This applies in all lifecycle phases of the asset lifecycle.

Work near or in the vicinity (including non-electrical work and external parties) that is NOT undertaken by or on behalf of Sydney Trains as an Electrical Network Operator, must be performed in accordance with the SafeWork Codes of Practice and directions issued by Sydney Trains.

TfNSW and TAOs must ensure the requirements detailed at Section 8.2 are implemented to the extent it applies to the scope of their work. This includes competency, training and authorisation of personnel, long, medium and short term planning of network changes, design, implementation of changes to the network, configuration management, operation, maintenance and disposal.

When required (e.g. formal audit) TfNSW and TAOs must produce evidence of their implementation of the requirements of AS 5577:

a. Formal Safety Assessments in accordance with Section 5 of this plan.

b. Report incidents to Sydney Trains as described in this plan.

1.5 Terms and definitions

For the purposes of this plan the definitions given in the *Electricity Supply Act 1995 (NSW) (ESA)*, *Electricity Supply (Safety and Network Management) Regulation 2014*, *Rail Safety National Law (NSW)*, and the **Electrical Safety Definitions** page available on the **RailSafe** site apply. In addition, the following definitions used:

AER	Australian Energy Regulator
ALARP	As Low As Reasonably Practicable (see SFAIRP)
AMB	Asset Management Branch, a division of TfNSW
ATSB	Australian Transport Safety Bureau
Cause	An event or condition that may contribute to a risk.
Competent	A person who has been assessed to have the skills, knowledge and experience required to complete a task.
Consequence	The nature and magnitude of harm if a hazard is realised.
Control	Defence against a cause resulting in a safety hazard or consequence.
DC	Direct Current
DCCB	Direct-Current Circuit Breaker
EAM	Enterprise Asset Management, a whole-of-enterprise data system within Sydney Trains
EDU	Electricity Distribution Unit, a department within Engineering & System Integrity (ESI)
ENA NENS	Electricity Networks Association National Electricity Network Safety (code)
ENSMS	Electrical Network Safety Management System, comprises components of the Sydney Trains Safety Management System that are relevant and necessary to meet regulatory requirements.
ENSR	Electrical Network Safety Rules, a subset of the ENSMS
EPA	Environmental Protection Authority
ERM	Enterprise Risk Management
ESA	Electricity Supply Act 1995 (NSW)
ESF	Electrical Safety Forum
ESI	Engineering & System Integrity, a business unit within Sydney Trains' Maintenance Branch
Hazard	A situation, condition or thing that has the potential to harm a person. Hazards may be physical, biological, chemical, or psychological. Different types of hazards may originate from the same source. Hazard identification can be planned or unplanned.
HV	High Voltage
IAW	in accordance with
ICON	Infrastructure Control Centre, responsible for monitoring the status of the Electricity distribution network and carrying out de-energisation/re-energisation of the Electricity distribution network

IFMS	Infrastructure Failure Management System
IMF	Incident Management Framework
IPART	Independent pricing and Regulatory Tribunal, a statutory authority and the electricity network regulator for NSW
ISSC	Industry Safety Steering Committee
LMS	Learning Management System
LV	Low Voltage
MEN	Multiple Earthed Neutral - A system of electrical earthing
MOM	Maintenance Operations Manager (located at Network Bases)
NMD	Network Maintenance Division, a business unit within Sydney Trains
NSW	New South Wales
OHW	Overhead Wire
ONRSR	Office of the National Rail Safety Regulator
OTSI	NSW Office of Transport Safety Inspectors
PPE	Personal protective equipment
QMS	Quality Management System
REFS	Relevant Environmental Factors Study
RFS	Rural Fire Service of NSW
RMC	Rail Management Centre, responsible for monitoring the status of rail operations
RSNL	Rail Safety National Law 2012 (NSW)
SAU	Sydney Trains' Assets Assurance Unit
SCADA	Supervisory Control and Data Acquisition
SCARD	Safety Change Assessment and Reporting Determination
SCP	Staff Competency Profile
SENI	Significant Electricity Network Incident
SEQR	Safety, Environment, Quality and Risk, a branch within Sydney Trains
SFAIRP	So Far As Is Reasonably Practicable
SHEM	A software module within EAM for recording incidents
SIMP	Site Incident Management Plan
SJAMS	St James, a database for managing quality issues and corrective action
SME	Subject-Matter Expert
SMS	Safety Management System
TAO	Technically Assured Organisation
TfNSW	Transport for NSW
TMP	Technical Maintenance Plan

UPS	Uninterruptible Power Supply
WHS	Workplace Health & Safety
Worker/ person	Has the same meaning as provided by section 7(1) of the Work Health and Safety Act 2011 (Cth)

2 Electricity Network Safety Management System (ENSMS)

2.1 Sydney Trains' policies

Sydney Trains is committed to providing a safe environment for our staff, passengers, customers, contractors and the public. All Sydney Trains policies are published internally[2]. Our safety policy is founded on the principles that:

a. Good safety performance requires planning, training, consultation, supervision and accountability.

b. Risks are identified and either eliminated or effectively managed.

c. All requirements of relevant legislation are met.

d. We are all responsible for safety.

e. All injuries are preventable.

To achieve these principles, Sydney Trains has established a comprehensive safety management system (SMS) available to all employees via the intranet. The Sydney Trains SMS is defined by *SMS-01-SR-3000 Safety Management System Requirements*[3]. It consists of 20 elements that comply with various legislative requirements and standards, including:

a. Rail Safety National Law (NSW) and Rail Safety National Law National Regulations 2012

b. Work Health and Safety Act 2011 (Cth) and Work Health and Safety Regulations 2017

c. Electricity Supply (Safety and Network Management) Regulation 2014.

Sydney Trains SMS was established to enhance safety management performance throughout the organisation. The aim of the risk-based systematic approach to safety management in line with international best practice is to provide safe workplaces and to demonstrate conformance to the required regulatory, statutory and industry requirements.

The SMS is under constant review, refinement, improvement, and stringent change control as outlined in its inherent operational safety risk and change management procedures.

The SMS has been developed using a continual improvement cycle of monitoring and review, focussing on improved system efficiency and effectiveness leading to improved safety performance of all Sydney Trains operations, including the electricity distribution network.

The continual improvement cycle consists of:

a. Commitment – the health and safety policy for the organisation and a demonstration of the commitment to the policy.

b. Planning – the way in which Sydney Trains will plan to fulfil the health and safety policy, objectives and targets.

[2] http://intranet.sydneytrains.nsw.gov.au/my-hr/policies-and-procedures
[3] http://sms.sydneytrains.nsw.gov.au/trim/sms-sydney-trains?RecordNumber=D2013%2F79068

c. Implementation – the way in which Sydney Trains will develop the capabilities and support mechanisms necessary to achieve the health and safety policy, objectives and targets.

d. Measurement – the methods that Sydney Trains will use to measure, monitor and evaluate the health and safety performance.

e. Review – the way in which Sydney Trains will regularly review its safety management system by taking preventative and corrective action and continually improving its overall performance.

The elements of the SMS contain documents (such as System and Operational Procedures, Forms, Guidelines, etc.) that together describe what Sydney Trains must do to manage safety, who is responsible and where appropriate, and how certain tasks must be done.

Sydney Trains' Electricity Network Rules form a subset of the SMS and are made available to all employees and external organisations via the RailSafe website. Sections are provided to contractors, suppliers and other third party stakeholders as may be required to assure safe outcomes.

2.2 Publication of the ENSMS

Sydney Trains Electricity Distribution Unit (EDU) publishes this plan and the top-level Electrical Network Safety Rules via the RailSafe website, http://railsafe.sydneytrains.nsw.gov.au/electrical-safety-sms-documents .

2.3 Management review and modifications to the ENSMS

2.3.1 Overview

Sydney Trains' electrical network SMS, formal safety assessments and the Safety Assurance Statement continuously evolve in response to periodic reviews, corrective or preventive actions recorded in the quality management system. Changes may arise from:

a. changing statutory requirements, codes of practice, industry best-practice

b. changes to Sydney Trains organisation and responsibilities

c. chances in operational and maintenance needs

d. changes in risk assessments, e.g. changes to safety controls

e. introduction of new technology, hardware or software

f. recommendations from audits and incident investigations

g. information received from the ESF and external industry forums, such as best practice

h. process-improvement activities

i. feedback from stakeholders including TfNSW, TAO and authorised persons.

EDU controls:

a. this ENSMS, including this Plan and Sydney Trains' Electricity Network Bushfire Risk Management Plan

b. the Electricity Network Safety Rules

c. the Electrical Risk Register

d. Formal Safety Assessments for the electricity distribution network.

2.3.2 Periodic review

SMS-02-SP-2000 Management Review describes Sydney Trains' commitment to continual improvement to effectively satisfy safety objectives and targets. The procedure is applicable to senior management and managers of the SMS, and details the following processes:

a. scheduling reviews of the SMS
b. reviewing safety plans and performance indicators
c. reporting on the SMS review and safety performance to senior management
d. reporting on non-conformances identified in safety and system audits
e. implementing corrective actions to address non-conformance.

All ENSMS documents have a review date set in each document which acts as a trigger to cause the document to be reviewed by EDU, revised (if necessary) and re-published.

2.3.3 Initiating changes to the ENSMS

Changes to the ENSMS are initiated through *SMS-07-SP-3067 System Safety Management of Change* [55], described further at Section 5.

2.3.4 Notification of changes

Changes to ENSMS documents are announced internally via the issue of an "Engineering Instruction" which are sent to the Deputy Executive Directors of the business units within Sydney Trains' Engineering & Maintenance Branch, and cascaded throughout the staff hierarchy to those affected, and the TfNSW Asset Management Branch.

Revised ENSMS documents are published to a shared email address "Electrical Technical Contacts". All electrical authorised persons are automatically included as subscribers to this address.

Sydney Trains notifies the rail regulator[4] of changes to the ENSMS that may affect Sydney Trains accreditation, notably those affecting the high-voltage distribution network.

In addition, EDU assesses changes to the ENSMS as to whether the change affects the tasks performed by authorised persons e.g. changes to forms, procedures, equipment and records. If this is the case EDU will:

a. Issue an engineering instruction informing the authorised persons of the change (including a copy of the revised documents).
b. Provide a written briefing explaining the aspects of the change as it affects each category of authorised persons.
c. Attend the workplaces affected and conduct briefing sessions for the authorised persons affected, ensuring not less than 90% have been briefed prior to the change being implemented.
d. Retain records of the persons briefed.

All other persons (including members of the public, external parties, other government authorities etc.) can access the released versions of ENSMS documents via the RailSafe website. The front page of the website lists the documents that have recently changed.

[4] Rail Safety National Law National Regulations 2012 clauses 22, 23

2.3.5 Effectiveness of changes

In response to changes categorised as significant, Sydney Trains may initiate an analysis or audit to assess the effectiveness of the change and the effectiveness of any corrective or preventive action implemented. Analyses will be undertaken with support from SER; audits may be carried out by Sydney Trains Internal Audit or an external auditor may be engaged.

3 Originating requirements

3.1 Overview

The primary legislation, standards and codes of practice applying to Sydney Trains are listed in legal requirements register on the intranet[5]. In addition to the Electricity Supply (Safety and Network Management) Regulation 2014 and AS 5577, other legislation applicable to the electricity distribution network includes but is not limited to the following acts, regulations and codes of practice.

Adherence to these standards, codes, and guidelines is required, to the extent practicable. Departures should be documented and justified including evidence the resulting level of safety is at least equal to or greater than the level of safety that would ensure from compliance with that standard.

Where there are conflicting requirements the legislation, codes of practice and national standards take precedence over TfNSW standards.

Where conflicts arise – such as multiple standards or codes of practice prescribing conflicting requirements – Sydney Trains will make decisions ensuring regulatory requirements are satisfied and risk is considered.

The following table lists source documents indicating those used by Sydney Trains, or where alternative standards are used.

NOTE

The following table is not exhaustive.

Source	Application	Comments
Electricity (Consumer Safety) Act 2004	Not Used	Superseded by Gas and Electricity (Consumer Safety) Act 2017.
Electricity Supply Act 1995	Applies	Refer to Section 3.2 Exemptions.
Circuit Layouts Act 1989	Applies	
Electricity (Consumer Safety) Regulation 2015	Not Used	Superseded by Gas and Electricity (Consumer Safety) Act 2017.
Electricity Supply (General) Regulation 2014	Applies	Defines exemptions from provisions of the Electricity Supply Act for certain distribution network service providers and for certain supply arrangements.
Electricity Supply (Safety & Network Management) Regulation 2014	Applies	Defines safety management requirements.
Home Building Act 1989	Applies	Contains requirements concerning low-voltage installations.
National Electricity (NSW) Law	Applies	Refer to Section 3.2 Exemptions.

[5] SMS-01-RG-3148

Source	Application	Comments
National Parks and Wildlife Act 1974	Applies	Defines constraints applicable to Sydney Trains in respect of easements or rights-of-way and access to electricity infrastructure on or in these lands. Contains constraints re management of vegetation near electrical infrastructure.
Rail Safety National Law NSW No 82a	Applies	Applies to all infrastructure required for the safe operation of the railway – including the electricity distribution network - and to rail infrastructure managers (all of Sydney Trains).
Service and Installation Rules of New South Wales	Applies	Defines Sydney Trains as the high-voltage electricity distributor for all assets on TAHE land and excludes high-voltage supply from any other DNSP.
Transport Administration Act	Applies	Confers rights on Sydney Trains in respect of work undertaken by 3rd parties that may infringe the safe approach distance to electrical equipment.
Australian Standard 5804: High Voltage Live Working	Not used	Sydney Trains does not permit live work on HV equipment.
Crossings of navigable waters: Electricity Industry Code	Applies	Defines minimum clearances and aircraft warning markers on aerial lines.
ENA DOC 001-2019 National Electricity Network Safety Code	Not used	Superseded by AS 5577.
ENA NENS 09-2014 National Guideline for the Selection, Use and Maintenance of Personal Protection Equipment for Electrical Arc Hazards	Applies	
ISSC 14 Guide to electrical workers' safety equipment	Not used	Sydney Trains uses ENA NENS 09-2014.
ISSC 20 Guideline for the management of activities within electrical easements and close to electricity infrastructure	Applies	Refer to Section 12.4.
ISSC 28 Guideline for enclosed spaces in NSW electricity networks	Not used	Superseded by SafeWork Code of Practice for Confined Spaces.

Source	Application	Comments
ISSC 29 Guideline for preclimbing and climbing assessment of poles	Not used	Refer to *PR D 78108 Pre-work Hazard Assessment and Controls for Work on Poles with Live Exposed Equipment*.
ISSC 3 Guide for the management of vegetation in the vicinity of electricity assets	Applies	Refer to *SP D 79036 Sydney Trains Electricity Distribution Network Bushfire Risk Management Plan*.
ISSC 31 Guideline for the management of private overhead lines	Not used	ST does not have private overhead lines.
ISSC 32 Guide for ISSC network operators to provide information to the construction industry for working near overhead power lines	Not used	Superseded by Safe Work Code of Practice Working near Overhead Powerlines.
ISSC 33 Guideline for network configuration during high bushfire risk days	Applies	Refer to *SP D 79036 Sydney Trains Electricity Distribution Network Bushfire Risk Management Plan* Auto-reclose is disabled on TOBAN days.
ISSC 34 Guide for ISSC height safety within the NSW electricity industry	Applies	
NSW Code of NSW Dept of Practice: Service Water and Energy and Installation Rules	Not used	Superseded by *Service and Installation Rules of New South Wales*.
NSW Code of Practice: Contestable Works	Not used	
NSW Code of Practice: Demand Management for Electricity Distributors	Not used	Sydney Trains does not have disconnectable loads, and does not implement load-shedding
NSW Code of Practice: Electricity Service Standards	Not used	Superseded by *Service and Installation Rules of New South Wales*.
NSW Code of Practice: Installation Safety Management	Not used	
NSW Electricity Transmission Reliability and Performance Standard 2017	Not used	Sydney Trains does not operate a Transmission Network.
SafeWork Code of Practice for Confined Spaces	Applies	

Source	Application	Comments
Service and Installation Rules of New South Wales	Applies	
Transmission NSW Dept of Design Reliability Resources and Standard for NSW Energy December 2010	Not used	Sydney Trains does not operate a Transmission Network.
Gas and Electricity (Consumer Safety) Act 2017	Applies	

3.2 Exemptions

Generally, electricity distribution networks exist for the wholesale supply of electricity on behalf of retailers and the Australian Energy Regulator (AER) under the National Electricity Law. The National Electricity Rules is the legislative instrument.

Sydney Trains holds an exemption (AER – N02076/13) from the AER to register as a network service provider and from the operation of Chapter 5 of the National Electricity Rules. This exemption was granted to Sydney Trains in June 2013 and remains under the Australian Energy Regulator's Network Service Provider Registration Exemption Guideline. The exemption places certain conditions upon Sydney Trains applicable to exemption class NR05[6] and relates to the way in which Sydney Trains may operate and maintain the network from which third party electricity customers are supplied.

Over 250 independent retail customers are connected to the electricity distribution network, primarily shops on station concourses. The customers are separately metered and billed by Sydney Trains as the distribution network operator.

Sydney Trains holds an exemption from the Australian Energy Regulator to register as a retailer and from the operation of certain parts of the National Energy Retail Law. This exemption (AER – R0042/13) was granted to Sydney Trains in July 2013 and remains under the AER's (Retail) Exempt Selling Guideline (March 2016). The exemption places certain conditions upon Sydney Trains applicable to exemption classes R1 and R5 and relates to the way in which Sydney Trains may supply third party electricity customers from the rail electricity distribution network.

Sydney Trains is also exempted from certain provisions of the ESA[7], and Part 2 of the National Electricity (NSW) Law.

[6] AER-N02076/13. Exemption class NRO5 “Metered energy on selling to customers in networks with metering infrastructure enabling access to full retail competition in a jurisdiction”.
[7] Electricity Supply Act 1995 (NSW) s 43B

3.3 Code of Practice: Work Near Overhead Power Lines

The NSW Code of Practice Work Near Overhead Power Lines [24] applies to all situations where there is a reasonable possibility of an external person, either directly or through any conducting medium, coming closer than the approach distances specified in that code. As described at Section 12:

a. This Code must be applied by external parties performing work adjacent to overhead wires operated or maintained by Sydney Trains.

b. Where the Code refers to the network operator, guidance is provided through *PR D 78700 Working around Electrical Equipment*.

3.4 TfNSW Standards, specifications and guidelines

Sydney Trains uses a comprehensive set of engineering standards to design, construct, commission, maintain, operate and decommission elements of the electricity distribution network. The engineering standards are developed, implemented, maintained and administered by the Asset Management Branch (AMB) within TfNSW and are integrated with technical maintenance plans and associated service schedules undertaken by Sydney Trains. Standards undergo periodic review to ensure they are effective and incorporate best practice.

TfNSW AMB is responsible for managing the content and integrity of the standards, making them available to TAOs and other interested parties. AMB sets standards through the implementation of a process to promote collaboration between the AMB and other sectors of the rail industry. TfNSW electrical engineering standards are available from their website at https://www.transport.nsw.gov.au/industry/asset-management-branch/quick-search.

3.5 Service and Installation Rules of NSW

Sydney Trains deviates from one of the objectives of the NSW Service and Installation Rules and the referenced Service and Installation Rules of NSW, owing to a departure from the requirements of AS/NZS 3000 – refer to Section 1.4.

3.6 Changes to regulatory requirements

Sydney Trains participates in electrical industry forums, notably the electrical industry safety networks in Sydney/Illawarra/Hunter, the electrical Industry Safety Steering Committee (ISSC) and the Energy Networks Association (ENA) to maintain awareness of current trends and forthcoming changes in the electrical industry.

Sydney Trains also has a corporate subscription to SAI Global and is automatically notified of changes to relevant standards.

4 Network Description

4.1 Overview

This chapter presents a description of the electricity distribution network, including the parameters required by AS 5577 Appendix C.

Sydney Trains operates the electricity distribution network (consisting of the distribution network and the traction system) supplying the railway operations of both Sydney Trains and NSW TrainLink as an integral part of the rail network.

As the operator of the electricity distribution network, Sydney Trains is defined in the ESA as a network operator. Ownership of the physical asset remains with Transport Asset Holding Entity (TAHE).

4.2 Supply interfaces

The rail electricity distribution network takes high voltage AC supply via bulk supply points throughout the network area. These bulk supply points are provided by 2 adjacent network operators (Ausgrid and Endeavour Energy) and TransGrid at 132kV, 66kV, 33kV or 11kV.

Some railway stations and small installations within the rail corridor are supplied from the interfacing network operator (Ausgrid and Endeavour Energy) at low voltage (415V 3 phase and 240V single phase) via isolating transformers. The components of the electricity distribution network include:

a. Substations
b. High Voltage (HV) aerial lines and underground cables
c. Low voltage distribution systems
d. Earthing systems
e. ICON.

As a high-voltage distribution network operator all the substations operated or maintained by Sydney Trains must be supplied via the high-voltage distribution network, i.e. an asset or substation cannot be supplied from a high-voltage connection to another network operator in isolation from the distribution network.

The following **do not** form part of the electricity distribution network and are explicitly excluded:

a. 1500 Volt DC OHW, supplying power to rolling stock
b. signalling power
c. low-voltage supplies to stations, buildings, and workshop supply (general supply).

Electrical assets of rail networks not managed by Sydney Trains, including but not limited to:

a. Sydney Metro and Sydney Light Rail
b. Public-Private Partnerships (such as Reliance Rail)
c. Other rolling stock operators.

