

Standard

High Voltage Network

Version 2.0

Issued date: 21 December 2017

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Standard governance

Owner: Lead Electrical Engineer, Asset Standards Authority
Authoriser: Chief Engineer, Asset Standards Authority
Approver: Executive Director, Asset Standards Authority on behalf of the ASA Configuration Control Board

Document history

Version	Summary of changes
1.0	First issued 25 May 2017.
2.0	Minor clarification to content.

For queries regarding this document,
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Transport
Asset Standards
Authority

Preface

The Asset Standards Authority (ASA) is a key strategic branch of Transport for NSW (TfNSW). As the network design and standards authority for NSW Transport Assets, as specified in the *ASA Charter*, the ASA identifies, selects, develops, publishes, maintains and controls a suite of requirements documents on behalf of TfNSW, the asset owner.

The ASA deploys TfNSW requirements for asset and safety assurance by creating and managing TfNSW's governance models, documents and processes. To achieve this, the ASA focuses on four primary tasks:

- publishing and managing TfNSW's process and requirements documents including TfNSW plans, standards, manuals and guides
- deploying TfNSW's Authorised Engineering Organisation (AEO) framework
- continuously improving TfNSW's Asset Management Framework
- collaborating with the Transport cluster and industry through open engagement

The AEO framework authorises engineering organisations to supply and provide asset related products and services to TfNSW. It works to assure the safety, quality and fitness for purpose of those products and services over the asset's whole-of-life. AEOs are expected to demonstrate how they have applied the requirements of ASA documents, including TfNSW plans, standards and guides, when delivering assets and related services for TfNSW.

Compliance with ASA requirements by itself is not sufficient to ensure satisfactory outcomes for NSW Transport Assets. The ASA expects that professional judgement be used by competent personnel when using ASA requirements to produce those outcomes.

About this document

This standard sets out the technical requirements for the high voltage alternating current cable infrastructure of the high voltage network.

This standard is a second issue. The changes from the previous version include minor clarification to content.

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1. Introduction

Power supply to light rail traction substations is primarily provided by high voltage (HV) feeders connecting the traction substations and the 11 kV network of local electricity distributors. Depending on the arrangement with the electricity distributor, some of these HV feeders may be owned by Transport for NSW (TfNSW).

A light rail network may also have some or all of its traction substations interconnected by means of 11 kV feeders.

For the purpose of this document, the HV network is defined as the HV feeders that are owned by TfNSW in these connections.

2. Purpose

This document sets out the requirements for the HV cables within light rail HV networks.

2.1. Scope

This document sets out the requirements of the HV cables within light rail HV networks.

The document does not cover the following:

- HV cables that are not owned by TfNSW
- HV cables of the TfNSW heavy rail or rapid transit systems

2.2. Application

This document applies to HV cables that form part of light rail HV networks.

This standard is applicable to all new HV cable installations.

This standard is also applicable to the modification of existing HV cable infrastructure.

Where a new HV cable installation or modification is constructed and energised in stages, the requirements of this standard are applicable to the configuration at each stage of construction.

This standard is intended to be used by competent personnel engaged in the provision of services relating to light rail infrastructure. In addition to the requirements of this standard, asset decisions take into account the life cycle cost considerations specified in T MU AM 01001 ST *Life Cycle Costing*.

If, when using the standard, it is considered that the intent of stated requirements is not clear, a clarification should be sought from the Lead Electrical Engineer, Assets Standards Authority (ASA).

3. Reference documents

The following documents are cited in the text. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document applies.

Transport for NSW standards

EP 20 00 00 03 SP Above Ground Cable Installation Systems - Selection Guide

EP 20 00 00 20 SP Testing of High Voltage and 1500 V dc Cables

EP 20 00 03 01 SP HV and 1500 V DC Cables - Joints and Terminations

EP 20 00 04 01 SP Cable Route Selection Guide

EP 20 00 04 04 SP Ground Entry Arrangements

EP 20 00 04 05 SP Cable Pits

EP 20 00 04 06 SP Underground Cable - Location Recording

T HR EL 20001 ST High Voltage AC and 1500 V DC Traction Power Supply Cable Requirements

T HR EL 20003 ST Underground Installation Configurations for High Voltage and 1500 V dc Cables

T LR CI 12530 ST Corridor Interface Requirements

T MU AM 01001 ST Life Cycle Costing

T MU MD 00009 ST AEO Authorisation Requirements

4. Terms and definitions

The following terms and definitions apply in this document:

AEO Authorised Engineering Organisation

ASA Asset Standards Authority

HV high voltage; voltage exceeding 1000 V ac or 1500 V dc

JOS judgement of significance

TfNSW Transport for New South Wales

5. Requirements

5.1. Application to existing HV cable installations

Where existing HV cable installations are modified, the design and construction of the modification shall be such that the resultant configuration shall comply with this standard.

Where it is not practicable to do so, the design shall be reviewed and accepted by the relevant Authorised Engineering Organisation (AEO) in accordance with the AEO's judgement of significance (JOS) processes for HV cables. Refer to T MU MD 00009 ST AEO Authorisation Requirements for more information. Where the AEO has not established an ASA accepted JOS process for HV cables, the proposed design shall be documented through a standards concession.

5.2. Mandatory standards

The HV cable infrastructure shall comply with the requirements that are relevant to HV cables in the following standards, with the exception of provisions set out in Section 5.3 and Section 5.4:

- T HR EL 20001 ST *High Voltage AC and 1500 V DC Traction Power Supply Cable Requirements*
- T HR EL 20003 ST *Underground Installation Configurations for High Voltage and 1500 V dc Cables*
- EP 20 00 00 03 SP *Above Ground Cable Installation Systems - Selection Guide*
- EP 20 00 00 20 SP *Testing of High Voltage and 1500 V dc Cables*
- EP 20 00 03 01 SP *HV and 1500 V DC Cables - Joints and Terminations*
- EP 20 00 04 01 SP *Cable Route Selection Guide*
- EP 20 00 04 04 SP *Ground Entry Arrangements*
- EP 20 00 04 05 SP *Cable Pits*
- EP 20 00 04 06 SP *Underground Cable - Location Recording*

5.3. Underground installation configurations

T HR EL 20003 ST has several requirements that are applicable to installations within the heavy rail corridor. For light rail installations, these requirements are only applicable to areas within segregated routes with boundary fences installed along both sides of the alignment route.

It is permissible that conduits for HV cables are encased within the concrete track slab, or in the concrete slab between the track slabs, at reduced depth.

For civil requirements that are applicable to undertrack crossings, refer to T LR CI 12530 ST *Corridor Interface Requirements*.

5.4. Above ground installation configurations

Above ground installation configurations shall only be used in a cable installation that is located within high security environments.

Examples of permissible environments include the following:

- within traction substations
- cable pits
- cable tunnels and shafts
- within the secure confines of a depot

Above ground installation configurations shall not be used in areas that are accessible to the public, including the light rail corridor in separated or mixed routes.

Above ground installation configurations may be installed in areas within segregated routes with boundary fences installed along both sides of the alignment route, provided that the safety risk is controlled so far as is reasonably practicable (SFAIRP) in accordance with a risk analysis undertaken in the design process.

Ground line troughing (GLT) shall not be used.