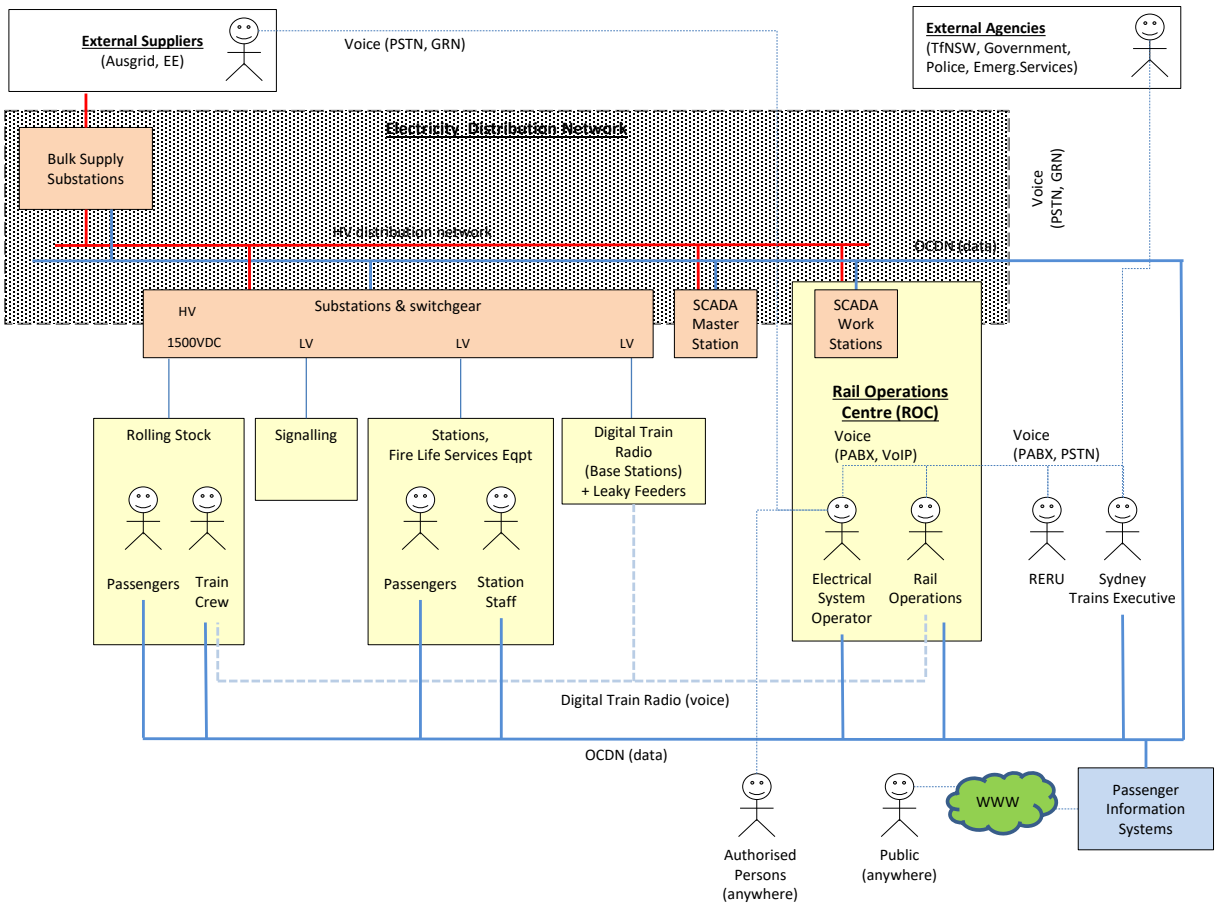


Figure 1: Electricity distribution network context

The distribution network consists of HV aerial lines and underground cables that bring the AC supply to distribution and traction substations. The traction substations then convert the electricity supply to DC power, which in turn is fed into the overhead wiring (OHW) system, from which trains draw their supply and are able to run.

General power is supplied from the substations for the signalling system, lighting, workshops, offices, and stations; ensuring a continuous electrical supply to these assets. General power is provided at nominal voltages compliant with those outlined in AS 60038. General power is, at numerous locations, supplied directly from a distribution substation or low voltage electricity network owned by an adjacent network operator.

Traction power is converted to 1500 Volt DC (nominal) at traction substations, then delivered via the overhead wire network to trains, powering the electric train fleet and all the auxiliary services (e.g., lighting, air-conditioning) on the trains.

The whole of the electricity distribution network (apart from the overhead wiring and some general supplies) is designed so that the failure of any one item of equipment does not affect the running of trains. This is known as single contingency failure mode. At some locations, such as the City Underground, double contingency is provided to ensure a secure supply.

The traction system extends to Wickham (Newcastle) in the north, Bowenfels in the west, Macarthur in the south-west, and Kiama in the south (refer to Appendix A).

4.3 Substations

Traction substations provide control, distribution, protection, and transformation of AC power to 1500 Volt DC power supply to the traction system. Traction sectioning huts maintain the overhead wiring voltage and eliminate unnecessary tripping of DC circuit breakers; they are not a source of power.

The rectification of AC to DC supply and the operation of the traction system can produce significant harmonics and other waveform distortions within the electricity distribution network. Therefore, general supply to other customers is largely limited to commercial enterprises operating within or immediately adjacent to the rail corridor.

Spacing of traction substations varies between one every 4 kilometres in high load areas, to one every 15 kilometres for outer suburban rail passenger transport. Substation spacing is a complex issue which must consider variables such as electrical loads, gradients, OHW types, energy losses, voltage drop, rail to earth voltage, and electrolysis.

High voltage feeders distribute the electricity supply to substations for rectification and further distribution to the OHW for traction supply and rail operations. For protection, operation and maintenance purposes, the overhead wiring is divided into separate sections by the switchable substations, sectioning huts, and field switches. Overall control and monitoring of Sydney Trains' substations is via a Supervisory Control and Data Acquisition (SCADA) system.

Electrical protection of the OHW system is provided by high-speed DC circuit breakers (DCCBs). Sectioning huts containing DCCBs are provided between substations for protection and sectioning of the OHW system and, on multiple tracks, to improve voltage regulation.

Substations and the selection of switchgear are based on AS/NZS 3000, AS 2067 and related TfNSW Standards which require specific controls to mitigate the risks posed by this equipment.

4.4 High voltage (HV) aerial lines & underground cables

The high-voltage network includes 882.6km of aerial lines of which 606.4 km is within the rail corridor, and 276.2km lies outside the rail corridor. The percentage on bushfire-prone land (in 2016) is depicted in Figure 2 below.

Except where general supply is taken directly from an adjacent network operator's distribution substation, the electricity supply between bulk supply points and substations is provided by HV AC aerial lines and underground cables.

High voltage electricity is distributed to and throughout the rail electricity distribution network at five nominal voltages:

a. 132kV – a short (<1km) aerial feeder (no. 285) from Heathcote Substation to an interconnection (at structure T231) with the 132kV feeder.

b. 66kV – network supplies from bulk supply points, and interconnections between traction substations and switching stations from Blacktown to Wallerawang and Hornsby to Sulphide Junction (Cardiff).

c. 33kV – network supplies from Endeavour Energy bulk supply points, and interconnections between traction substations in all other areas of the rail electricity distribution network.

d. 11kV – Distribution and reticulation of electricity supplies to signalling and ancillary installations within or adjacent to the rail corridor, and railway stations.

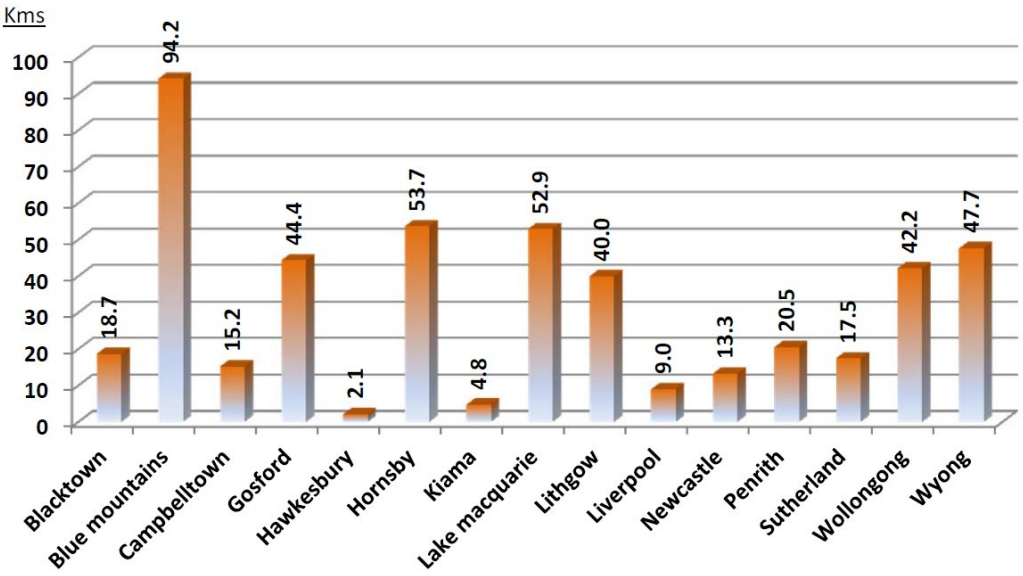


Figure 2: Percentage of Feeders on Bushfire-prone Land

The high voltage system consists of aerial conductors and underground cables, and is mostly located within the rail corridor. Underground cables generally require less routine maintenance than aerial lines. Cables can be subject to accidental damage during excavations, and faults are not always easy to find. Some sections of the system traverse public recreational and road reserves, National Parks, and government-administered properties.

Protection of HV feeders is from circuit breakers located within substations. Auto-reclosing is applied by the SCADA system at ICON.

4.5 Buried cables

Sydney Trains has buried cables outside the rail corridor. For safety reasons, it is extremely important to check the location of these and other services (including gas, communications, water and sewerage) before starting to dig or excavate.

4.6 Abandoned cables

Railway land sold by TfNSW or its related entities (State Rail, Rail Infrastructure Corporation, TAHE) may have abandoned cables. If you need to excavate near or remove abandoned cables, please contact Sydney Trains and request an “Abandoned Cable Permit”.

4.7 Overhead wiring (OHW) and electric rolling stock

The 1500 Volt Overhead Wiring does not form part of the electricity distribution network and does not come under the scope of the *Electricity Supply (Safety and Network Management) Regulation 2014*. As such the methodology and practices of how Sydney Trains addresses the safety of persons in relation to the 1500 Volt OHW is not contained within this document; it is addressed in other Sydney Trains strategies, standards, documents, procedures and processes. However, many of the strategies deployed by Sydney Trains concerning the restrictions and safety of persons in the rail corridor also largely contribute to the strategies and procedures to limit public access to the potential hazards associated with the electricity distribution network.

The OHW system transfers traction power at 1500 Volt DC from the traction substations to the train pantographs by way of catenary and contact wires. The train pantograph slides under the contact wire and collects power to operate the motors, with the current returning to the substations through the rails. The overhead is at positive voltage potential and the rails are at negative voltage potential. This system's assets include the cables, wires, wire support structures, wire crossovers, regulators, insulators and switches.

4.8 1500 Volt DC interfaces

Where Sydney Trains supplies power to a 1500 Volt DC section operated or maintained by another Rail Infrastructure Manager (RIM) an Interface Agreement shall be established requiring the RIM to liaise with Sydney Trains to ensure power is supplied when needed, and to ensure electrical work performed by one party do not adversely affect rail operations of the other party.

4.9 Signalling

The 120VAC signalling supplies do not form part of the electricity distribution network and do not come under the scope of the Electricity Supply (Safety and Network Management) Regulation 2014. The management of safety associated with the signalling supplies is covered by the RSNL. Reports are submitted to the Independent Transport Safety Regulator (ITSR) as part of Sydney Trains' rail safety accreditation.

Signalling power supplies are built with two independent sources of supply; one designated as normal, and the other as emergency. In most cases, the normal supply is assigned to the Sydney Trains 11kV/415kV distribution system and the emergency supply is from the adjacent network operator at low voltage AC. The HV supply is transformed to LV (415VAC[8], 240VAC, 120VAC) and then rectified where required to 24VDC for signalling.

These signalling power supplies are set up with an automatic changeover switch that is biased to draw supply from the normal source but will change over to the emergency source if the normal supply is lost. This provides a high level of independence and a low probability of simultaneous loss due to a common cause.

Some locations have two independent Sydney Trains supplies, with a small number of others relying on two supplies from the adjacent distribution network service provider. This not a normal or desired arrangement and a concession is required from AMB if contemplated.

New signalling power supply systems incorporate fewer power supply locations, with an uninterruptible power supply (UPS) downstream of the changeover contractor. The UPS provides a constant, smooth supply to the signalling equipment that is unaffected by surges, dips and other disturbances on the Sydney Trains or adjacent network operator networks. Adopting this technique has made the signalling system much more robust, particularly during extreme weather events.

[8] Three phase earthed 415V supply.

4.10 Low voltage supplies

Stations, buildings and workshops are supplied from the HV distribution system. Substations transform the power to the required low voltage. The reticulation of low voltage supply is mostly insulated cables run in either ducts, buildings and structures or conduits. There is some pole mounted wiring, and this is generally between network operators substation or point of supply (connection point), and a building/structural point of attachment. A small amount of this is open wire. Protection of the general supply network is via high rupture capacity fuses or low voltage circuit breakers.

Power failure at a station without a backup supply does not affect the traction or signalling systems. However, having no functioning lights, escalators or lifts on stations is a safety risk for the travelling public. In the event of power failure, station staff are trained to respond to ensure the safety of the travelling public. This may include running trains through blacked-out stations without stopping, and providing bus services between affected stations until power is restored.

The rail electricity network supplies electricity directly to independent (embedded) customers (e.g., retail tenants of Sydney Trains station concourses), and a small number of third party non-tenants. These consume approximately 1.8% of the energy supplied by the Sydney Trains network.

In the Blue Mountains it also serves as the backup supply for the Endeavour Energy feeder supplying public consumers with connections at the Lawson and Blackheath substations. In this respect the impact for retail consumers in these areas arising from isolations or failures on the feeders in the Blue Mountains must be considered.

4.11 Modified direct earthing system

The traction rail is insulated from the general mass of the earth by concrete or timber sleepers and ballast (crushed stone) that, in combination, present sufficient resistance to current flow to prevent almost all leakage to earth. The negative is NOT bonded to earth at the source so leakage current will only exist where a path of lower resistance bypasses part of the rail return system.

Some leakage is always possible and can often occur. If DC leakage currents are able to enter buried metallic objects such as metal water pipes or electric earthing systems, electrolysis can occur and, if left uncontrolled, this can completely corrode the affected metallic material.

As a control measure, Sydney Trains does not use a MEN system in situations near 1500 Volt track. Installations near 1500 Volt track must be electrically isolated from any MEN systems (usually by an isolating transformer installed between the point of supply and the main switchboard) and a dedicated, insulated earthing conductor is run from the substation throughout the local low voltage network.

4.12 Infrastructure Control (ICON)

Sydney Trains has a central facility (ICON) which monitors and controls the electricity distribution network and related infrastructure using a SCADA system which communicates with the substations throughout the network, and presents information to electrical system operators at the central control facility. The mission of ICON is to ensure the supply of electricity to the railway assets meets operational needs, primarily the rolling stock, signalling, maintenance centres, stations and other facilities, as well as:

a. Monitor the status of the electricity distribution network including the high-voltage circuit breakers, feeders and substations.

b. Monitor the status of the 1500 Volt DC overhead wire.

c. Control the operation of most high-voltage circuit breakers.

d. Control the de-energisation and re-energisation of electrical assets.

e. Control the auto-reclosing of high-voltage circuit breakers.

f. Monitor power usage at critical locations.

g. Manage the response to emergencies involving electricity.

h. Record and respond to incidents, as/when reported.

The processes implemented by ICON are described in Operator Procedures and Trouble Instructions.

ICON has interfaces to the Rail Management Centre (rolling stock operations), WeatherZone (to monitor weather conditions) and emergency services.

To provide business continuity and disaster recovery in the event of certain types of incident, the ICON facility and its communications links are dual-redundant.

5 Safety management

5.1 Safety policy

Sydney Trains' health and safety policy (Appendix B) defines our commitment to risk management and guidance on risk management approaches. All staff are obliged to manage risk in accordance with this policy. It provides an integrated, systematic and mandatory approach to:

a. Make decisions ensuring the change is as safe as reasonably practicable, and identifying opportunities to reduce risks.

b. Minimise harm to persons (including the public, staff and contracts), the environment and external property.

c. Ensure the organisation achieves its operational objective (i.e. operating the railway) while minimising the operational impact arising from incidents.

d. Decompose these objectives to identify the safety controls that should be implemented at all levels of the organisation.

e. Produce and retain records demonstrating compliance with these objectives and to satisfy legislative requirements for safety.

5.2 Safety assurance

Sydney Trains provides assurance of system safety as described in the TfNSW Guide to TfNSW Framework for Assuring the Safety of Rail Assets and Infrastructure. This describes:

a. safety duties

b. the approach to transport safety regulation and assurance

c. ensuring safety and the meaning of SFAIRP

d. safety organisation and responsibilities

e. operation and maintenance of rail assets

f. TfNSW's framework for assuring the safety of rail assets and infrastructure

g. configuration management

h. governance.

The Rail Services Contract and the organisational arrangements between TfNSW, TAHE, Sydney Trains and TAOs.

Further guidance is provided in the *ONRSR Guideline Major Projects* concerning safety assurance, SFAIRP determination and the factors that should be considered.

5.3 Safety management lifecycle

The safety life cycle is the series of phases from initiation and specifications of safety requirements, covering design and development of safety related features in a safety-critical system, and ending in decommissioning of that system. The lifecycle model is defined by the TfNSW AMB[9], Figure 1:

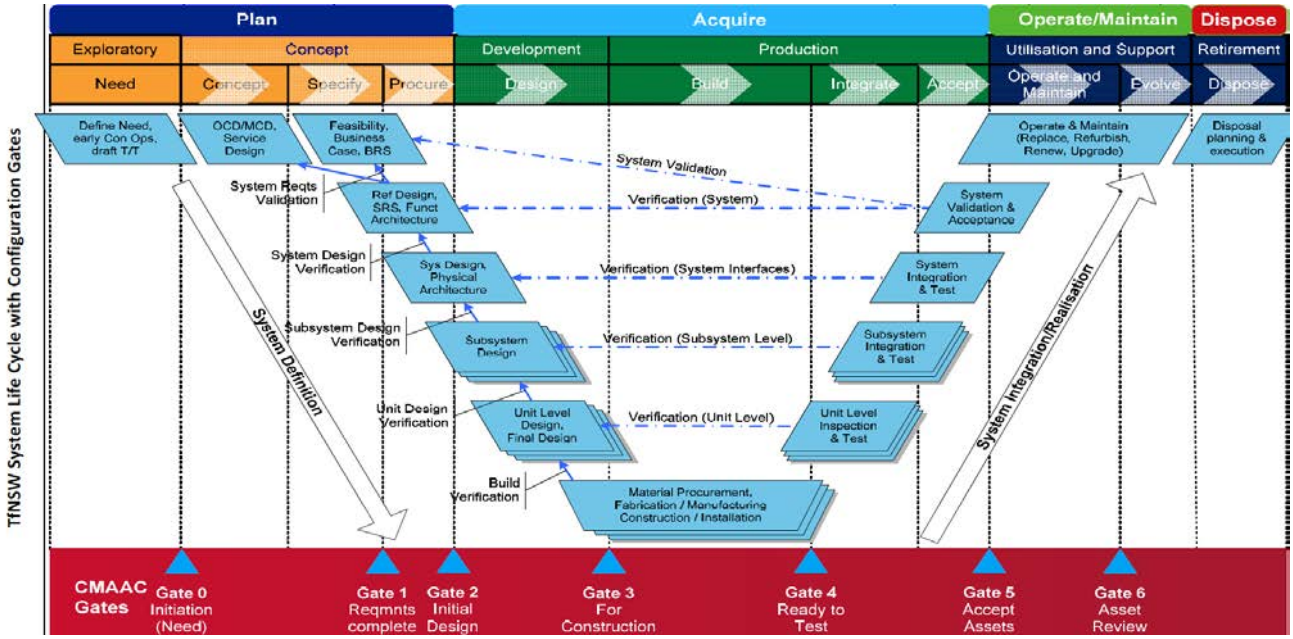


Figure 3: AMB Asset Lifecycle Model (Based on AS15288)

Safety management activities work products are linked to the asset lifecycle phases and configuration gates. Refer to Figure 6.

5.4 Risk management responsibilities – Transport Cluster

The entities within the transport cluster responsible or accountable, and those who should be consulted or informed, are shown in Table 1.

[9] Figure 3 of TfNSW AMB standard T MU MD 20001 ST

Table 1: Sydney Trains RACI Matrix for Risk Management Aspects of Electrical Assets in All Lifecycle Phases

	Regulation & AS 5577	Design					Construct		Commission	Operate		Dispose
	Sydney Trains Asset Lifecycle	Exploratory	Conceive			Develop	Produce			Utilise and Support		Retire
		Need	Conceive	Specify	Procure	Design	Build	Integrate	Accept	Operate & Maintain	Evolve	Dispose
Stakeholder Organisations	AMB			R								
	TfNSW Strategic Planning	R	R		R		R*	R*	R*	I	I	I
	TAO or Sydney Trains as designer (incl. E&SI)	A	A	A	A	A						
	TAO or Sydney Trains as constructor (incl. MW)						A	A	A		A	A
	Sydney Trains Network Maintenance			C*, I			C*, I	C	C	A	C	C
	E&SI (incl. EDU)	C	I	C*, I	I	I	C*, I	I	I	C	C	I
	SER (Safety)									C	C	
	SER (Environmental)									C	C	
	AMD	C	C	C	C	I	R*/C	R*/C	R*/C	R	R	R

Key: R = Responsible A = Accountable C = Consult I = Inform

R* depending on the project development: where TfNSW plans work = AMD C, where Sydney Trains lead project = AMD R,
C* Proposed and Staged Operating Diagram Functions

5.5 Risk management responsibilities – Sydney Trains Enterprise

Risk management occurs at three levels across the Sydney Trains organisation:

- Strategic risk registers for the enterprise, at the level of the Sydney Trains Chief Executive, which is informed by…
- Tactical risk registers for each branch, where risk responsibility is assigned to each, informed by…
- Operational risk management to reduce safety risks on the network so far as is reasonably practicable (SFAIRP). This is purely focused on the SAFETY element of risk, where the impact is harm to people. While these assessments may identify risks to the operation of the railway, financial or reputational risks are forwarded up to the tactical or strategic level for consideration at those levels.

Refer to Figure 4 and Table 2.



Figure 4: Hierarchy of Sydney Trains enterprise risk registers

Table 2: Risk management responsibilities

Risk management responsibilities	
Chief Executive	Overall responsibility and accountability for risk management within Sydney Trains. Delegates responsibility of monitoring risk assurance to Risk Owners who are at an appropriate level or perform a specific function within the business.
Director, Deputy Executive Directors	Responsible for managing risk within their branch. Formally defined as Safety Risk owners in the SMS. Ensure appropriate risk assurance activities undertaken for ‘owned’ risks.

Risk management responsibilities	
Associate Directors & Professional Heads	Responsible for managing risk within their Division. Formally defined as Safety Risk Control owners in SMS. Make sure owned controls are in place and working as intended.
Project Managers	Responsible for managing risks associated with their projects, assets and contracts.
Maintenance Operations Managers, Team Managers, Area Electrical Engineers	Responsible for managing risks associated with maintenance activities and safety in the field, allocating resources and equipment.
Electrical Workers	Responsible for managing risks associated with maintenance activities and safety in the field, working safely in accordance with guidance and procedures provided in the Electrical Safety Management System, SWMS and SWI.

5.5.1 Planning

The safety planning process is detailed in the document *SMS-03-OP-3212 Safety Planning and Performance Monitoring*, and responsibilities are summarised in the following table:

Process	Responsibility	Tools & Forms
Define Organisation	Associate Director EDU	Corporate Plan Safety Strategic Plan
Establish Safety Objectives and Measureable Targets	EDU Principal Engineer Electrical Safety Systems supported by SME's across Electrical division	KPIs - both positive and negative Positive Safety Performance Indicators (PSPIs)
Manage This Plan	EDU Principal Engineer Electrical Safety Systems	Branch Business Plan and/or Divisional Business Plan Local Safety Plan
Measure Safety Performance	EDU Principal Engineer Electrical Safety Systems	Statistical reporting guide EDU Visual Management Centre
Electrical Risk Register	EDU Principal Engineer Electrical Safety Systems SER Risk professional assigned to EDU Principal Engineers and SME's within ESI Electrical	Electrical Risk Register SER Corporate risk register (FPe database) SCARD Safety Assurance Statements Safety Assurance Reports Bow-Tie SFARP Demonstration
Review This Plan	Associate Director EDU EDU Principal Engineer Electrical Safety Systems Manager Network Maintenance Manager Assets Assurance	Safety Strategic Plan Branch/Divisional Business Plan

Process	Responsibility	Tools & Forms
Design Safety Management (where Sydney Trains is the TAO)	Design Manager, in accordance with Sydney Trains' MN A 00001 Design Management Manual	SCARD Safety Assurance Statements Safety Assurance Reports Hazard Log Human Factors Analysis Functional Failure Analysis Bow-Tie SFARP Demonstration
Design Safety Management (external TAO)	Sydney Trains' Interface Manager The TAO presents hazard logs and risk assessments to Sydney Trains for review. Residual risks are presented to Sydney Trains for review and acceptance.	SCARD** Safety Assurance Statements** Safety Assurance Reports** Hazard Log* Human Factors Analysis* Functional Failure Analysis* Bow-Tie SFARP Demonstration** *by each TAO **by Sydney Trains using TAO data
Implement Safety in Maintenance	Maintenance Operations Managers (MOMs) at Network Bases	Technical Maintenance Plans Electrical Risk Register Hazard Log Local Safety Plans Visual Management Centres
Work safely in accordance with SMS	Authorised persons All staff and contractors	Sydney Trains SMS Electricity Network SMS (Electricity Network Safety Rules) Electrical Risk Register Hazard Log Hazardous Locations Register SWMS, SWI Site-Specific Hazard Logs Site-Specific Safety Plans Local Instructions Worksite briefings

5.6 Safety Change Management

Sydney Trains requires all changes to be assessed for safety risk and managed as described in [55]. This describes the process to manage the reduction in safety risk so far as is reasonably practicable (SFAIRP) for all applicable changes that could potentially affect the safety of workers, our customers or the public, or pose operational, reputational or financial risks to the organisation. The workflow is depicted below (from [89]).

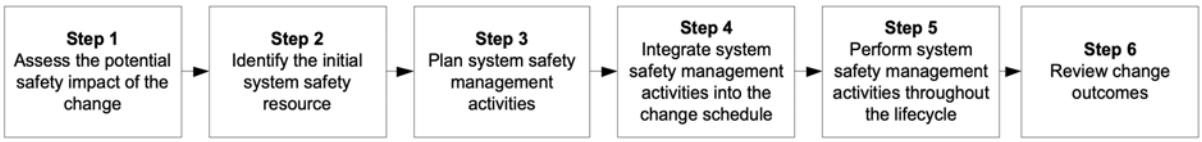


Figure 5: Safety Change Management Workflow

Changes that may trigger risk assessments include, but are not limited, to:

- Changes in originating requirements such as legislation, regulations, codes of practice and related standards.
- Changes to the organisational structure and allocated responsibilities.
- Changes to the electricity distribution network, e.g. changes to the network configuration or the introduction of new technology, hardware or software.
- Changes in the electricity network safety rules, procedures and local instructions describing safe access to electrical equipment.
- Changes in the electricity network safety rules affecting the training and qualification of electrical workers.

The potential impact of a change is assessed using a "Safety Change Assessment and Reporting Determination" (SCARD)[10] which categorises changes as **Significant**, **Important** or **Minor**, and the required work products at each lifecycle phase are depicted in Figure 6 (from [[89]]). This is used to determine which major safety work products and activities – such as a Safety Change Plan[11], Safety Assurance Report (SAR)[12] or Safety Assurance Statement (SAS)[13] – are to be produced.

[10] http://sms.sydneytrains.nsw.gov.au/trim/sms-sydney-trains?RecordNumber=F2013%2F16496-02
[11] https://transportcloud.sharepoint.com/:w:/r/sites/ST-RiskPortal/_layouts/15/Doc.aspx?sourcedoc=%7BED1B4A79-37E8-416A-A4E1-9075C2FBF1E1%7D&file=SS-TP-02%20-%20Safety%20Change%20Plan%20Template%20v2.0.docx&action=default&mobileredirect=true&DefaultItemOpen=1
[12] https://transportcloud.sharepoint.com/:w:/r/sites/ST-RiskPortal/_layouts/15/Doc.aspx?sourcedoc=%7B8C1A779D-6E55-41D0-B2CF-A3C145EAD7CF%7D&file=SS-TP-03%20-%20Safety%20Assurance%20Report%20v2.0.docx&action=default&mobileredirect=true&DefaultItemOpen=1
[13] https://transportcloud.sharepoint.com/:w:/r/sites/ST-RiskPortal/_layouts/15/Doc.aspx?sourcedoc=%7BABC79950-AF7C-4E40-AA99-7F58CBC7867B%7D&file=SS-TP-04%20-%20Safety%20Assurance%20Statement%20Template%20v2.0.docx&action=default&mobileredirect=true&DefaultItemOpen=1

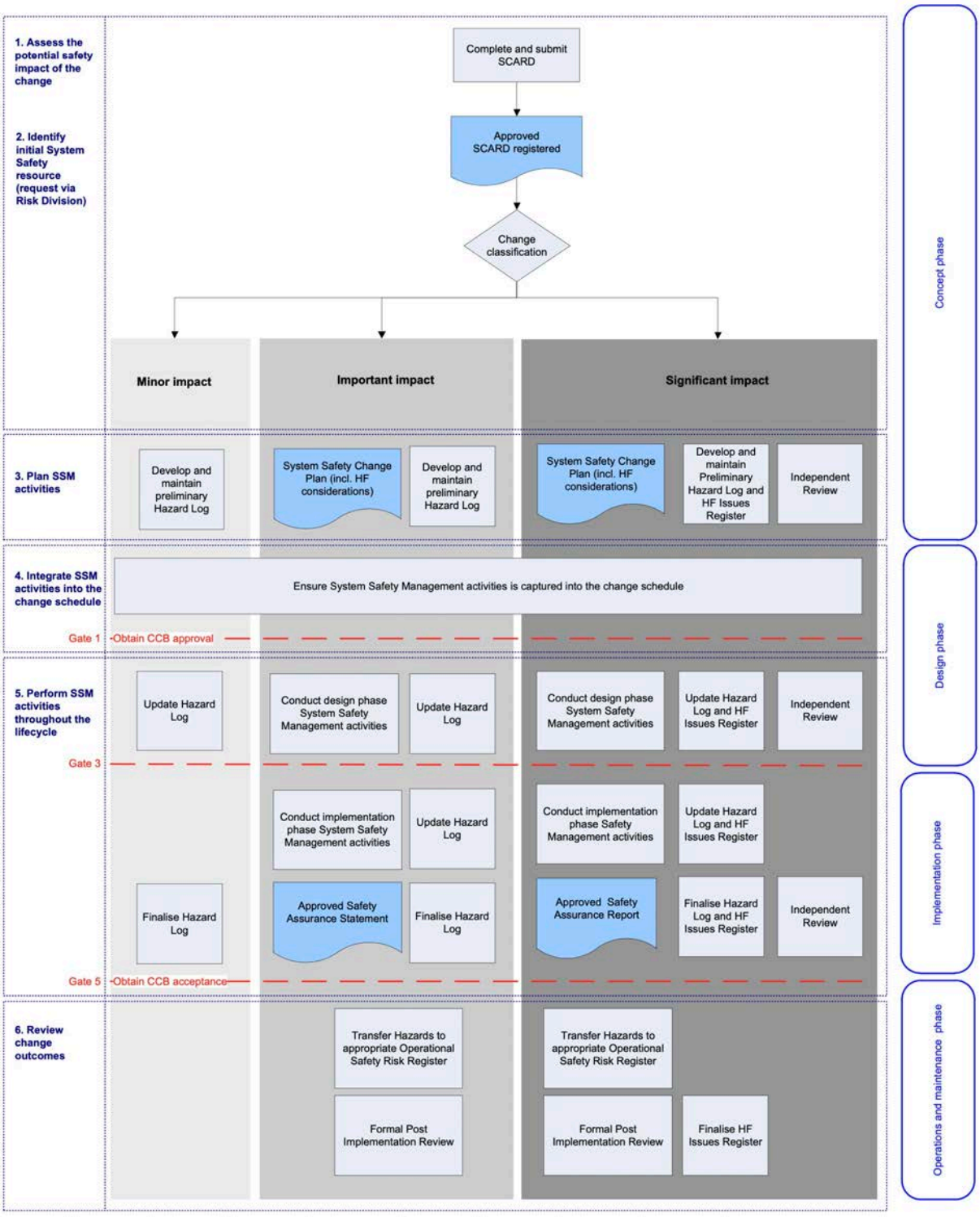


Figure 6: Safety management integrated with asset lifecycle phases

5.6.1 Significant or Important Changes

Where the SCARD concludes a change is SIGNIFICANT or IMPORTANT, either Safety Assurance Statements or Safety Assurance Reports will be produced; these are equivalent to the Formal Safety Assessments required by AS 5577 supported by the respective documentation identified during the determination.

The system safety approval and acceptance of change should be applied at the appropriate stages within the process steps.

5.6.2 Minor Changes

Where the SCARD concludes a change is MINOR, the typical work products:

- Must include either a project hazard log or SFAIRP demonstration (bow-tie).
- Supporting documents such as a human factors analysis (workflows and manual procedures), functional failure analysis, FMEA or FMECA (hardware/software), test and verification data, etc.

5.7 Formal Safety Assessments (FSA)

AS 5577 requires "formal safety assessments" in accordance with Appendix A of that standard. Sydney Trains applies its safety management system to implement these, in the form of "Safety Assessment Reports" (SAR). FSA are required:

a. For the electricity distribution network and ENSR as a whole, addressing:
   - Major loss of supply and black start
   - Bushfire
   - Safety risks to workers and public.

b. For changes assessed as SIGNIFICANT or IMPORTANT, as described previously.

Supporting each FSA is a bow-tie SFAIRP workbook in the Sydney Trains format. The workbook for *Safety risks to workers and public* is the master containing all hazards, causes and controls, while those for loss of supply and bushfire are subsets extracted from that.

Existing unmodified assets constructed prior to 2014 do not have formal safety assessments in the sense described by AS 5577 for the specific asset. Where these assets are to be modified or replaced, a Hazard Analysis[14] is required, presenting the risk considered, the causes (hazards) contributing to the risk, the alternatives considered, the controls, assumptions and exclusions, supported by a hazard log[15] (a spreadsheet with qualified data) and recommendations indicating which solution(s) are considered to reduce risk SFAIRP based on the hazard log data.

[14] https://transportcloud.sharepoint.com/sites/ST-RiskPortal/_layouts/15/Doc.aspx?sourcedoc=%7B2EF1E3A6-CD57-432C-B66F-B3E662AE7881%7D&file=SS-TP-01%20Project%20Hazard%20Log.xlsm&action=default&mobileredirect=true&DefaultItemOpen=1

[15] https://transportcloud.sharepoint.com/sites/ST-RiskPortal/_layouts/15/Doc.aspx?sourcedoc=%7B2EF1E3A6-CD57-432C-B66F-B3E662AE7881%7D&file=SS-TP-01%20Project%20Hazard%20Log.xlsm&action=default&mobileredirect=true&DefaultItemOpen=1

An FSA is not produced for safety risks arising from the protection of the environment (excluding bushfire). These include:

- Hazard trees and the risk of destabilising track or embankments as a result of vegetation activities; these are managed by the track and civil discipline due to the associated risks to rolling stock (train struck by tree or foreign object) and derailment due to destabilising the track, cuttings or embankments. Sydney Trains has zero tolerance to these and an FSA is not warranted.
- Exposure to non-electrical hazards in the environment (for example, asbestos, chemicals, snake-bites) are managed as workplace health and safety risks by the Safety branch.

5.7.1 Formal Safety Assessments (FSA) Guidance

Utilising the Risk Division template for a SAR and Risk Division guidance, the FSA typically includes:

- Executive Summary, with an overview and conclusions.
- An Introduction, presenting background information and the scope of the assessment responding to the requirements of AS 5577 in the context of the specific risk(s) considered.
- Methodology, including the possible scenarios considered, activities, guidance, treatment of safety vs financial, operational or reputational risks; assumptions, completeness, acceptance/rejection of controls and finalisation and implementation of any recommendations.
- Analysis, presenting the precise system description, context, external interfaces, human stakeholders, the primary scenario analysed, functional failure analysis, a discussion of the causes, consequences, existing preventive/mitigating controls, alternatives considered and/or any possible controls identified, and the recommended controls as per the bow-tie worksheet; the details are presented in this bow-tie worksheet.
- Findings, presenting the control options, uncertainties and factors that change with time and a comparison with the practices of other comparable networks and industry best practice.
- Recommendations, developed from the findings.
- References to the sources of information for the above, including sources (where available) for the assessments of likelihood and consequences and evidence of the implementation of controls.

The FSA must contain a statement confirming whether the risk is considered to be managed SFAIRP, or recommendations of further work required to reach that conclusion which may include safety changes.

Sources of data for the consequences and likelihood are referenced in the hazard analysis with traceability of the risks and controls to the originating requirement statements (from standards, codes of practice, hazard logs, incident investigations, analyses, subject matter experts, risk workshops, etc.).

5.7.2 Periodic review of Formal Safety Assessments (FSA)

Formal Safety Assessments are reviewed and updated every 5 years, and/or when a change has been identified which would affect the risk prioritisations, e.g.:

a. The asset is to be significantly modified or replaced.

b. New information is made available about the risks associated with the hazard.

c. Changes have occurred that imply risks associated with operation or maintenance could be further reduced; examples include changes in the condition of the asset, requirements, available technology, work methods, external interfaces or the physical environment.

d. An incident occurs.

e. Significant changes are proposed to the workplace or work system responsible for its maintenance.

5.7.3 Working safely around electrical equipment

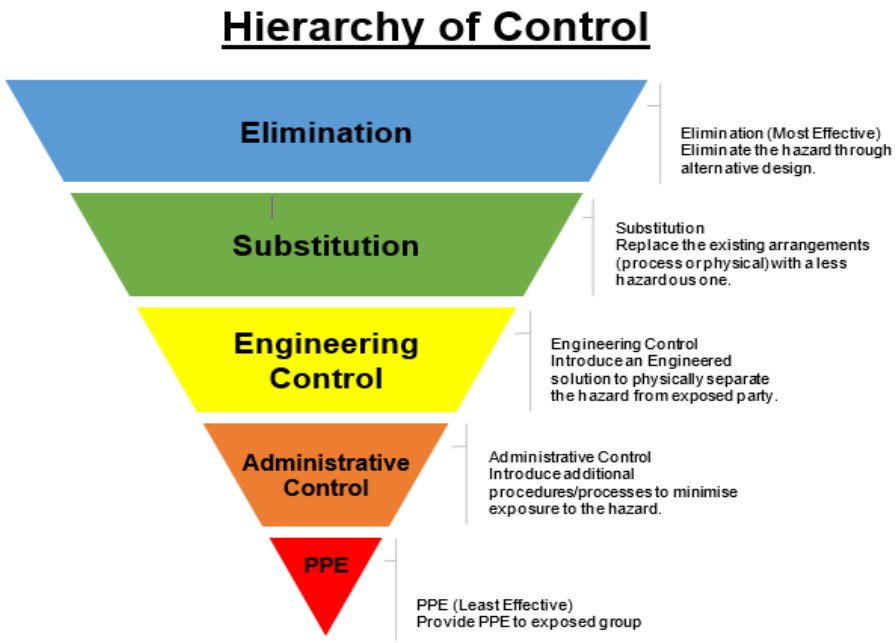
Sydney Trains has an established suite of rules and procedures for working safely on or near electrical equipment – refer to *RL D 79800 Electrical Network Safety Rules*. Compliance with these rules is mandatory for all staff, TAO and contractors engaged to work on or near electrical equipment.

5.7.4 Managing risks

As described in SMS-06- OP-3043 the person responsible for the work must produce a documented risk assessment which:

- Identifies the hazards, including the nominal voltage of exposed electrical equipment, its location and describes the task(s) to be performed.
- Assesses the credible consequences.
- Identifies the possible (alternative) control measures, with their effectiveness (using the hierarchy of controls).
- Of the possible alternative control measures, identifies those which will be implemented vs those that are rejected.

5.7.5 So far as reasonably practicable



To claim risk has been reduced so far as is practicable, it is necessary to show:

a. Alternatives have been ranked by effectiveness, starting with elimination, separation, etc., and the cost of implementing the controls identified.

b. Alternative solutions have been assessed (one solution is not sufficient).

c. The most effective practicable control has been adopted.

d. Possible controls are rejected on the basis that the cost of the control is grossly disproportionate to the value of net safety benefit obtained; the latter being based on the value of life saved, and the legal meaning of “grossly disproportionate”. The cost of the control is considered over the future life of the asset - not the project cost as presented in the TfNSW risk matrix.

e. If removing an existing effective control for a known cause, an alternative control must be provided which is no less safe (effective) than the existing control.

f. The change does not re-introduce or increase the likelihood of a known cause which is effectively controlled by an existing control.

g. The change does not expose Sydney Trains management to potential risks of statutory non-compliance or negligence.

h. The residual risk has been accepted by the Network Operator (Sydney Trains), particularly where there is an existing safety control that has been proven to be effective and is reasonably practicable.

Even where a risk is classified as "broadly acceptable", if there are options for further risk reduction and the cost is proportionate to the benefits to be gained, these options must be considered and either accepted or rejected together with the rationale for that decision.

It is unacceptable to:

- Reject a known, effective control without showing its cost is grossly disproportionate to the safety benefit obtained

- Remove a known effective, control and replace it with a less effective one, or
- Introduce or re-introduce a known hazard without an effective control.

5.7.6 Risk acceptance criteria

Risks are assessed using Sydney Trains' Enterprise Risk Management - Risk Ranking, not the scale provided in AS 5577 Appendix B1. Decisions concerning the implementation/rejection of controls follow the guidance of the ONRSR "Guideline Major Projects".

5.7.7 Risk treatment

In all cases it remains necessary to demonstrate the risk is reduced SFAIRP by the application of appropriate controls that pass the test of "reasonably practicable".

Risk treatment is described in the Enterprise Risk Management System[16], refer SMS-06-PR-1382: ALARP Determination and Demonstration and further guidance is provided in the ONRSR "Guideline Major Projects".

5.7.8 Exceptions, non-compliance and variations

Where an applicable relevant standard or procedure is not used, or compliance with specific requirements of an applicable standard will not be satisfied, the responsible organisation (Sydney Trains, TfNSW, TAO or contractor) shall document:

a. The reason for the non-use or non-compliance with the requirement.

b. The alternative provisions for the design, construction, commissioning, installation, operation, maintenance and decommissioning of network assets that will ensure a level of safety in relation to those activities that is at least equal to or greater than the level of safety that would ensure from compliance with that requirement.

Where electrical work on or near electrical equipment differs from that defined in the ENSR a waiver may be sought from Sydney Trains; refer to *RL D 79800 Electrical Network Safety Rules* and *SP D 79056 Special exception from working to the ENSR*.

Where a design, electrical installation, selection of equipment, equipment condition or maintenance procedure differs from the TfNSW Standards this must be resolved as either through obtaining a concession from TfNSW AMB, or accepted as a defect (and rectified).

5.7.9 Specific hazards nominated by AS 5577

AS 5577 Ref.	Hazard	Response
1.1(a)	Permanent embedded generation facilities	Sydney Trains has photovoltaic generation at nominated locations with anti-islanding provisions. Hazards are recorded in the Electrical Risk Register.

[16]http://intranet.sydneytrains.nsw.gov.au/__data/assets/pdf_file/0007/57094/Enterprise-Risk-Management-System-Requirement.pdf

AS 5577 Ref.	Hazard	Response
1.1(b)	Temporary embedded generation facilities	Recently constructed substations are fitted with ports for connection of temporary generators. Older substations do not have this capacity. Hazards associated with emergency generators are recorded in the Electrical Risk Register.
1.1(c)	Emergency generators	Emergency generators are installed at key asset locations, including RMC and ICON, Prince Alfred substations and to back up key signalling supplies. One substation located in Royal National Park has an emergency generator. Hazards associated with emergency generators are recorded in the Electrical Risk Register.
1.2(a)(i)	Safety of the public	Refer to Section 12 Public Safety Awareness.
1.2(a)(ii)	Safety of persons near or working on the network	Refer to Section 12 Public Safety Awareness.
1.2(a)(iii)	Protection of property and electricity network assets	Refer to Section 12 Public Safety Awareness.
1.2(a)(iv)	Safety aspects arising from the protection of the environment, including protection from ignition of fires by the electricity distribution network	Refer to Sydney Trains Safety Risk Assessment Report - Electricity distribution network bushfire risk.
1.2(a)(iv)	Safety aspects arising from the loss of electricity supply	Refer to Electrical Risk Register.
1.2(e)	Hazards associated with the design, construction, commissioning, operation maintenance and decommissioning of the electricity network are identified, assessed and managed	Refer to Section 5 Safety management and Section 8.2 Requirements applicable to all TAO and contractors.
4.3.3(a)	Operating connected to emergency power sources	Emergency generators are installed at key asset locations, including RMC and ICON, Prince Alfred substations and to back up key signalling supplies. One substation located in Royal National Park has an emergency generator. Hazards associated with emergency generators are recorded in the Electrical Risk Register.

AS 5577 Ref.	Hazard	Response
4.3.3(b)	Operating without normal supply assets such as powerlines or transformers	The design of the electricity distribution network protects against this risk by redundancy, i.e. 2 or more duplicated (independent) supplies, with quality-of-service agreements from the external suppliers. Refer to: • Infrastructure Control Centre (ICON) Operator Procedures • ICON Trouble Instructions (3 books) • ICON Trouble Instructions "Book 8".
4.3.3(c)	Operating at other than normal voltage levels	Sydney Trains operates at normal voltage levels in accordance with AS60038. The robust nature of the network implies that the network is not subject to operation at other than normal voltage levels. In the event of the supply being insufficient to sustain power to rolling stock, the traction substations are designed to shed loads automatically by dropping the supply to the largest loads (rolling stock) while maintaining supply to equipment (signalling, fire-life safety) required for the safe operation of trains as long as possible. In this event the safe detrainment of passengers becomes the first priority and is handled according to the protocols of Sydney Trains' operations division. Refer to: • Infrastructure Control Centre (ICON) Operator Procedures • ICON Trouble Instructions (3 books) • ICON Trouble Instructions "Book 8".
4.3.3(d)	Operating under communication outages	Sydney Trains operates private fixed networks for voice and data. Mobile phones over alternative carriers, landlines and internet (voice, messaging and email) are used as alternatives. In the event of a lengthy outage of all electrical power and communications, electrical staff can drive to substations to perform switching manually. ICON has a documented procedure for handling communication outages; refer Infrastructure Control Centre (ICON) Operator Procedures. There is a local instruction for each substation for operation in the event remote control from ICON (via SCADA) is not available.

AS 5577 Ref.	Hazard	Response
4.3.3(e)	Operating under changed conditions to avoid further damage to the network	Sydney Trains operates at normal voltage levels in accordance with AS60038. The robust nature of the network implies that the network is not subject to operation at other than normal voltage levels. In the event of the supply being insufficient to sustain power to rolling stock, the traction substations are designed to shed loads automatically by dropping the supply to the largest loads (rolling stock) while maintaining supply to equipment (signalling, fire-life safety) required for the safe operation of trains as long as possible. In this event the safe detrainment of passengers becomes the first priority and is handled according to the protocols of Sydney Trains' operations division. Refer to: • Infrastructure Control Centre (ICON) Operator Procedures • ICON Trouble Instructions (3 books) • ICON Trouble Instructions "Book 8".
A3.1(a)	Safety related aspects of the loss of supply	In the event of outages the network is designed to shed loads automatically by dropping the supply to the largest loads (rolling stock) while maintaining supply to equipment (signalling, fire-life safety) required for the safe operation of trains as long as possible. In this event the safe detrainment of passengers becomes the first priority and is handled according to the protocols of Sydney Trains' operations division.
A3.1(b)	Electrical work on or near electricity network assets	Refer to *RL D 79800 Electricity Network Safety Rules*.
A3.1(c)	Other activities that may involve electrical hazards, including work being carried out in the vicinity of electricity network hazards	Refer to Section 12 Public Safety Awareness.
A3.1(d)	Single and multiple failure modes, including knock-on effects	Design aspects are included in the protection concepts by TAOs. Operational aspects – refer to: • Infrastructure Control Centre (ICON) Operator Procedures • ICON Trouble Instructions (3 books) • ICON Trouble Instructions "Book 8".

AS 5577 Ref.	Hazard	Response
A3.1(e)	The design of network assets and the condition and operating methodologies for electricity network assets	Refer to Section 5 Safety management and Section 8.2 Requirements applicable to all TAO and contractors.
A3.1(f)	External hazards and natural disasters	Design aspects are included in the protection concepts by TAOs. Operational aspects – refer to: • Infrastructure Control Centre (ICON) Operator Procedures • ICON Trouble Instructions (3 books) • ICON Trouble Instructions "Book 8".
A3.1(g)	Intentional and unintentional human activities	Refer to Section 5 Safety management and Section 8.2 Requirements applicable to all TAO and contractors. Operational aspects – refer to: • Infrastructure Control Centre (ICON) Operator Procedures • ICON Trouble Instructions (3 books) • ICON Trouble Instructions "Book 8".

The FSA includes preventive and mitigating controls. As appropriate to each risk these may include engineered controls and administrative (operational) controls. Implicit within each control is the need to ensure any response is performed in a safe manner.

Risks to the ability of the EDU to perform its tasks are not included in FSA; these are dealt with separately in Sydney Trains' Strategic and Tactical risk registers.

Sydney Trains' SMS Element 15 Emergency Preparedness and Security contains plans, forms, lists, and guides and documents pertaining to emergency and security awareness and preparation.

Sydney Trains has business continuity plans, substation Local Instructions[17] localised for specific sites, and "trouble instructions"[18] as well as incident management plans in place to cover eventualities that could involve the electrical network such as:

a. Power supply faults (loss of supply)
b. Infrastructure failures (civil or signalling)
c. Domestic animals and stock in the rail corridor
d. Fatality
e. Fire
f. Open gates or holes in fence

[17] http://intranet.sydneytrains.nsw.gov.au/branches/engineering-and-maintenance/engineering-system-integrity/engineering-information/electrical/local-instructions/substation-local-instructions

[18] http://intranet.sydneytrains.nsw.gov.au/directorates/maintenance/network-maintenance/divisional-documents

g. Safeworking incidents
h. Extreme weather
i. Seasonal response
j. Track geometry defects
k. Train - Trips – Obstructions
l. Trespassing.

The responses to these are addressed in the ICON Trouble Instructions.

Events leading to major disruptions to passenger rail services, regardless of cause are identified. The mitigating controls for these events generally include a combination of the use of alternate means of public transportation and re-routing trains, until normal services can be restored.

6 Incident management

6.1 Safety incident and action management

Incidents are managed in accordance with the Sydney Trains' incident management framework[19] and safety management system. The safety management system provides the following guides:

a. *SMS-17-SP-3102 Incident Notification, Reporting and Investigation*

b. *SMS-17-OP-3101 Investigate Report On and Analyse Safety Incidents*.

The Sydney Trains Incident Management Framework[20] describes the response to a major incident.

The investigation and analysis following an incident may include recommendations for change. These are reviewed by SER and may lead to safety action items requiring corrective action; the process is documented in the SMS; see for example:

a. *SMS-18-OP-3115 Manage Corporate Safety Recommendations/Findings Utilising SJAMS*

b. *SMS-18-OP-3116 Manage Local Safety Recommendations/Findings Utilising SJAMS*

c. *SMS-18-OP-3139 Conduct Safety Action Closure Review*.

6.2 Electrical safety incident reporting

Incidents should be reported to ICON Electrical in accordance with *SMS-17-SP-3077 Incident Reporting and Investigations*.

ICON Electrical or the SER On-Call Officer will notify EDU of significant or major incidents.

Notifying EDU of an incident:

a. Primary contact: Associate Director EDU

b. Alternate contact: Principal Electrical Safety Investigator.

6.3 Investigations

6.3.1 Major safety incident Investigation

The Business unit accountable for the process that involved the incident are responsible for undertaking the initial level 5 (or equivalent) investigation.

EDU on request will provide support to the business unit in completing the level 5 (or equivalent) investigation.

[19] http://intranet.sydneytrains.nsw.gov.au/branches/customer-operations/operations-control/rail-operations/service-delivery/procedures-manuals-instructions/incident-management-framework-3
[20] http://sms.sydneytrains.nsw.gov.au/trim/sms-sydney-trains?RecordNumber=F2013%2F16502-02

The Principal Electrical Safety Investigator or another EDU Principal Engineer will attend site as soon as practical for the purposes of an initial assessment and oversight of evidence collection.

A Flash Report is to be produced and provided to the Associate Director EDU within 24 hours.

Where Level 4 or 3 (or equivalent) investigations commence, the Principal Electrical Safety Investigator shall provide subject matter expertise for the investigation team. Where the PEI is not available the Associate Director EDU shall nominate a suitable person to be the SME.

Significant incidents may also result in an investigation by external authorities such as the Office of Transport Safety Investigations (OTSI) or SafeWork.

6.3.2 Reportable safety and asset incident investigation

The Business unit accountable for the process that involved the incident are responsible for undertaking the level 5 (or equivalent) investigation.

A Flash report is to be produced and provided to the Associate Director EDU within 48 hours.

EDU on request will provide support to the business unit in completing the level 5 (or equivalent) investigation.

The relevant discipline Investigator shall attend site as soon as practical for the purposes of an initial assessment and oversight of evidence collection.

Where investigations are required the Principal Electrical Safety Investigator will nominate a suitable subject matter expert for the investigation team.

7 Audits and reporting

7.1 Who we report to

EDU notifies the Electrical Regulator of Reportable Safety Incidents, Major Reportable Safety Incidents, Reportable Asset Incidents and Major Reportable Asset Incidents. Prior to verbally advising or reporting in writing to the regulators consult with Sydney Trains regulatory compliance:

- Primary Contact: Manager Regulatory Liaison,
- Secondary Contact: Manager Investigation & Action Management.

7.1.1 IPART

- Primary Contact: Director, Independent Pricing and Regulatory Tribunal
- Secondary Contact: Principal Engineer, Energy Networks Regulation
- Email: energy@ipart.nsw.gov.au

7.2 Regulatory performance reports

Each year Sydney Trains publishes its ENSMS performance in accordance with the IPART "Electricity Network Reporting Manual" on the TfNSW website at: https://www.transport.nsw.gov.au/news-and-events/reports-and-publications/sydney-trains-electricity-network-safety-management-system.

The content and submission procedures are described in the IPART reporting manual.

7.3 Internal reporting

Sydney Trains' Report, Analytics & Insights Asset Management publishes an "Electrical Asset Assurance Report" each quarter. This records statistics such as electrical asset condition rating, electricity demand and demand growth, network capacity, maintenance performance, defects, incidents and failures and summaries of significant incidents.

Sydney Trains also produces an annual "System Integrity" report encompassing the whole of the railway, including the electricity distribution network; for internal distribution only.

7.4 Internal audits

From time to time Sydney Trains conducts internal audits of the safety management system, which may include the electrical network safety management system. Internal audits are initiated and carried out by Sydney Trains' Report, Analytics & Insights Asset Management unit or the TfNSW Internal Audit division. These may also initiate and conduct quality management audits.

Internal Audit provides an independent and objective review and advisory service to:

a. Provide assurance to the Chief Executive, and the Audit and Risk Committee, that Sydney Trains' financial and operational controls, designed to manage the organisation's risks and achieve the entity's objectives, are operating in an efficient, effective and ethical manner.

b. Assist management in improving Sydney Trains business performance.

Audit objectives include:

a. Evaluating the effectiveness of risk management processes and contributing to their improvement.

b. Providing assurance that risk exposures relating to the organisation's governance, operations and information systems are correctly evaluated.

c. Evaluating the design, implementation and effectiveness of the organisation's ethics-related objectives, programs and activities.

d. Assessing whether the information technology governance of the organisation sustains and supports the organisation's strategies and objectives.

Internal audits can be conducted to identify opportunities for improvement:

a. Assisting in improving the efficiency, effectiveness and economy of Sydney Trains business systems and processes.

b. Assessing proposed changes to existing controls during changes to business processes.

The approach is described on the intranet, and includes:

a. *AMS-09-FRA-005 Organisational Process Review System Requirement*

b. *AMS-09-PRO-002 Organisational Process Review Organisational Procedure*

c. *AMS-09-TEM-002 Audit Plan and Notification Template*

d. *AMS-09-FOR-002 Integrated Audit Checklist*

e. *AMS-09-TEM-001 Audit Report Template*.

7.5 External audits

External audits may be initiated by the regulator (IPART) or Sydney Trains. These are to be conducted as described in the IPART Electricity Networks Audit Guideline. This provides guidance with respect to the selection of the auditor, the conduct of the audit and the criteria used.

When an external audit is required in response to an IPART:

a. IPART must be given prior notice of the intention to conduct the audit, nominating the proposed auditor.

b. The auditor must be selected as per Section 12 of the Electricity Supply (Safety and Network Management) Regulation 2014 and the IPART Electricity Networks Audit Guideline.

c. A Deed must be prepared and signed between IPART, Sydney Trains, the Auditor describing the scope of the audit, the proposed auditor and a detailed audit proposal. The Deed and requirements are contained in the IPART Electricity Networks Audit Guideline.

d. Sydney Trains may also choose to engage external auditors. In this event IPART must be notified of the intention to conduct an audit, the proposed scope and proposed auditor. IPART may indicate that it has no interest in the audit in which case the Deed described above is not required.

7.6 Audit findings and corrective action

Issue identified in audits are managed by the Investigation and Action Management business unit of Sydney Trains Safety & Accreditation Division. Issues arising from audits are:

a. Reviewed to assess the relevant stakeholders.

b. Allocated to managers who may accept each issue for action, transfer it to another manager or reject it.

c. Appropriate action is negotiated and agreed with the stakeholders affected.

d. Tracked to closure within an agreed time frame.

7.7 Incident reporting

Sydney Trains provides incident reports to TfNSW for incidents concerning crossings of the rail electricity networks over navigable waterways in NSW.

The various regulatory and investigative agencies such as ATSB, OTSI, ONRSR, IPART, SafeWork, EPA etc. mandate notification of a range of safety, electrical, WHS, Environmental etc. incidents within defined time frames.

8 Organisation

8.1 Transport cluster

On July 1 2013, Sydney Trains, TfNSW, and RailCorp entered into the Sydney Trains Rail Services Contract. Generally, asset ownership rests within TAHE and the related strategy, policy and the high-level governance functions are undertaken within TfNSW. This arrangement is described further in the TfNSW Guide to TfNSW Framework for Assuring the Safety of Rail Assets and Infrastructure, refer to Figure 7:

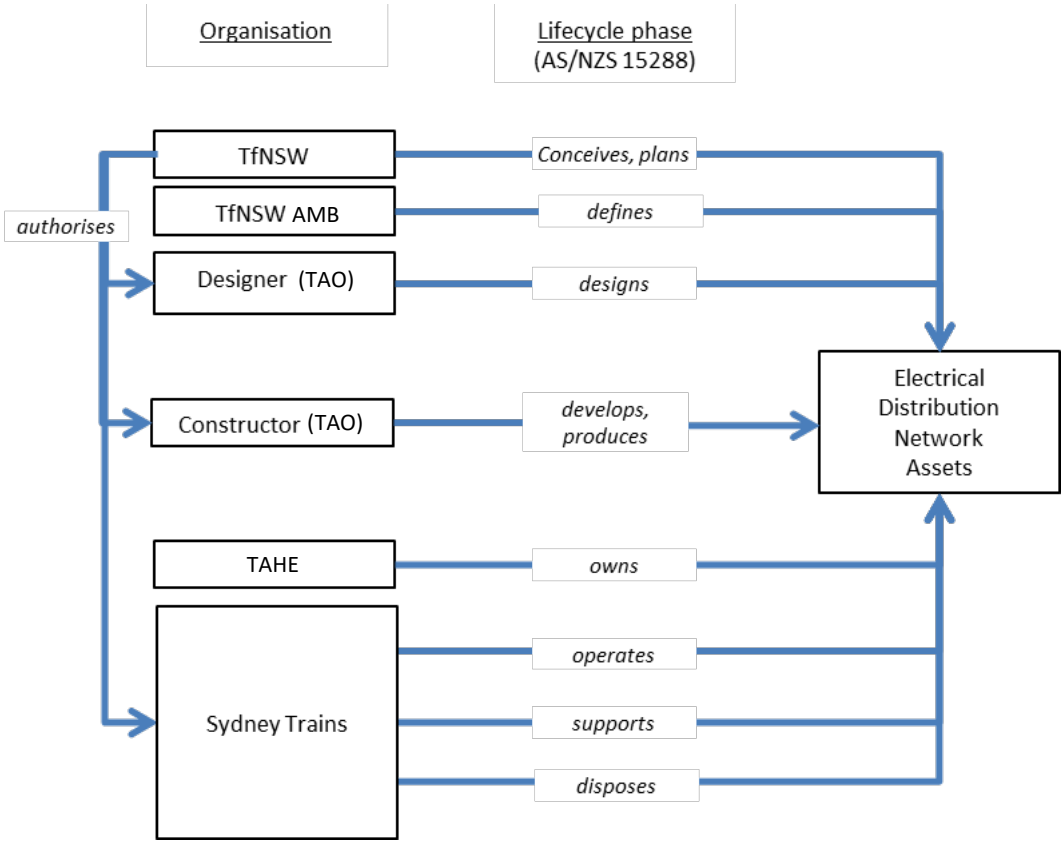


Figure 7: Organisations and roles in the context of the electricity distribution network

8.2 Requirements applicable to all TAO and contractors

The following are required of all TAO and contractors engaged for the planning, design, construction, commissioning, operation or maintenance or disposal of electricity distribution network assets:

Lifecycle phase	Requirement
All phases	TAO shall implement the requirements of AS 5577 tailored according to the lifecycle phases for which they are authorised. Each TAO is required to demonstrate its implementation of the requirements of AS 5577 including but not limited to showing: • Responsibilities and accountabilities are defined. • Procedures for establishing and maintaining competency are defined and implemented, including training and periodic assessment. • A risk register is maintained in which risks from all lifecycle phases have been identified and are assessed. • Conducts formal safety assessments as described in this plan. • Produces evidence that safety controls are implemented and are effective. • Produces evidence that risks are controlled SFAIRP.
All	Deliver to Sydney Trains the documentation necessary to enable Sydney Trains to operate and maintain the network safely. This includes but is not limited to (for example): • safety hazard logs and/or bow tie safety documentation • evidence of consultation with operators and maintainers • product specifications • test and commissioning data • component FMECA identifying failure modes and those which are hazardous • as-built drawings • technical maintenance plans • operating and maintenance instructions • Local Instructions.
All	Exceptions, non-conformances and variations shall be handled in accordance with Section 5.7 Formal Safety Assessments (FSA).
Planning, Design, Implementation, Commissioning	TAO shall comply with the requirements of AS 5577 Sections 4.4.4, 4.4.5, 4.4.6 and 4.5; attention is drawn to the minimum evidence required for compliance defined in the IPART Electricity Networks Audit Guideline.

Lifecycle phase	Requirement
Design, Implementation	The design of new or significantly modified electricity assets proposed at locations assessed as bushfire category 1 or 2 shall include a risk assessment showing the risk of bushfire is controlled SFAIRP. This analysis shall present: • The threats considered, including events that lead to fire such as blown-in branches or bark from significant distances, trees or branches that may fall on overhead wires, ignitions caused by lightning and grassfires from neighbouring properties, as well as asset failure modes that may contribute to a fire ignition. • An analysis of the safety benefit obtained by preventing or mitigating the risk. • The alternative controls identified that could prevent or mitigate the risk. • Quantified assessment of the cost of implementing the alternatives. The rationale for adopting a solution (RSNL Section 46) which either (a) eliminates risks to safety so far as is reasonably practicable; or (b) if it is not reasonably practicable to eliminate risks to safety, minimises those risks so far as is reasonably practicable. The meaning of "reasonably practicable" is that defined in the RSNL Section 47. This data shall be supplied to and agreed with the network operator prior to commencing construction.
Design, Implementation	Maintenance task analysis and maintenance planning including repair or replacement of electrical assets shall be based on a failure modes, effects and criticality analysis (FMECA) that includes consideration of: • Identifies the failure modes of the equipment, and of those, indicates those that are hazardous, i.e. may cause fire ignition or pose a safety risk to workers, adjacent properties, external parties, or the public. • The risks associated with bushfire at that location as represented by the bushfire category assigned to the asset or defect. • The past incidence and future risk of fire ignitions from all sources in the vicinity of the asset. • The time of year, expected weather conditions to be endured. • The age, prior maintenance history and failure rate of the asset. This data shall be produced by the TAO responsible for design and agreed with the network operator and maintainer prior to commissioning the assets.
Commissioning	The Network Operator will not accept assets into service without completion of an agreed commissioning process. TAOs may utilise Sydney Trains *GL D 79100 Electrical Commissioning Requirements and Deliverables*, or develop a plan agreed with Sydney Trains.
Implementation, Operation and Maintenance	All work on or near electrical equipment shall be performed in accordance with Sydney Trains Electrical Network Safety Rules, refer to Section 5.6.

Lifecycle phase	Requirement
Maintenance	Electricity network defects shall be assigned a bushfire risk category using the assessment defined by the network operator. This is a numeric value in the range 1 (highest risk) to 5 (lowest risk) based on the conditions at that location. This data shall be produced by the TAO responsible for maintenance and supplied to the network operator and maintainer prior to carrying out the maintenance. The TAO shall report the status of the defects found and the maintenance tasks (planned, completed, overdue) categorised by bushfire risk (1-5). This information shall be supplied each year by 30 August for inclusion in the network operators report to the regulator, and with updates when requested by the network operator. This is expected to occur 2-3 times during summer.
Maintenance	Maintenance or replacement of electricity assets in bushfire category 1 or 2 locations shall not be postponed beyond the original due date.
Risk Management	TAOs shall provide EDU with copies of risk assessments conducted for the scope of their work in the planning, design, implementation, commissioning and maintenance of electricity distribution network assets.
Incident management	Incidents shall be reported in accordance with: • the Sydney Trains SMS (non-electrical incidents) • Section 6 of this document (electrical incidents). TfNSW and TAOs shall conduct their own initial investigation into incidents and provide Sydney Trains with copy of that investigation and any corrective action proposed. Sydney Trains reserves the right to investigate any/all electrical incidents and may issue recommendations arising.
Audit	Upon request from Sydney Trains, TfNSW and TAOs shall conduct regulatory compliance audits using an auditor agreed by Sydney Trains to assess the extent of compliance with the Electricity Supply (Safety and Network Management) Regulation 2014 (NSW), AS 5577 and the Sydney Trains ENSMS. These audits shall be conducted in accordance with the IPART Electricity Networks Audit Guideline. The scope of the audits will be tailored according to the organisations responsibilities as an TAO.

8.3 Sydney Trains as an TAO

Sydney Trains, in its role as the maintainer of the TAHE infrastructure, is an TAO accredited by TfNSW to carry out engineering works on the infrastructure.

An TAO is accountable for ensuring it has the systems, tools, capability and capacity to deliver engineering services for any contracted scope of work. The capability of Sydney Trains to deliver relevant engineering services includes:

a. Engineering management
b. Competency management
c. Configuration management
d. Quality management
e. Systems engineering
f. Safety management.

The TfNSW requirements for safety management are described in the TfNSW Standard *T MU MD 20001 ST System Safety Standard for New or Altered Assets*, and *TS 10504: 2013 TAO Guide to Engineering Management sections 9.1-9.2*.

Sydney Trains' *AMD-AMI-FRA-001 Configuration Management Plan* details the safety assurance work products to be produced at various sections of the asset lifecycle; refer to Section 7.1 and Appendix A of that plan.

Sydney Trains:

a. Provides the AMB with access to assets so that the AMB may carry out its review, surveillance and audit functions.
b. Provides the AMB with information relating to the Sydney Trains services reasonably requested by the AMB to enable AMB to perform its functions.

Within their scope of authorisation Sydney Trains is responsible for:

a. Providing a safety and assurance argument for their engineering work.
b. Coordinating the delivery of assets and services with the end user.
c. Managing related stakeholder activities.
d. Assuring their engineering work for safety and integrity.

Sydney Trains uses its own systems and tools as evidence for authorisation, outlining how it undertakes, assure and manage engineering activities. The Sydney Trains' *MN A 00001*[21] *Design Management Manual* and *MN A 00413*[22] *Technical Reviews Manual* provide further details.

[21] http://intranet.sydneytrains.nsw.gov.au/?a=94253
[22] http://intranet.sydneytrains.nsw.gov.au/?a=93996

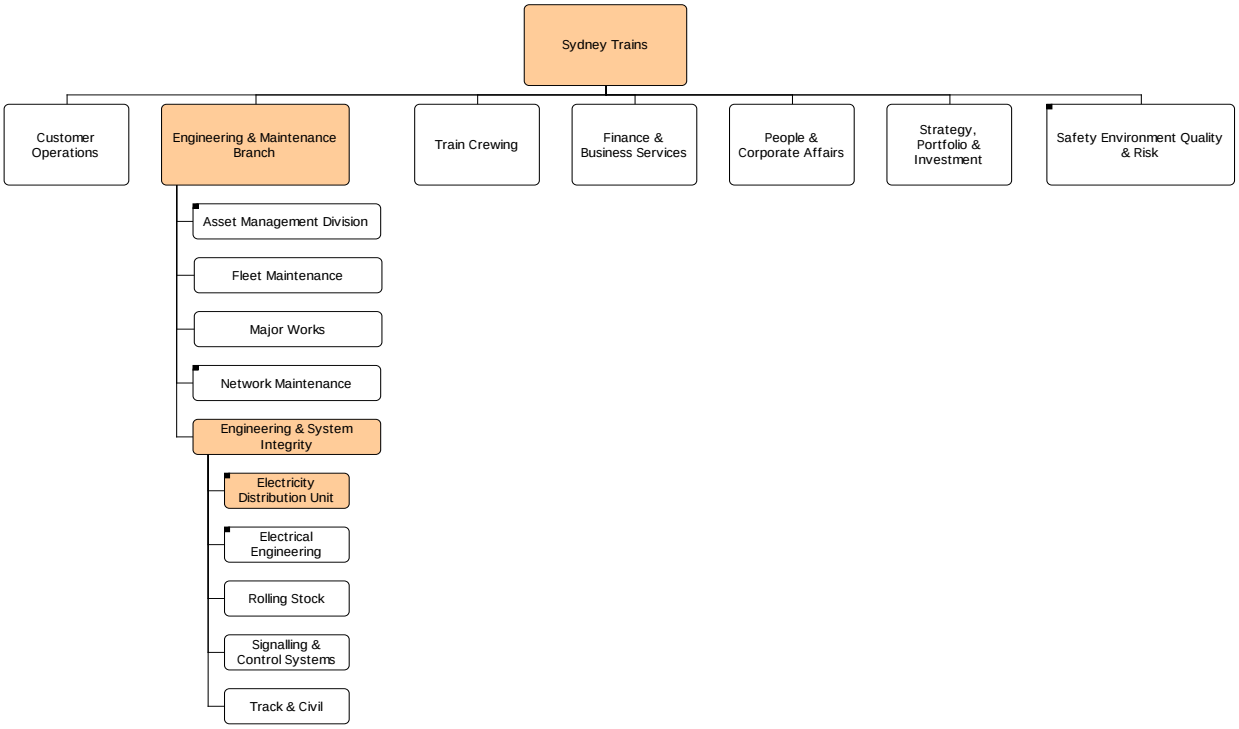


Figure 8: Sydney Trains' organisation

8.4 Sydney Trains organisation

In 2020, Sydney Trains was restructured as seven branches, reporting to the Chief Executive:

- Customer Operations, comprising the public-facing functions of the railway operation.
- Engineering & Maintenance, inclusive of the design, construction, commissioning, operation and maintenance of the electricity distribution network. Within the Engineering and System Integrity division is the EDU. The functions of the EDU are specific to the development, implementation and administration of this plan.
- Train Crewing.
- Finance & Business Services.
- People & Corporate Affairs, comprising workplace relations, communications and human resources.
- Strategy, Portfolio & Investment, comprising network growth, strategy, portfolio delivery, business and process improvement and performance reporting.
- Safety, Environment Quality & Risk (SER): development, implementation and maintenance of the corporate safety management system and enterprise risk management.
- The executive levels of Sydney Trains are depicted in Figure 8, showing the hierarchy down to the EDU. The organisation of EDU is shown in Figure 9.

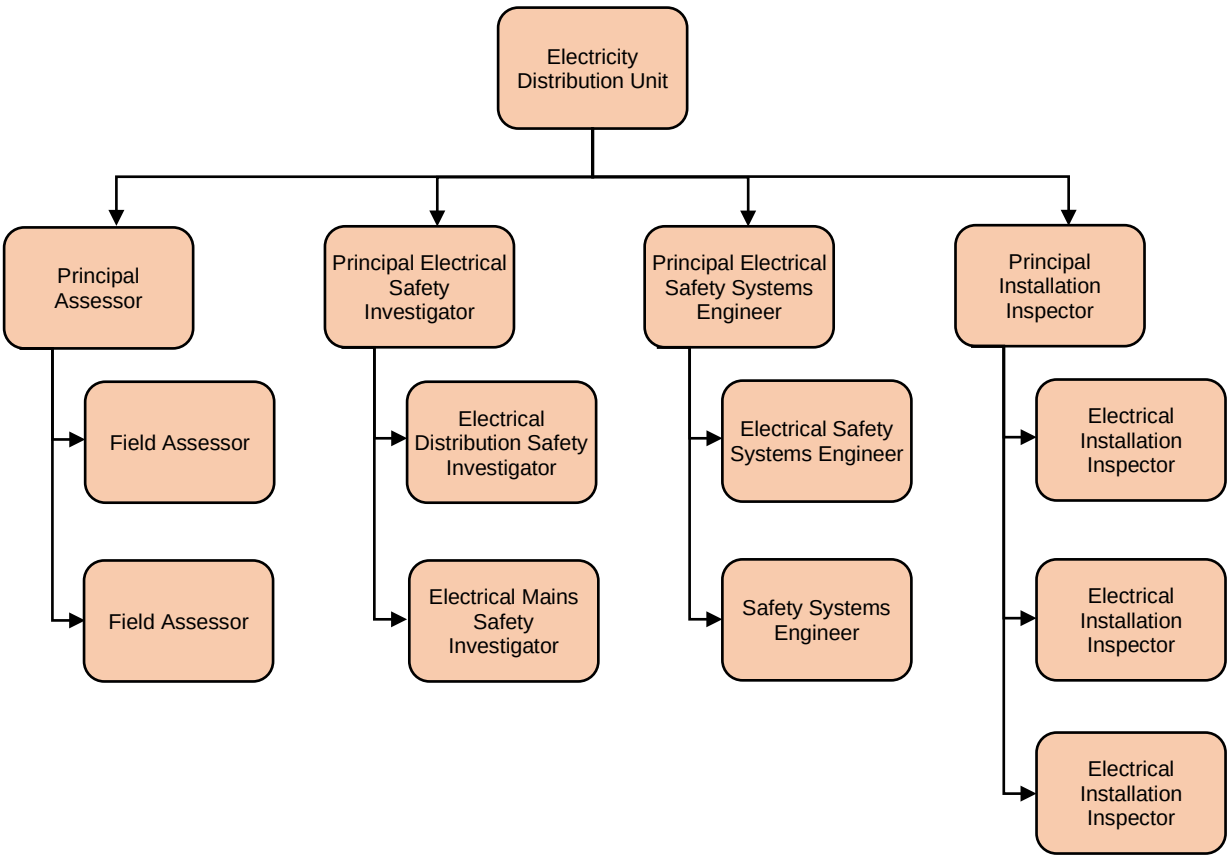


Figure 9: Electricity Distribution Unit organisation

8.5 Sydney Trains responsibilities, accountabilities and authorisations

The obligations and authorisation of personnel, with respect to the design, construction, commissioning, operation, maintenance and decommissioning of the electricity distribution network are detailed within *SMS-02-RG-3058 RAA Matrix*.

Sydney Trains *SMS-02-RG-3058 Safety Responsibilities, Authorities and Accountabilities (RAA) Matrix* lists the responsibilities assigned to specific management roles.

8.6 Key persons

The following persons are assigned responsibility for the implementation of this plan. All are within the Engineering and Maintenance Branch:

Area of Responsibility	Directorate/ Business Unit	Position
Management and control of the ENSMS as per section 5	EMB/EDU	Principal Engineer Electrical Safety Systems
Personal Certifications (Electrical)	EMB/EDU	Principal Assessor
Incident Investigations	EMB/EDU	Principal Investigator
Independent validation of assurance	EMB/System Integrity	Systems Assurance Manager
Audits (external)	Engineering & System Integrity	Deputy Executive Director Engineering & System Integrity
Audits (internal)	Finance & Corporate Services	Associate Director Asset Services & Governance
Design Risk Management	EMB/Electrical Engineering	Professional Head Electrical Engineering
External Party Works	EMB/Asset Management	Deputy Executive Director Asset Management
Maintenance planning	EMB/Asset Management	Asset Strategy Manager (Electrical) Asset Managers (Electrical)
Maintenance execution	EMB/Network Maintenance	Electrical Engineering Manager Maintenance Operations Managers (MOM's) at each Network Base

8.7 Resourcing

The numbers of electrical workers are managed by each network base within the Maintenance Directorate. Each base has a maintenance resource manager responsible for assigning resources to activities, and monitoring resource utilisation. When necessary the maintenance resource manager may seek additional resources from other network bases or externally (contractors, plant and machinery) as appropriate to the work.

Indicators are used to identify under-resourcing such as:

a. The maintenance tasks assigned/complete/outstanding.

b. The number of outstanding defects or activities older than a defined threshold.

c. Activities cancelled for lack of resources.

The Associate Director EDU manages the professional staff within EDU based on the allocation of responsibilities, and resource utilisation. Resource utilisation is estimated by recording the tasks assigned/complete/outstanding.

The Maintenance Operations Managers (MOMs) at the network bases are responsible for allocating resources to network maintenance activities on a daily basis, including internal resources (staff and equipment) as well as engaging external contractors and hiring equipment as deemed necessary. The Maintenance Operations Managers and/or Maintenance Engineer may recommend changes to internal resource numbers as appropriate based on an ongoing need.

8.8 Training and competency

All engineering activities performed on behalf of Sydney Trains must be carried out by staff holding an appropriate level of engineering competency for the activities undertaken. This requirement addresses competency obligations of the RSNL and its associated regulations, and as a TAO as required by TfNSW through the AMB.

Work in relation to the asset lifecycle of TfNSW assets, including engineering and design work, is required to be under the authorisation of a TAO. This requirement applies to engineering and design at all phases of the design development process, and applies to Sydney Trains projects whether delivered by in house resources or by contractors (including construction contractors).

Where projects are delivered by in-house resources, or by contractors who do not hold TAO status, staff competency is to be managed in accordance with:

a. Sydney Trains' Competency Management Policy

b. Sydney Trains' Competency Framework

c. Sydney Trains' Competency Management System supporting the ‘Competency Framework’.

The processes contained in the Competency Management System cover both the requirements for initial competency assessment and processes to ensure the ongoing maintenance and currency of competencies.

Where projects, or engineering services, are to be delivered by contractors required to be a TAO under a Sydney Trains contract, such contractors must demonstrate compliance with their internal competency management system as assessed and approved by the AMB. Contractors must maintain a competence assessment system to provide evidence of appropriate competency management of their engineering or design personnel (i.e. designers, checkers and verifiers). This includes the need for the contractor to self-assess their personnel, and to have a robust and auditable process that identifies the qualifications, skills and experience of the identified personnel.

Training and competency for Sydney Trains engineers and managers are managed and assessed in accordance with the Engineering System Integrity guidelines. Responsibilities are detailed in Sydney Trains' SMS-02-TP-4057.[23]

The competencies and qualifications required for electrical workers are defined in *PR D 78701 Personal Certifications – Electrical*.

SMS-11-OP-3014 Training and Competence describes Sydney Trains' systems of safety induction, identification of training needs, provision of training and assessment, and competence management of all workers and visitors applicable to Sydney Trains operations, including the electricity distribution network. This system procedure also explains the relationships between TfNSW Learning & Development (L&D), and General and Line Managers at Sydney Trains.

8.9 Safety awareness training

Safety training for electrical workers includes, but is not limited to:

a. initial training (e.g. initial safety compliance training programs and safety induction)

b. continuation training (e.g. Safety Management System training and safety refresher training)

c. certified specialist work safety training, including electrical workers, rail safety workers, First Aid, Warden, Safety Committee, and Fork Lift

d. training of safety committee representatives and management relevant to their responsibilities

e. rail safety worker training including RIW and general construction induction training

f. on-the-job training such as team training talks and eLearning

g. risk-based competency assessment.

[23] http://intranet.sydneytrains.nsw.gov.au/__data/assets/pdf_file/0012/109020/safety-responsibilities-sbo.pdf

The process for the management of safety training and competence at Sydney Trains is summarised in the table below:

Process	Responsibility	Tools & Forms
Identify competencies	Deputy Executive Directors TfNSW L&D Line Managers	Staff Competency Profile (SCP) Safety curriculum
Develop training plans	Line Managers	SCP Safety Training Plans Learning Management System (LMS)
Induct workers	Line Managers	Safety Induction Guide Safety Induction Register Safety Induction Form
Provide training	Trainers Line Managers TfNSW L&D	Quality Training Management System LMS
Assess competency and ongoing competence	Assessors Line Managers	Certificates, Licenses, Qualifications, Competency Assessments
Maintain and retain training and assessment records	Line Managers Trainers/Assessors TfNSW L&D	LMS Records management system (HPE RM8 – Hewlett Packard Enterprise Records Manager (release version 8))
Review and evaluate training programs	TfNSW L&D Deputy Executive Directors Executive Director Safety	SCP LMS

8.10 Consultation and communication

System Procedure *SMS-10-OP-3092 Consultation and Issue Resolution* aims to promote effective communication and consultation in regard to safe operations, and describes the processes and types of safety communications and consultation used across the organisation.

This system procedure outlines the following processes:

a. communicating safety information
b. health and safety consultation with workers or their representatives
c. exchanging safety information with external stakeholders
d. nomination process for worker representatives
e. resolution of safety issues
f. maintenance of communication and consultation records.

The process for the management of consultation and communication at Sydney Trains is summarised in the following table.

Process	Responsibility	Tools & Forms
Develop and maintain communication strategy	Systems Support and Assurance Specialist	Safety Communication Schedule
Communicate safety information	Deputy Executive Directors Business Unit Managers Line Managers	Safety Inductions Guides: Providing Safety Briefings, Safety Noticeboards Requirements, Work Group Safety Communication Arrangements form
Exchange safety information with external stakeholders	Line Managers	Safety Induction
Manage consultation arrangements	Deputy Executive Directors Business Unit Managers Line Managers	Work Group Determination and Consultation Arrangements form Guide to Conducting Health and Safety Elections
Consult with workers	Business Unit Managers Line Managers	Guide to Managing WHS Safety Issues raised in consultation
Resolve safety issues Maintain communication and consultation records	Line Managers	Worksite Briefing Safety Committee agenda, minutes and other tools

8.11 Safety in the field

Worksite safety in the field comprises two aspects.

All electrical work must be carried out by persons with the appropriate personal certifications defined in PR D 78701 [53].

Where work is carried out in the rail corridor in a hazardous location where a Protection Officer is required, the site safety must be managed by the Protection Officer in accordance with the Rail Corridor Safety Program guidance[24].

At worksites in other locations e.g. outside the rail corridor, the procedures defined at http://intranet.sydneytrains.nsw.gov.au/__data/assets/pdf_file/0013/121243/PCM-Work-Health-Safety.pdf apply.

Prior to commencing on-site activities a Pre-Work Briefing[25] shall be conducted as per *SMS-06-OP-3114 Pre-work Briefings*[26]. Briefings shall include hazards identified for the specific task(s) and the safety controls, including those identified in FSA.

[24] For guidance refer to https://railsafe.org.au/learn/instructional-video/rail-corridor-safety
[25] Refer to http://sms.sydneytrains.nsw.gov.au/trim/sms-sydney-trains?RecordNumber=D2013%2F76345 (Sydney Trains) or https://railsafe.org.au/powb/home (contractors)
[26] http://sms.sydneytrains.nsw.gov.au/trim/sms-sydney-trains?RecordNumber=D2013%2F76346

8.12 Emergency preparedness and response

The operational and system procedures within SMS Element 15 describe the processes for developing and implementing both strategic and local incident plans to ensure Sydney Trains responds effectively and safely to critical and other emergency situations.

Operational Procedure *SMS-15-OP-3132 Develop and Implement Site Incident Management Plan* outlines the process to develop and implement strategic emergency preparedness plans which cascade down to the local site level. This includes:

a. establish strategic and local incident management plans

b. implement and communicate plans

c. training and practice incident response

d. evaluate and review incident management plans.

The process for the management of emergency preparedness and response at Sydney Trains is summarised in the following table:

Process	Responsibility	Tools & Forms
Develop emergency strategic plans	• Head of Operations Control • Incident, Readiness Response Managers	Incident Management Framework (IMF)
Establish incident management plans	• Head of Operations Control • Line Managers	IMF Site Hazard Identification Template Site Incident Management Plan (SIMP) Workplace First Aid Assessment
Implement and communicate incident management plans and procedures	• Head of Operations Control • Incident, Readiness Response Managers • Line Managers	Induction Guide Local Safety Induction Form
Provide emergency preparedness training	• Head of Operations Control • Line Managers	Training Materials
Test and practice incident management plans and procedures	• Incident, Readiness Response Managers • Line Managers	Schedule of Emergency Exercises SIMP IMF Evacuation Observation Form
Evaluate effectiveness of plans	• Incident, Readiness Response Managers • Line Managers	External Emergency Services exercises SIMP
Review of plans		Document Review form Request to Publish form

9 Safety performance measurement and evaluation

9.1 Key performance indicators

As required by Regulation 10 (1) of the Electricity Supply (Safety and Network Management) Regulation 2014, Sydney Trains measures performance against its safety management system at several levels. At the enterprise level Sydney Trains uses below indicators:

a. The impact on operations in the form of the total time delays to train running, incurred as a result of all incidents (including electrical).

b. Safety incidents (including near misses) as required to be reported by regulators including ONSRR, Safe Work Australia and IPART.

In addition to the above, other indicators are monitored and reported in order to provide a broad appreciation of safety-related performance. Details and commentary on the full range of safety performance indicators appears in Sydney Trains' Annual Safety Report and the Engineering & Maintenance Branch Strategic Business Plan.

Safety performance is reported to IPART in the Annual ENSMS Performance Report and provides a meaningful reflection of the electrical network risk. Sydney Trains' enterprise safety reporting remains aligned with the national rail occurrence standard Occurrence Notification – Standard 1 (ON-S1) of the Office of the National Rail Safety Regulator (ONRSR).

9.2 Monitoring and measurement

EDU utilises a "Visual Management Centre" to monitor incident rates involving electricity. These provide a rapid summary of performance (including safety) to senior management as well as providing a rapid indication of changes in performance. The statistics are categorised and analysed to quickly identify changing trends.

The procedures within SMS Element 16 Inspection, Testing, Calibration and Monitoring describe Sydney Trains' systems for the inspection of workplaces and operational areas and inspection, testing and calibration programs for plant, equipment and engineering controls.

9.3 Reporting and incident investigation

System procedure *SMS-17-SP-3077 Incident Notification, Reporting and Investigations* detail Sydney Trains' processes for reporting rail and non-rail incidents and investigations. The operational procedure *SMS-17-OP-3101 Investigate Report On and Analyse Safety Incidents* outlines the process required to investigate and report on safety incidents both internally and to external authorities/regulators when required.

9.4 Safety (corrective and preventative) action management

SMS-18-OP-3078 Safety Action Management Utilising SHEM advises managers of the process to manage corrective and preventative actions arising from the identification of non-conformances and recommendations.

9.5 Records

SMS-09-SP-3021 Records Management describes the systems for the creation, management, storage, retention and disposal of safety records. It applies to all workers responsible for managing safety records, and is relevant to the processes from identification of records to be retained, through to record retrieval and disposal.

Sydney Trains' Safety Records Register contains all records produced by the Safety Management System. The register is maintained by the Manager Enterprise Systems and reviewed by Information & Records Management Services in Transport Shared Services (TSS), in accordance with *SMS-09-SP-3021 Records Management* and *SMS-09-OP-3023 Manage and Retain Safety Records*. It details the types of safety records to be retained, confidentiality (where required), retention/custodial periods, and methods of disposal.

Documents, legislation, standards, codes, guidelines and procedures required for the safe design and construction are managed by TfNSW.

Documents for commissioning of assets are managed by EDU.

Documents for operation, maintenance and decommissioning are held by Sydney Trains Network Maintenance Division.

Asset records including, but not limited to asset data, technical maintenance plans, bushfire risk prioritisation, asset failure modes and maintenance data are held in the Enterprise Asset Management system (EAM) under Sydney Trains Asset Management Division.

Designs and drawings are held in a “virtual plan room”, with electrical Operating Diagrams published internally on the intranet.

Maps and spatial data are held in a geographic information system (GIS).

Records relating to the ENSMS and revisions to it are held by Sydney Trains technical publications unit within E&SI.

Long term storage and retrieval of records are described in Accident/incident records for electrical are held in EAM. Incidents involving physical injury are recorded in SHEM.

10 Asset management

10.1 Asset management of the electricity distribution network

Each year Sydney Trains produces a whole-of-enterprise asset management plan which includes electrical assets. This presents the asset management model and processes pertaining to the electricity distribution network based on the TfNSW Asset Management lifecycle

The *MN A 00001 Design Management Manual* provides further guidance on the lifecycle activities, configuration gates and work products. This, and *MN A 00413 Technical Reviews Manual* provide the primary means by which Sydney Trains demonstrates its implementation of asset management.

Sydney Trains, through the application of its Total Asset Management Methodology:

a. Requires assets to be planned, acquired, operated, maintained, upgraded, and disposed of in a systematic manner that meets the agreed needs of nominated stakeholders at minimum lifecycle cost.

b. Applies risk management techniques across the asset's life cycle to ensure specified levels of service quality, safety, environmental risk, and economic outcomes are achieved in a timely manner.

c. Complies with the statutory and regulatory requirements including:

   - NSW Treasury's Total Asset Management (TAM) Manual
   - the RSNL
   - Office of the National Rail Safety Regulator (ONRSR)
   - the ESA
   - National Rail Safety Accreditation Package (NAP) requirements.

The asset management planning functions continually evolve following a Total Asset Management Methodology to optimise the delivery and performance of the rail system assets to deliver safe, effective, and efficient rail services.

10.2 System integrity

System integrity is the ability of the electricity distribution network to perform its intended functions without being degraded or impaired by changes or disruptions in its internal or external environments. This is the outcome of Sydney Trains' maintenance and asset management systems, processes and people.

Sydney Trains Reporting, Analytics and Insights division compiles quarterly Asset Assurance Reports that include:

a. irregularities and incidents

b. levels of maintenance defects re vegetation clearance

c. defect age (rectification time)

d. completion of routine maintenance activities

e. audit outputs

f. summaries of inspection findings

g. technical investigations.

Asset Assurance Reports are compiled in consultation with subject matter experts (SMEs) from ESI and other divisions within the directorate. Consultation meetings provide an opportunity for SMEs to comment on report findings and their impacts upon system integrity. The Asset Assurance Reports focus on reliability measures and system safety.

10.3 System capacity

The electricity distribution network is designed on the basis of providing traction and auxiliary power to electric trains, and power to operate the signalling systems, stations, workshops, and other facilities required to operate the railway.

If the total demand for power is at or exceeds system design capacity, the system becomes unreliable and failures become more frequent resulting in loss of power to trains, resulting in delays to the scheduled services. From a system perspective, the major issue is the capacity of the network to meet forecast peak demand which typically occurs in the Friday evening in hot weather.

This growth in demand stems from:

a. Changes to the 1500 Volt DC traction demand as a result of changes to the fleet (increased mass, number of trains).

b. Changes to timetabled passenger services (tonnes per hour through critical points).

c. Reliability and redundancy considerations, allowing sections of the high-voltage network to be isolated for maintenance without unduly affecting railway operations.

d. Ensuring multiple points of supply are available – with redundancy.

e. Extensions to the rail network that entail additional timetable services, stations, signalling, etc.

Sydney Trains has tools to model and forecast power demand based on these parameters.

Capacity delivery is primarily managed through TfNSW's Power Supply Upgrade (PSU) program which comprises new and upgraded substations, and some enhancements to the 1500 Volt DC overhead wiring system to address excessive wire temperatures. Parts of the high voltage AC electricity network also need to be augmented from time to time to ensure adequate capacity under contingency feeding conditions and provide connectivity to new substations.

10.4 Measures of electricity network performance

Asset failures in the electricity distribution network may ultimately lead to resulting in loss of supply to trains or safety related systems required for the safe operation of trains (i.e. signalling, Train Radio or fire-life-safety systems such as tunnel emergency lighting and ventilation, sump pumps etc.). In this context the metrics used include:

a. Delays (i.e. total time) to scheduled train services attributed to electrical assets.

b. Number of trips of high-voltage feeders, per year.

10.5 Network configuration management

As an TAO Sydney Trains has delegated authority to make decisions on the configuration of TfNSW railway assets as described in the TfNSW Guide to TfNSW Framework for Assuring the Safety of Rail Assets and Infrastructure. Sydney Trains' design configuration management responsibilities pertaining to the electricity network include:

a. Matters arising from the interface of the rail infrastructure and rolling stock for which Sydney Trains is responsible.

b. Matters arising from the interface of the rail infrastructure and rolling stock with the assets and operations of other entities.

c. Hardware and software used in its configuration management systems, particularly in the production, collection and storage of product configuration information, and in change control procedures.

The Sydney Trains Configuration Control Board (CCB) provides senior management control over asset configuration matters at Sydney Trains. It comprises managers from appropriate business units (or their delegates) to adequately represent all Sydney Trains business units with railway asset configuration responsibilities. The Deputy Executive Director Network Maintenance and Deputy Executive Director Engineering & System Integrity (from the EMB) represent the respective business units responsible for the electricity network infrastructure on the CCB. Subsidiary CCBs are established as directed and authorised by the Sydney Trains CCB to deliver effective configuration management of rail electricity network to provide management control over asset configuration matters within the appropriate electrical discipline and sub-disciplines.

CCB does not certify the technical integrity of proposed changes - consent is contingent on persons with design authority confirming there is no objection to the technical content of the proposed change.

10.6 Design of new or altered assets

Designs for new or altered assets must consider:

a. The statutory requirements listed at Section 3.

b. For altered existing assets predating 2012, the guidance at Section 12.4 concerning ISSC 20.

c. Codes of practice listed at Section 3.

d. Provide safe access to operate and maintain electrical equipment, with consideration of the constraints and controls for safe access described in Sydney Trains Electricity Network Safety Rules.

e. Electrical infrastructure standards published by TfNSW[27].

f. Design requirements contained in Electrical Engineering Instructions, Technical Notes and Substation Location Instructions (protection settings).

[27] https://www.transport.nsw.gov.au/industry/asset-management-branch/find-a-standard

10.7 Acceptance of designs

Designs produced internally (by Sydney Trains' Engineering & System Integrity) or externally (by TfNSW or external TAOs) are submitted for review by subject matter experts and may lead to the issue of actions requiring resolution prior to a statement of "No Objection to Construct". Sydney Trains may provide comments but does not "accept" designs by external TAOs.

Technical reviews and criteria are described in the *MN A 00413 Technical Reviews Manual*.

Designs produced internally (by Sydney Trains' Engineering & System Integrity) or externally (by TfNSW or external TAOs) must complete the following steps (not necessarily in this order; they can be completed concurrently):

a. A Safety Change Assessment and Reporting Determination (SCARD) must be submitted by the Sydney Trains asset manager with a copy issued to EDU.

b. The safety work products identified from the SCARD must be produced; even when assessed as MINOR, a safety hazard log is required which, among other things, should identify whether there is a residual risk to the network operator or maintainer. Or if there is no residual risk, this should be stated.

c. The network operator (Sydney Trains EDU) and maintainer (Sydney Trains Network Maintenance) must be formally advised of the proposed change, the risk assessment (including the residual risk) and their agreement obtained.

d. The network maintainer must be informed of the arrangements to operate maintain the equipment. In particular, the project should inform them and provide the opportunity for formal consultation with the nominated health and safety representatives. This is initiated by the project via Sydney Trains Workplace Relations.

e. A Local Instruction for operating the equipment must be provided.

f. A Technical Maintenance Plan to maintain the equipment must be provided.

g. Sydney Trains Network Maintenance will advise if they require a demonstration or evaluation of the equipment for the nominated health and safety representatives, and/or formal training for the operators and maintainers.

h. Sydney Trains EDU will advise whether a change to the Electricity Network Rules is required to addresses the type of equipment concerned and its operation.

i. TfNSW AMB Type Approval is required for new equipment and steps (a) to (e) above are pre-requisites to obtaining that.

j. A Proposed Operating Diagram must be submitted and agreed.

10.8 Cyclic maintenance and renewals

Electrical assets and their inherent components are naturally subject to fatigue throughout their operational lifespan. Within the rail network, such assets are planned to be replaced or refurbished prior to the end of their operational and/or economic life. This asset replacement and refurbishment routine is within the Major Periodic Maintenance (MPM) programme and is referred to as "Steady State Cyclic Maintenance and Renewals". The purpose of Steady State Cyclic Maintenance and Renewals is to ensure the condition and performance of electrical assets and, in turn, the overall electricity network remains sustainable over the long term.

For electricity infrastructure, cyclic maintenance and renewals comprise the following programs:

Contact wire renewal	AC Circuit breaker renewal	Bulk oil circuit breaker retrofit
Ring main unit renewal	Battery banks	Distribution line maintenance
Distribution line pole renewal	OHW maintenance	Substation maintenance
Switchgear	Transformers	

A key element of the maintenance strategy is to reduce the risk of infrastructure related failures by managing and upgrading the asset population to increase reliability and reduce risks arising from failure. These efforts are prioritised using risk assessment data.

These renewals may be carried out by Sydney Trains, TfNSW or external TAOs.

10.9 Operation and maintenance

The standards, policies and procedures defining the operation and maintenance of electricity distribution network assets include:

a. Electrical engineering instructions issued by the EDU and published on RailSafe
b. Electricity Network Safety Rules, published on RailSafe
c. Technical Maintenance Plans
d. Technical Notes
e. Trouble Instructions and Operator Procedures held at ICON Electrical
f. Local Instructions at substations
g. Electrical standards and TMPs specify:
   - maintenance to be carried out (inspection, testing, component change-out, etc.)
   - frequency and methodology of maintenance practices
   - requirements for managing and reporting compliance with standards for nominated scheduled maintenance tasks.

The TMPs are a set of preventative and surveillance maintenance strategies and principles designed to achieve agreed operational and maintenance objectives and to ensure the supply of energy to Sydney Trains' operations is guaranteed.

Deviations from the TMPs may be proposed, in accordance with Sydney Trains' procedure *PR E 72004 Electrical Engineering TMP Deviations*.

On-site work is conducted in accordance with Sydney Trains' SMS. Prior to commencing on-site activities a pre-work briefing shall be conducted as per the SMS Operating Procedure 06.20 Pre-work Briefings. Briefings shall include hazards identified for the specific task(s) and the safety controls, as identified in FSA.

Records of the maintenance activities and inspections shall be maintained in Ellipse or as Asset Assurance Inspection Reports.

10.10 Tools, test equipment and PPE

Workers performing hazardous manual tasks must use tools, test equipment and personal protective equipment (PPE) that have been approved by Sydney Trains for that purpose. Tools and test equipment are identified in Sydney Trains *SP D 79039 Electrical Tools and Test Equipment* [105]. PPE is identified in *D2013/80874 PPE for Electrical Work* [106].

The procedures to propose, evaluate and acquire new tools, test equipment and PPE are described in *GL D 79106 Sydney Trains Electricity Distribution Network Selection and Approval of Tools and Test Equipment* [107]. These procedures should also be followed for PPE.

10.11 Safety, security and environmental programs

Safety, security, and environmental programs are designed to improve asset performance and address statutory requirements where there is an obligation to carry out:

a. safety works to address WHS issues and provide a safe workplace for employees
b. security measures
c. environmental compliance.

These programs are prioritised on the basis of the risk mitigated and improved compliance with standards. For electricity infrastructure these programs include:

a. vegetation control
b. asbestos removal (substations and huts)
c. substation fencing
d. corridor boundary fencing
e. DCCB Frame leakage at substations
f. spill protection
g. tunnel Lighting.

The requirements for new or modified assets are defined in specifications published on the AMB website.

10.12 Physical security

One of the primary preventive controls is physical security of the electricity network assets. Two guides are mandatory:

- *ENA DOC 015-2006 National guidelines for prevention of unauthorised access to electricity infrastructure,* notably in respect to requirements concerning climbing aids on poles and structures, clearance zones, etc.
- *ISSC 20 Electrical Easements.*

The AMB has published standards defining the requirements for new or modified assets, including:

a. *T HR EL 99004 ST Substation Fencing*
b. *T HR CI 12160 ST Boundary Fences*

c. *T MU SY 20001 ST Surface Transport Fixed Infrastructure Physical Security Standard*

d. *TMC 511 Boundary Fences*.

10.13 Non-electrical equipment on 1500 Volt DC structures

OHW stanchions and supporting structures throughout the rail corridor are generally not fitted with spark-gaps or bonds to the traction rail; there is a risk that the structure is at a hazardous voltage or even live at 1500 Volt in the event an insulator has failed. Hence these cannot be assumed to be touch-safe and must be assumed to be hazardous until proven otherwise (by testing). All persons are required to maintain the appropriate safe approach distance until the structure is proven safe.

Consequently Sydney Trains does not permit non-electrical equipment to be attached to stanchions and other structures supporting 1500 Volt DC equipment throughout the rail corridor.

OHW stanchions and supporting structures in public areas are fitted with spark gaps and bonds to ensure they remain touch-safe.

11 Customer connections

11.1 Safety

Sydney Trains ensures the safety of electrical installations connected to the Sydney Trains electricity distribution network[28], through:

a. Design, construction and maintenance standards required of customers for their electrical installations.

b. Testing, connection and notification criteria for contractors installing electrical installations.

c. Inspection regime and procedures for directions to remedy faulty work and the disconnection of unsafe installations by the network operator.

d. Procedures for notifying the regulator of defective installation work.

11.2 Design and construction

The design and construction of customers' electrical installations is required to comply with the following:

a. *AS/NZS 3000 Electrical Installations*

b. Section 3.5 Service and Installation Rules of NSW (of this document)

c. *T HR SS 80002 ST Low Voltage Electrical Installations*

d. *T HR EL 17001 ST Electrical Distribution System Installation & Connection*.

11.3 Maintenance

In the case where Sydney Trains is the customer, Sydney Trains will maintain electrical installations in accordance with Section 35 of the Gas and Electricity (Consumer Safety) Act 2017 through the implementation of the relevant Sydney Trains Technical Maintenance Plans.

In the case where the Customer is an external entity to Sydney Trains, the customer will maintain their electrical installations in accordance with Section 35 of the Gas and Electricity (Consumer Safety) Act 2017.

11.4 Criteria for contractors

The testing, connection and notification criterion for contractors installing electrical installations is to comply with the Gas and Electricity (Consumer Safety) Act 2017 and TfNSW Standard *T HR EL 17001 ST Electrical Distribution System Installation Connection and Inspection*.

11.5 Risk management

Risks in the area of customers' electrical installations are managed by applying the *Code of Practice Managing electrical risks in the workplace* and the *Service and Installation Rules of NSW)*.

[28] Electricity Supply (Safety and Network Management) Regulation 2014, regulation 5.

11.6 Installation inspections and connections

EDU collects records of installation inspections, Certificates of Connection and installation defects for low voltage electrical assets. Installation inspectors record this data in a database controlled by EDU.

Sydney Trains' system for the management of the following aspects of customers' installation safety, are covered in TfNSW Standard *T HR EL 17001 ST Electrical Distribution System Installation Connection and Inspection*:

a. Standard of Installation Work
b. Testing Requirements
c. Notification
d. Inspections
e. Remedy of Work Containing Safety Breaches
f. Connection to Supply
g. Audit Inspections
h. Corrective Action
i. Qualifications of Inspectors.

EDU has a group of installation inspectors who inspect low-voltage installations to confirm these are in accordance with the NSW Service Installation Rules. Metrics are collected concerning connection requests, and defects identified.

11.7 Defective installation work

Installation inspection reports determine if the installation can be accepted for connection to supply or not. Defects must be rectified by the contractor before supply connection. All defects are recorded. Sydney Trains EDU will notify the regulator of defects which compromise safety.

12 Public Safety Awareness

This section:

- Identifies the electrical risks hazards posed to the public.
- Provides simple precautions to avoid electricity incidents.
- Provides a basis for electrical elements in Sydney Trains' Rail Safety Week, which aims to raise awareness of public safety in relation to the railway as a whole (not just electrical).
- In addition to the construction industry, anyone is potentially at risk and any informed members of the public are encouraged to advise of hazardous activities near electricity assets, or seek advice – not just local councils or developers.

12.1 Hazardous activities

The primary hazards in electrical incidents include contact with high-voltage electricity, 1500 Volt DC electricity, or contact with low voltage electricity. Some of the most common scenarios include:

- External parties working in the vicinity of overhead power lines.
- Erecting scaffolding, or operating cranes, mobile lighting, excavators and other plant/machinery, in which the machinery may make contact with the overhead line allowing electricity to pass through it to the ground, and the person in contact.
- Contact between overhead powerlines and a crane, vehicle or machinery, making the vehicle 'live' and allowing the electricity to pass through it to the ground.
- Contact between overhead powerlines and a person, the tools or materials they hold, allowing the electricity to pass through the person to the ground.
- Unauthorised access to electricity assets, such as entering substations or copper theft, which may leave electrical equipment in a dangerous state or conductors exposed.
- Vehicles snagging the 1500 Volt overhead line at level crossings and elsewhere.
- Construction and maintenance activities involving unloading/loading trucks in the vicinity of aerial lines.
- Operating plant/machinery in the vicinity of aerial lines or the overhead wire.
- Digging/excavating in the vicinity of buried cables, with the possibility of damaging or striking it, allowing electricity to pass through the tools or machinery used and the person in contact.
- Foreign objects and trees striking or making contact with Sydney Trains aerial lines (this applies to high-voltage feeders as well as 1500 Volt DC overhead lines in the rail corridor).
- Traction current escaping and making contact with metallic objects in locations where the public may make contact, notably along roadsides, bridges/overpasses, as well as nearby metallic structures such as poles, traffic lights, traffic barriers, handrails, etc.
- Aerial lines from other networks falling onto or making contact with Sydney Trains aerial lines (this applies to high-voltage feeders as well as 1500 Volt DC overhead lines in the rail corridor).

- Electrical work above live low-voltage lines (e.g. re-stringing conductors) or above 1500 Volt DC (e.g. civil maintenance work on bridges and overpasses over the rail corridor).
- Landowners, residents and contractors placing structures underneath overhead power lines – including buildings, metallic fences, swimming pools, sheds, containers, or storing materials underneath, whether on private, railway or public land.
- Yachts and large vessels passing under an aerial line crossing a waterway.
- Train surfing.
- Aerial activities such as operating light aircraft, hang-gliding, paragliding, kite flying, operating drones in the vicinity of aerial lines.

12.2 Communication with the public

Since the majority of Sydney Trains' electricity distribution networks aerial lines and cables are situated within the dedicated rail corridor this means it is generally restricted from public access. Therefore, the risk for the public in relation to the electricity distribution network utilised by Sydney Trains is significantly decreased due to this limited interface exposure.

Sydney Trains also engages a range of communication mediums to reach the target audience for each program implemented. The selected media varies in accordance with the requirements of each program but may include advertisements, education kits, personal presentations, press releases and the web. Examples are:

a. Informs councils of the electricity network infrastructure (feeders, poles, buried cables, substations).
b. Provides data on buried cables feeders to DB4YD and http://www.lookupandlive.com.au.
c. Reviews proposed Development Applications and where appropriate responds to those.
d. Provides periodic reminders to landowners concerning managing vegetation near aerial lines.
e. When requested, provides advice to businesses and tradesmen working near electricity network infrastructure.
f. Participates in a range of electrical industry safety forums.
g. Participates in rail-safety industry forums, particularly those operating electrical rolling stock.
h. Trespassing Safety Awareness included as part of Rail Safety Week each year - highlights the dangers of trespassing on the rail corridor.
i. The annual National Rail Safety Awareness Week - reminds passengers, pedestrians and road users to stay safe around railway lines.
j. TfNSW website https://transportnsw.info/ - contains all of public safety messages including the issue of trespassing onto the rail corridor.

All safety aspects of work within the rail corridor are managed by the Rail Corridor Safety Division, whose purpose is to address risks faced by workers and contractors in the rail corridor, including safety controls and managing incidents where injury could occur.

The Incident and Emergency Response Unit co-ordinates joint exercises involving Bushfire Brigades, Councils, Emergency Services, and other relevant organisations to assist in the co-ordination of the various parties in the event of major incidents.

12.3 New developments near electrical infrastructure

Major infrastructure must comply with the NSW Planning & Environment "*Planning guideline for Major Infrastructure Corridors"* which requires "Potential impacts to major utility/transport/gas pipelines/other infrastructure" to be addressed, including existing infrastructure operated/maintained by Sydney Trains.

12.4 Legacy assets (Existing developments near electricity infrastructure

With respect to legacy assets, attention is drawn to the effect of ISSC 20 and AS 5577 Section 1.3. Where a conflict between a structure and electrical infrastructure predates 2012, this may remain as-is (i.e. no change) provided there are no changes to the feeder, the structure, or its intended use – including business-related activities therein. This applies both to assets managed by Sydney Trains, TfNSW entities (Metro) as well as external owners of property under aerial lines.

Sydney Trains' External Party Works Managers are responsible for liaison with those affected, including councils and neighbours. This includes liaison with councils in respect of development applications and periodically reminding owners and residents on lands affected by or neighbouring easements of the constraints and obligations.

Where a change occurs to the feeder, the structure or intended use, the current design standards apply, and structures must comply with the Electricity Supply Act, ISSC 3, ISSC 20 and AS 5577 section 1.3.

When considering changes:

a. All proposed changes must be submitted to Sydney Trains for review.

b. Where an asset is not modified (i.e. like-for-like replacements) the original safety assessment continues to apply.

c. Where an asset is modified, or a new design is produced:

   - The TAO must provide evidence the safety hazards have been identified, recorded, assessed and managed by eliminating safety risks so far as is reasonably practicable, and where not reasonably practicable, by reducing those risks so far as is reasonably practicable.

   - New/modified assets should comply with the standards applicable at the date of the design. Where this is not reasonably practicable the TAO must obtain a concession from TfNSW with no objection from Sydney Trains EDU.

d. Where a standard is revised the change is reviewed to identify the equipment affected and the impact of the change, i.e. to determine whether a safety change can be initiated, and/or identify other benefits (financial, operational or maintenance).

e. Where an existing structure is modified either under or near an aerial line, or the existing use of the structure is altered (e.g. from a pedestrian access to a train crew facility, café or ticket office), ISSC20 applies and may result in the removal of the asset or the relocation of the aerial line. This applies both to assets managed by Sydney Trains, TfNSW entities (Metro) as well as the owners of property under aerial lines.

12.5 Vegetation near aerial lines

Sydney Trains' Vegetation Management Plan provides guidance in respect of trees including planting, tree management (trimming), hazard trees and bushfire risk management.

12.6 Objects on, under or in the vicinity of aerial lines

Structures, materials, vehicles and plant in the vicinity of aerial lines are at risk of contact with electricity as a result of fallen lines or poles and should not be placed within 5m of aerial lines, poles or substations, nor obstruct access for maintenance of the electricity infrastructure. Note:

- Equipment must not be installed on or near structures supporting or protecting electrical equipment. This includes poles supporting aerial lines, stanchions supporting 1500V equipment, or substation fences.
- Some structures are not permitted under aerial lines and must be removed – for example metal fences or swimming pools.
- Changes decreasing the clear space under aerial lines are not permitted, e.g. landscaping, as well as temporary activities such as storing piles of materials, shipping containers, sheds or carports.
- Structures constructed prior to September 2012 may remain as-is provided there is no change to the structure or its use. If the structure or its intended use are changed this may trigger relocation of the structure, or the aerial line – which may entail significant costs. For example, changing a pedestrian area from being public access to include a café (where significant numbers of people may congregate for some time) is considered a significant change.
- Sydney Trains has the authority to require immediate removal of structures or objects that create unacceptable risks.
- Poles and towers shall be constructed to prevent climbing without the use of greater than normal agility, tools, or climbing aids.
- Use http://www.lookupandlive.com.au - to check for aerial lines.

12.6.1 Not Permitted

The following are not permitted within 5m of electrical poles, substations or under aerial lines, and must be removed:

- Construction of new or modified buildings within 5m of aerial lines, poles, or substation fences such as commercial or residential dwellings, carports, garages or sheds.
- Vehicles which a person may climb to the top of, plant or machinery.
- Swimming pools, whether above or in-ground.
- Large metallic objects such as site sheds, toilets, shipping containers, scaffolding, steelwork, poles/pipes, fences or track.
- Storage or stockpiles of materials beyond the limits described below.
- Obstructions that restrict or block access to the electrical infrastructure.

12.6.2 Consent required

The following are not permitted without written consent from Sydney Trains EDU:

NOTE

The proposed activity must not commence without written advice from Sydney Trains confirming "no objection" to the proposed activity.

- Stockpiles of materials which are non-flammable and not explosive exceeding 2.5m (if climbable), and can be moved at short notice.
- Operation of mobile plant/equipment with a fully extended height greater than 4.6 metres including any load and/or person carried.
- Metallic fencing, with safety controls such as breaks in the fence electrical continuity and earthing be in place to prevent induction and transferred voltage hazards.

Where these activities are being planned or considered you must submit a written request to Sydney Trains EDU for review, including:

- Details of the proposed activity, structure or materials to be placed under aerial lines stating the maximum height and profile, whether the structure or materials can be climbed, and the plant or machinery to be used.
- A survey of the aerial line.
- Calculation of the maximum height which does not infringe the clearances defined in [40].
- A risk assessment including a statement of the proposed safety controls to be implemented, which as a minimum should include visible markers or bunting indicating the maximum safe height and signage indicating the business unit and contact details in the event the materials must be moved.
- Arranging an on-site inspection with an Authorised Officer from Sydney Trains; the objective of that inspection is to confirm (i) there is no practicable alternative which is not under aerial lines and (ii) the proposed location does not obstruct access for maintenance of the aerial lines, poles or vegetation.

12.6.3 Permitted activities

Activities permitted without obtaining prior consent include:

- Using mobile plant & equipment - not exceeding 4.6 metres height when fully extended including any load carried.
- Poles and signage that cannot be climbed and not exceeding 4.6 metres.
- Material storage – including stockpiles – provided:
  a. the material is not flammable, not explosive, and
  b. the material does not exceed 2.5 metres height (if climbable) or does not exceed 4.6 metres (if not climbable), and
  c. can be moved at short notice.

You must provide signage indicating the business or person responsible and contact details in the event the object or materials must be moved at short notice.

12.7 Advice to the public

12.7.1 Remember…

- Look up for overhead power lines.
- Stay away – keep outside the “safe approach distance” at all times (refer to Section 12.7.4).
- Treat all aerial lines and cables as live, and keep clear of them and anything they touch – especially vehicles, machinery or structures.
- If you don’t know, ask for advice (refer to Section 12.7.4).
- If you must come within the safe approach distance - obtain an electrical isolation (refer to Section 12.7.4).
- Electricity poles and substations have a label with a unique identifier and the phone number to contact the network operator.
- If you see something wrong, report it immediately – Call 000 and Sydney Trains ICON on 1800 060 015.

12.7.2 Search for services in the vicinity of your work

12.7.2.1 Aerial lines

The presence of aerial lines can be ascertained by:

a. The aerial lines visible at the location.

b. The supporting poles, which are labelled with a contact number.

c. From consulting the website http://www.lookupandlive.com.au.

If you need an isolation, you must make sure **all aerial lines are isolated**. If you have arranged this with one network, this does not mean the other network(s) have also isolated theirs.

12.7.2.2 Buried cables

Sydney Trains has buried cables within and outside the rail corridor. For safety reasons, it is extremely important to check the location of these and other services (including gas, communications, water and sewerage) before starting to dig or excavate.

Before attempting excavations or digging, you MUST lodge an enquiry with Dial Before You Dig (DBYD), either by calling them on 1100, visiting their website at www.1100.com.au or using their iOS app. DBYD provides plans indicating the presence of electricity, water, gas and telecommunications cables and pipes to identify where it is safe to dig.

12.7.2.3 Abandoned cables

Railway land sold by TfNSW or its related entities (State Rail, Rail Infrastructure Corporation, RailCorp) may include abandoned buried cables.

If you need to excavate near or remove abandoned cables please contact Sydney Trains and request an “Abandoned Cable Permit”. Sydney Trains will identify whether it was a Sydney Trains cable, and any further actions, if appropriate.

12.7.3 Advise Sydney Trains of your intended activity

Before working near Sydney Trains aerial lines or buried cables, please advise Sydney Trains by downloading and completing a “Request for Advice” form at https://www.transport.nsw.gov.au/sydneytrains/commercial/building-near-railway, and submit that to the regional email address appropriate to your location.

Please use this form:

- **To advise of any activity you intend to perform** near aerial lines or buried services, such as using cranes, unloading vehicles, erecting temporary structures or scaffolding, erecting mobile lighting, etc.
- **When planning development work**.
- **To request advice** on working safely in the vicinity of aerial lines.
- **If you need to arrange an electrical isolation**, and/or need to engage a person qualified to hold an Electrical Permit to Work.
- **Before digging or excavating** near buried services.

Please include details of:

- **The location.**
- **The expected date(s) and duration** of the activity.
- **A short description of the activities** near aerial lines or buried services, such as using cranes, unloading vehicles, erecting temporary structures or scaffolding, erecting mobile lighting, etc.
- **Your contact details**.
- **Acknowledge you have obtained the SafeWork NSW Code of Practice** (refer to Section 3.3) and understood what you should do.

12.7.4 Request advice – consultation is free

If you need further advice on working safely, or are seeking an electrical isolation, please complete and submit the “Request for Advice” form as per above.

12.7.5 Working near exposed electrical equipment

If working near live exposed electrical equipment, you should follow the guidance in [24]. All persons, the tools or materials they hold, vehicles, plant or machinery remain outside the “Safe Approach Distance” (SAD) – the dimension “A” in Figure 10 defined in Table 3, plus an additional distance allowing for:

a. inadvertent actions or equipment failure

b. the movement of aerial lines due to wind (horizontal swing) and temperature (vertical sag) in accordance with [40]

c. the extent and dimensions of the design envelope (refer to Figure 11) of plant fitted with elevating units or tipping trays or equipment such as cranes, trucks with tip-trays, excavators or plant with extendable booms or masts.

When advice or consultation is requested, additional safety controls may be appropriate. These are drawn from the advice in PR D 78700 [56] on the RailSafe website, which describes the safe approach distance, hazards when using tools or materials in the vicinity, as well as mobile plant and temporary structures.

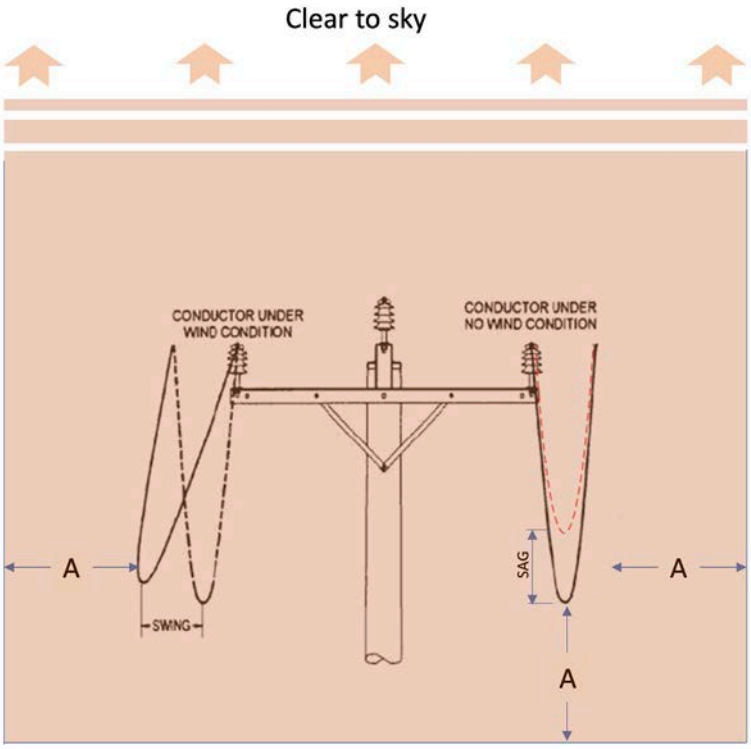


Figure 10: Safe Approach Distance with allowance for sag and swing

Table 3: Safe Approach Distances

Safe Approach Distances	
	Dimension A
Persons working near aerial lines without an Electrical Permit – including the tools, equipment or materials they hold – including additional allowance for inadvertent actions or equipment failure.	3 m
Plant or machinery working near aerial lines without an Electrical Permit – this includes but is not limited to cranes, mobile plant, elevating work platforms (EWP), excavators, drilling rigs, forklift trucks, tip trucks and concrete pumps, portable or moveable equipment such as lighting towers, generators and compressors.	3 m
Fallen wires touching the ground, structures, vehicles, plant or machinery.	8 m
Excavations near buried cables.	3 m
Vehicles passing under 1500 Volt DC OHW.	0.9 m
Vehicles passing under aerial lines not exceeding 33,000V.	0.9 m
Vehicles passing under aerial lines above 33,000V not exceeding 132,000V – including mobile plant or cranes stowed for transit.	2.1 m

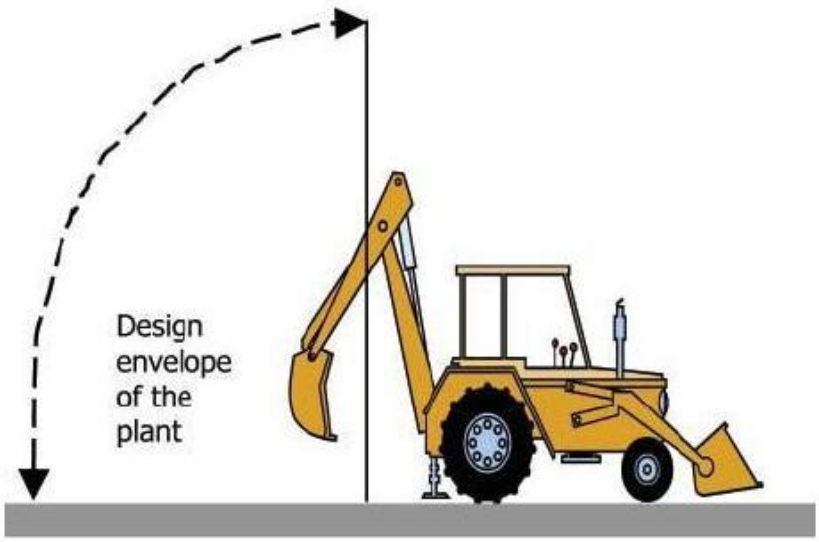


Figure 11: Design Envelope of plant and machinery

12.8 External (3rd Party) works by neighbours and councils

External works carried out by neighbours and councils in close proximity to electrical network assets pose risks to the external parties, and to the electrical network. Managing these risks includes the following:

a. Responding to requests for information from external parties; Sydney Trains has a dedicated External Party Works Manager, within the Asset Management group to handle all liaison with those responsible for external works including councils and neighbours.

b. Identifying third-party works, which includes both advice from local councils, neighbours and developers concerning proposed developments or maintenance work as well as periodic inspections of the electrical network assets to identify activities to be conducted, or being conducted, in close proximity to the electrical network.

c. Responding to Development Applications received concerning proposed construction near electricity network assets and advising Councils of constraints or requirements that should be included.

d. Informing developers working near electricity network assets of the WorkCover Code of Practice "Work Near Overhead Power Lines" and how to request further advice from Sydney Trains or arrange an Electrical Permit.

e. Ensuring Sydney Trains Electricity distribution network assets are labelled with a contact telephone number and a unique identifier, to assist external parties wishing to Sydney Trains in respect of these assets; this primarily concerns poles supporting aerial lines.

f. Participating in "Dial Before You Dig" to provide detailed survey drawings showing the location of buried electrical assets to those seeking this information.

g. Providing information concerning safe working when working in close proximity to electrical assets via the RailSafe website.

h. Assessment of the risks posed by the third-party works to assess the risks and possible controls; this is by EDU inspectors and SMEs within the Electrical department.

i. Providing information to the third party in respect of the electrical network, including access to the Virtual Plan Room, access to the ENSMS, and specialist advice when requested.

j. (optional) Ongoing surveillance of the work, when deemed necessary.

k. Action that may arise in response to external works.

Periodic inspection of cable routes outside the rail corridor (both aerial and underground) are used to identify activities or structures that may pose risks (e.g. infringing the Safe Approach Distance). This is conducted periodically by the Sydney Trains Maintenance Directorate.

12.9 Neighbours of easements and public assets

Where Sydney Trains carries out work on electrical network assets within easements and public land the Sydney Trains' External Party Works Manager is responsible for liaison with those affected, including councils and neighbours. This includes liaison with councils in respect of development applications and periodically reminding owners and residents on lands affected by or neighbouring easements of the constraints and obligations.

12.10 Safety messages

12.10.1 General community

Target Group	Scenario
Developers, construction companies, truck drivers, operators of heavy plant	**Unloading/loading vehicle near overhead powerlines** • Find a safe location to unload/load which is not under aerial lines and will not infringe the safe approach distance. • Follow the SafeWork NSW Code of Practice “Working Safely near Overhead Power Lines” [2]. • Use a safety observer. • Notify Sydney Trains of the proposed activity and request advice regarding working with an Electrical Permit and other safety controls.
Developers, construction companies	**Erecting/removing scaffolding in the vicinity of aerial lines** • Follow the SafeWork NSW Code of Practice “Working Safely near Overhead Power Lines” [2]. • Conduct a safety hazard assessment. • Work with an Electrical Isolation (Permit to Work) while erecting/removing scaffolding. • Install non-conductive barriers with signage warning of the hazard.

Target Group	Scenario
Developers, construction companies	**Operating cranes near overhead lines or the rail corridor** • Notify Sydney Trains of the proposed activity and request advice regarding working with an Electrical Permit and other safety controls. • Follow the SafeWork NSW Code of Practice “Working Safely near Overhead Power Lines” [2]. • Conduct a safety hazard assessment. • Use limiters to restrict the movement of the crane. • The crane must not infringe the safe approach distance. • When not working, Sydney Trains will permit cranes to “weathervane” over aerial lines. • Cranes are not permitted over the rail corridor at any time.
Road users	**Vehicles passing under 1500 Volt DC Overhead Wire (e.g. Level Crossings)** • High vehicles above 3.7m will infringe the safe approach distance to the overhead wire. • Truck-drivers – make sure the tray is fully DOWN before approaching a level crossing. • Call 000 and Sydney Trains ICON on 1800 060 015 immediately.
General public - all	**Foreign objects in the OHW - Conductive object makes contact with the 1500 Volt DC Overhead wire** • Examples include wires, long metallic objects, cranes, plant & machinery, children's kites or balloons, cables and wires, yachts, trees. • If the object is metallic it will transfer 1500 Volt DC to anything else it touches or is connected to – fences, other buildings, bridge or roadside equipment such as barriers, handrails or poles. • Can extend outside the rail corridor – e.g. trees, wires, long metallic objects, cables, kites, plant & cranes. • These objects may conduct electricity making them hazardous – do not touch. • Call 000 and Sydney Trains ICON on 1800 060 015 immediately.
Pedestrians on roads, bridges overpasses	**Nearby metallic infrastructure exposed to traction current/voltage** • Earthing & bonding fault in rail infrastructure can transfer traction power to nearby metallic infrastructure along the roadside such as poles, railings, vehicle barriers, metal fences, traffic lights. Persons touching these may receive an electric shock. • Call 000 if a person is injured. • Report the incident to Sydney Trains ICON.

Target Group	Scenario
Local councils, developers and owners of neighbouring properties Tradespeople Children Young students General community Employees of other electricity networks Emergency services personnel	**Before work commences** • Look up to check the location and distance of powerlines before beginning any outdoor activity. • Keep a safe distance or clearance from overhead powerlines. • Consider appropriate clearance when working around powerlines as the safe distance can vary according to the size and voltage of the powerline. • Set-up or build structures well away from powerlines and easements. • Set up plant, equipment and vehicles for safe distance or clearance from powerlines during operation (including work platforms, cranes, lighting, and trucks). • If you need to work close to aerial lines consult the SafeWork NSW Code of Practice “Working Safely near Overhead Power Lines” [2] for further safety controls. • Contact Sydney Trains and inform them of the proposed activity. • Request an electrical isolation (Electrical Permit to Work) and the services of an Accredited Permit Holder.
Local councils, developers and owners of neighbouring properties Tradespeople Employees of other electricity networks Emergency services personnel	**Working safely near overhead powerlines** • Contact Sydney Trains and inform us of the activity. • Follow the SafeWork NSW Code of Practice “Working Safely near Overhead Power Lines” [2].
Local councils, developers and owners of neighbouring properties Tradespeople Children Young students General community	**Fallen wires or poles** • Treat all powerlines as if they are ‘live’. • If wires have fallen on your vehicle, remain in the vehicle or machinery as escape is very risky. • Never approach, attempt to rescue or allow others to approach any machinery or vehicles in contact with powerlines. • Stay a minimum of eight metres from a vehicle or machinery in contact (a bus-length away). • Call 000 and Sydney Trains ICON on 1800 060 015 immediately.

Target Group	Scenario
Local councils, developers and owners of neighbouring properties Tradespeople Children Young students General community Employees of other electricity networks Emergency services personnel	**Contact with overhead powerlines** • Treat all powerlines as if they are 'live'. • Remain in the vehicle or machinery as escape is very risky. • Never approach, attempt to rescue or allow others to approach any machinery or vehicles in contact with powerlines. • Stay a minimum of eight metres from the vehicle or machinery (to be safe stay at least a bus length away) • Call 000 and Sydney Trains ICON on 1800 060 015 immediately. • Get a competent person to inspect all tyres, bearings and brakes before any continued use of the vehicle or machinery.
General community	**Outdoor activities** • Children playing with kites, drones, model airplanes, party balloons. • Look up to check the location and distance of powerlines before beginning any outdoor activity, such as recreational activity or work around your home. • Set up or build structures away from powerlines and easements. • Only use lights and extension cords outside that are designed for outdoor use. • It is dangerous for anyone to enter, tamper with or gain unauthorised access to electrical assets such as. substations. • Cutting cables, climbing poles or substations or other risky behaviour around electricity isn't worth the risk.
Light aircraft, Hang-glider and Paraglider pilots	**Flying close to the ground or landing – contact with aerial lines** • Watch for poles or aerial line markers indicating the presence of aerial lines. • Hitting aerial lines is not survivable – to be avoided at all costs. • Follow instructions per the CASA Operations Manual and HGFA guidance. • Call 000 and Sydney Trains ICON on 1800 060 015 immediately.
All persons	**Fallen power lines** • Stay away – assume they are live. • Call 000 and Sydney Trains ICON on 1800 060 015 immediately.

Target Group	Scenario
Person thrown from plant/machinery	**Plant makes contact with aerial line** • Assume the power lines are live. • Tyres may have exploded, or be unsafe. • Person inside – DO NOT TOUCH THE VEHICLE OR OPEN DOORS until help arrives. • If a person has been thrown out administer CPR and defibrillate until help arrives. • Call 000 and Sydney Trains ICON on 1800 060 015 immediately.
Passengers in a vehicle	**Fallen power lines – in contact with motor vehicle** • Assume the power lines are live. • Tyres may have exploded, or be unsafe to drive on. • Remain inside the vehicle – DO NOT OPEN DOORS OR TOUCH THE GROUND until help arrives. • Call 000 and Sydney Trains ICON on 1800 060 015 immediately. • Wait for help to arrive before attempting to leave the vehicle.
External persons	**Fallen power lines – in contact with motor vehicle** • Assume the power lines are live. • DO NOT TOUCH THE VEHICLE OR WIRES. • Call 000 and Sydney Trains ICON on 1800 060 015 immediately. • Wait for help to arrive.
Yachts and large boats	**Tall vessels in the vicinity or passing under aerial lines** • May make contact with aerial lines over water crossing. • Use navigation maps which show the presence of aerial lines – do not rely on consumer-grade maps or apps for navigation. • Watch for aerial line markers indicating the presence of aerial lines. • To be avoided at all costs. • Call 000 and Sydney Trains ICON on 1800 060 015 immediately.
Community Young students	**Unauthorised access, graffiti, theft and vandalism** • It is dangerous to graffiti, steal or tag electrical equipment, it's not worth the risk. • It is dangerous to remove graffiti on substations and other electrical equipment such as pillar boxes, kiosk substations, etc. • Report graffiti on electrical equipment via the TfNSW online reporting tool at https://transportnsw.info/contact-us/feedback/train-feedback.

12.10.2 School students

As part of Rail Safety Week, Sydney Trains provides information for school children advising the dangers of electricity both inside buildings and outdoors.

Target Group	Scenario
Community	**Fallen aerial lines or poles** • Stay away from fallen powerlines and service mains or anything touching them. • Report them as soon as possible – call 000 or Sydney Trains ICON on 1800 060 015. • Keep an eight-metre distance from any fallen powerlines and any items such as trees that may have come into contact with live wires – especially vehicles. • If you are in a vehicle in contact with wires stay inside and wait for help – do not attempt to get out.
Community	**Fire** • If you see a fire, report it to 000.
Young children	**Electrical equipment in the rail corridor – stations, pedestrian overpasses** • Don't play with electrical equipment - contact with electricity will kill. • If you see a fire report it to an adult.
Teenagers	**At stations, pedestrian footbridges and overpasses** • Contact with the overhead wire is almost certainly fatal

12.11 Functions performed by Sydney Trains

Business Unit	Functions
Asset Management	• Reviews Development Applications for structures near railway assets. • Issues periodic reminders to landowners and residents of neighbouring properties and those with easements. • Contributes data to "Dial Before You Dig", implementing the recommendations of ISSC32 and to www.lookupandlive.com.au.

Business Unit	Functions
Network Maintenance (including ICON)	• Provides advice when requested via the internet webpage form. • Plans electrical isolations. • Implements electrical isolations and issues Electrical Permit to Work. • Arranges Accredited Permit Holder (if required). • Disables Auto-reclose on high-voltage feeders in specific circumstances. • Co-ordinate response to electrical emergencies. • Periodic patrols of the network aerial lines and cable routes outside the rail corridor (both aerial and underground) to check for infringements of the safe approach distance, and unidentified construction activities near cables and aerial lines, and vegetation. • Periodic patrols of the network - identify new hazards or development/construction activities near electrical assets • Periodic patrols of the network - confirm the status of legacy structures under aerial lines (ISSC 20). • Performs planned maintenance of electrical equipment. • Vegetation control. • Bushfire preparedness. • Responds to electrical failures.
Engineering & Maintenance Branch (Electrical)	• Reviews designs of structures proposed near Sydney Trains assets.
Electricity Distribution Unit	• Provide specialist advice when requested. • Investigates incidents. • Monitor and report safety performance. • Initiate safety changes.
People & Corporate Affairs	• Rail Safety Week: – Advice to the public. – Visit selected schools (roadshow).
Rail Incident and Emergency Response Unit	• Co-ordinates response to major incidents including Bushfire Brigades, Councils, Emergency Services.

13 Bushfire risk management

Sydney Trains approach to managing the risks of bushfire associated with the Electricity distribution network is presented in *SP D 79036 Sydney Trains Electricity Distribution Network Bushfire Risk Management Plan*, published on RailSafe.

14 Referenced documents

14.1 Versions

The following sections lists the documents referenced in this plan at the date of issue. All users of this plan are reminded to obtain current copies of referenced documents from the publisher of the document (e.g. SAI Global, TfNSW or Sydney Trains); it is not acceptable to rely on uncontrolled local or printed copies.

14.2 Changes

Where a standard is revised, the change is reviewed to identify the equipment affected and the impact of the change, i.e. to determine whether a safety change can be initiated, and/or identify other benefits (financial, operational or maintenance).

14.3 Public documents

[1] Electricity Supply Act 1995
[2] Electricity Supply (General) Regulation 2014
[3] Electricity Supply (Safety & Network Management) Regulation 2014
[4] Circuit Layouts Act 1989
[5] Gas and Electricity (Consumer Safety) Act 2017
[6] Home Building Act 1989
[7] National Electricity (NSW) Law
[8] National Parks and Wildlife Act 1974
[9] Rail Safety National Law NSW No 82a
[10] Transport Administration Act 1988
[11] AS 5804 High Voltage Live Working
[12] Crossings of navigable waters: Electricity Industry Code
[13] ENA DOC 001-2019 National Electricity Network Safety Code
[14] ENA NENS 09-2014 National Guideline for the Selection, Use and Maintenance of Personal Protection Equipment for Electrical Arc Hazards
[15] ISSC 14 Guide to electrical workers' safety equipment
[16] ISSC 20 Guideline for the management of activities within electrical easements and close to electricity infrastructure
[17] ISSC 28 Guideline for enclosed spaces in NSW electricity networks
[18] ISSC 29 Guideline for preclimbing and climbing assessment of poles
[19] ISSC 3 Guide for the management of vegetation in the vicinity of electricity assets
[20] ISSC 31 Guideline for the management of private overhead lines
[21] ISSC 32 Guide for ISSC network operators to provide information to the construction industry for working near overhead power lines
[22] ISSC 33 Guideline for network configuration during high bushfire risk days
[23] ISSC 34 Guide for ISSC height safety within the NSW electricity industry
[24] NSW Code of Practice: Working Near Overhead Power Lines
[25] NSW Code of Practice: Service Water and Energy and Installation Rules
[26] NSW Code of Practice: Contestable Works
[27] NSW Code of Practice: Demand Management for Electricity Distributors
[28] NSW Code of Practice: Electricity Service Standards
[29] NSW Code of Practice: Installation Safety Management
[30] NSW Electricity Transmission Reliability and Performance Standard 2017
[31] NSW Code of Practice Confined Spaces

[32] Service and Installation Rules of New South Wales
[33] Transmission NSW Dept of Design Reliability Resources and Standard for NSW Energy December 2010
[34] AS/NZS 2067 Substations and high voltage installations exceeding 1 kV AC
[35] AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)
[36] AS/NZS 5577 Electricity network safety management systems
[37] AS/NZS 15288 Systems and Software Engineering – System Life Cycle Processes
[38] AS/NZS 31000 Risk management - Guidelines
[39] AS/NZS 60038 Standard Voltages
[40] AS/NZS 7000 Overhead line design
[41] Australian Energy Regulator Electricity Network Service Provider Registration Exemption Guideline
[42] ENA DOC 023-2009 ENA Guidelines for Safe Vegetation Management
[43] ENA NENS 04-2006 National guidelines for safe approach distances to electrical and mechanical apparatus
[44] A415539, Guideline – Major Projects, Office of the National Rail Safety Regulator
[45] Work Health and Safety Act 2011 (NSW)

14.3.1 Sydney Trains

[46] *Electrical Safety Definitions* – published on the **RailSafe** site
[47] RL D 79800 Electricity Network Safety Rules
[48] RL D 79801 One Method of Safe Working
[49] RL D 79802 Electrical Distribution Network Management
[50] RL D 79803 Working Near or On/Within
[51] RL D 79804 Electrical Safety Incidents
[52] RL D 79805 Personnel Competency
[53] PR D 78701 Personal Certifications
[54] *Safety Management System Elements* - published at http://RailSafe.sydneytrains.nsw.gov.au/sms-documents
[55] SMS-07-SP-3067 System Safety Management of Change
[56] PR D 78700 Working around Electrical Equipment
[57] SP D 79036 Sydney Trains Electricity Distribution Network Bushfire Risk Management Plan

14.3.2 TfNSW

Note: for TfNSW electrical standards refer https://www.transport.nsw.gov.au/industry/asset-management-branch/quick-search

Guide to Transport for NSW Framework for Assuring the Safety of Rail Assets and Infrastructure

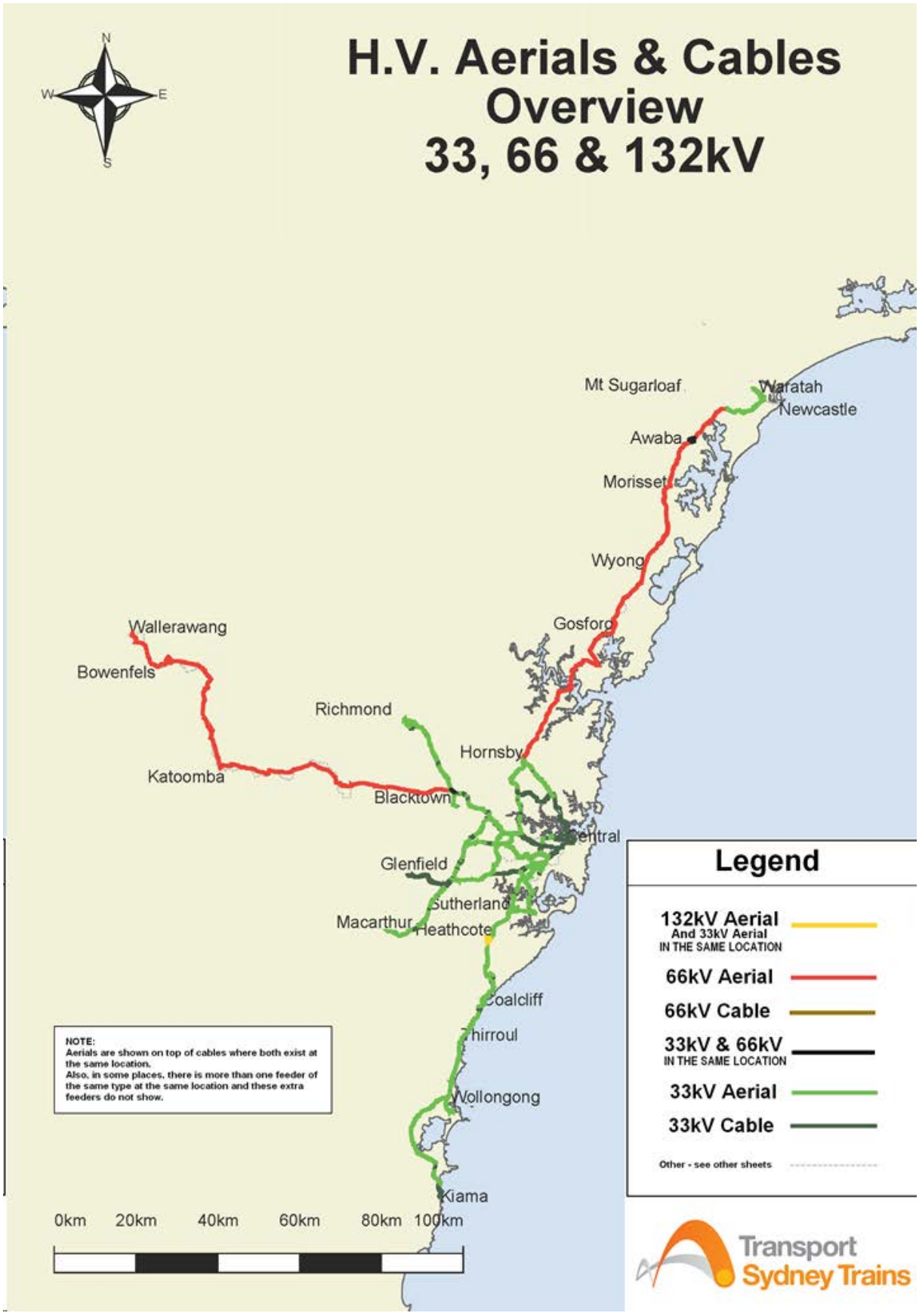
14.3.3 Other

[58] IPART Electricity Network Reporting Manual
[59] IPART Electricity Networks Audit Guideline
[60] National Rail Safety Accreditation Package (NAP)
[61] NSW Treasury's Total Asset Management (TAM) Guideline

14.4 Unpublished documents

[62] 50707-JB1162, Vegetation Manual
[63] AMD-AMP-PL-001, Configuration Management Plan
[64] APP-AMP-1617-PL-004, Electrical Asset Management Plan 2016/17 to 2025/26
[65] D2013/80874 PPE for Electrical Work
[66] EI A 19-04 New PPE for Electrical Work
[67] Sydney Trains Electricity Network Performance Annual Report
[68] EMS-09-GD-0067, Vegetation Management in the Rail Corridor
[69] EMS-09-TP-0152, Vegetation Management Scope of Work
[70] EMS-09-WI-0071, Bush Fire Hazard Reduction
[71] EMS-09-WI-0178, Fauna Impact Mitigation when Clearing Vegetation
[72] GL D 79100 Electrical Commissioning Requirements and Deliverables
[73] Guide for Emergency Services access to the Rail Corridor
[74] Infrastructure Control Centre (ICON) Operator Procedures and Trouble Instructions
[75] MN A 00001 Design Management Manual
[76] MN A 00413 Technical Reviews Manual
[77] MN C 10501 Bush Fire Hazard Management
[78] NMD-GD-182 Electrical Routine Maintenance
[79] PR E 72004 Electrical Engineering TMP Deviations
[80] QMS-19-GD-3648 Integrated Auditing Guide
[81] QMS-19-GD-6006 Auditor Competency Framework
[82] QMS-19-SP-3647 Auditing Procedure
[83] QMS-19-TP-6005 Auditor Competency evaluation sheet
[84] QMS-19-WI-3649 Risk Based Auditing
[85] SMS-01-RG-3148 Legal Requirements Register
[86] SMS-01-SR-3000 Safety Management System Requirements
[87] SMS-03-SP-3063 Safety Planning
[88] SMS-04-SP-3064 Asset Life Cycle Management
[89] SMS-07-SP-3067 System Safety Management of Change
[90] SMS-09-OP-3022 Identify and Monitor Safety Records
[91] SMS-09-SP-3021 Records Management
[92] SMS-10-SP-3070 Communication and Consultation
[93] SMS-11-SP-3011 Training and Competence
[94] SMS-15-OP-3132 Develop and Implement Site Incident Management Plan
[95] SMS-17-GD-4702 L4 Investigation Plan
[96] SMS-17-OP-3101 Investigate Report On and Analyse Safety Incidents
[97] SMS-17-OP-3644 HPI Determination and Reporting
[98] SMS-17-OP-4701 Conduct of L4 Safety Investigations
[99] SMS-17-SP-3077 Incident Reporting and Investigations
[100] SMS-18-OP-3115 Manage Corporate SEQR Recommendations/Findings
[101] SMS-18-OP-3116 Manage Local SEQR Recommendations/Findings
[102] SMS-18-OP-3139 Conduct SEQR Action Closure Review
[103] SMS-18-SP-3078 Safety Action Management
[104] SMS-20-SP-3080 System Review
[105] SP D 79039 Electrical Tools and Test Equipment
[106] D2013/80874 PPE for Electrical Work
[107] GL D 79106 Sydney Trains Electricity Distribution Network Selection and Approval of Tools and Test Equipment

Appendix A Network Map



Appendix B Safety Policy

Health & Safety Policy

Version 3.1 • issue date 22/11/2019 • review date 22/11/2022

As Chief Executive, I fully support the Sydney Trains' Health and Safety Policy. The health and safety of all our workers and customers is our first priority.

Vision

A safe railway, a safeworkplace, a safe culture.

Purpose

Sydney Trains is committed to creating and maintaining a working environment that enables proactive health and safety management which strives to protect and improve the health, safety and wellbeing of our workers and customers, and assures the safety of our visitors

Policy Statement

To demonstrate this commitment and ensure effective implementation of this policy, we will:

- Create a culture of working safely.
- Create a climate in which all incidents are reported and learnings from incidents are communicated.
- Establish measurable objectives and targets to ensure continuous improvement aimed at eliminating work-related injury and illness.
- Develop and implement effective risk management systems and processes to proactively identify hazards and eliminate or reduce risks.
- Ensure full compliance with all relevant health and safety legislation and regulatory requirements.
- Establish effective consultation and communication mechanisms that ensure involvement of workers in the decision making process that could potentially impact on health and safety, and effective dissemination of information to all workers and stakeholders.
- Provide appropriate training and awareness programs to ensure competency of all workers.
- Establish formal safety accountabilities and performance reviews for all our managers.
- Ensure the health and wellbeing of our workers is valued and promoted.
- Employ robust processes to monitor and review health and safety performance.
- Implement and maintain a system of safe working.
- Provide resources to meet the objectives of this policy.



Howard Collins OBE
Chief Executive

Transport Sydney Trains

NSW GOVERNMENT