Sydney Trains
Engineering System Integrity
Engineering Instruction
Electrical Distribution Unit

EI D 25-04

Potential for Polychlorinated Biphenyl Compounds (PCB) in Paper Lead Cables

This Engineering Instruction includes urgent engineering information. Adherence to the information in this Instruction is **MANDATORY**.

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Audience:

- Teams Handling and Maintaining High Voltage Cables
- Asset Engineers
- Project Managers
- SEQR staff

Main Points:

- One ENO in the ACT has identified two High Voltage Paper Lead Cables containing PCBs. Other ENOs across Australia have undertaken sample testing and found no PCB in their cables.
- Sydney Trains does have High Voltage paper lead cables in service.
- Safe work procedures and PPE are required to ensure worker safety.
- Retain a sample of cable for PCB testing and analysis when paper lead cables are modified or repaired.

Primary Affected Document: SP D 79052 Cables – Work near or on/within

Scope

This Engineering Instruction addresses the potential hazard of Polychlorinated Biphenyl compounds (PCBs) in high voltage cables after an Electrical Network Operator (ENO) in the ACT (Evo Energy) identified traces of PCB in two (2) paper lead high voltage cables.

Background

Two samples taken by Evo Energy of paper lead high voltage cables were found to have traces of PCB contamination. Further tests conducted by other ENO across Australia have found no traces of PCBs. Polychlorinated biphenyl compounds (PCBs) are a class of highly persistent, bio accumulative chemicals that were once widely used in electrical products such as transformers, capacitors and light fittings. PCBs are listed under the Stockholm Convention on Persistent Organic Pollutants. They were phased out in Australia by the end of 2009 under the National PCB Management Plan.

The PCB CCO (PDF 58KB) sets out requirements for managing PCB materials and wastes, including activities such as:

- processing
- storage
- transport
- disposal.

PPE provides the best protection to minimise exposure. Upon exposure, our bodies will excrete PCBs at different rates and research suggests that complete elimination occurs over two to three months (maximum time) following exposure.

1. **Ingestion is highest risk** – application of PPE and good hygiene practices will eliminate the risk.
2. **Skin absorption** – studies have shown reduced absorption through skin and washing with soap within 15 minutes is effective in removing PCB/oil. Acute (once-off) and ongoing exposure response can result in chloracne/rash, depending on concentration and duration of exposure.
3. **Inhalation** – little research available but symptoms at high concentrations are typically respiratory irritation and laboured breathing. P2 Respiratory PPE are effective controls.

For recent exposures, blood testing for PCBs is also available. For more information, please discuss with your Line Manager or SEQR partner.

First aid

- If eye contamination occurs, remove any contact lenses and wash eyes for at least 15 minutes. Seek medical attention.
- If skin contamination occurs, the liquid should be wiped off immediately and the skin washed with soap and water. Water alone is not sufficient. If clothing is contaminated it should be quickly removed and disposed of as recommended. Solvents should NOT be used to wash the skin. Seek medical attention.
- Health monitoring – Blood testing can be used to indicate any exposure to PCBs; if deemed required please contact please the NSSQ Senior Occupational Hygienist to discuss further.

Sydney Trains engaged Progressive Risk Management to conduct testing of 16 samples of varying layers of the high voltage cables recently removed from the network. All samples returned a concentration of PCB below 2 mg/kg. In accordance with Polychlorinated Biphenyl (PCB) Chemical Control Order 1997, the cables sampled are classified as non-PCB containing material.

Action required

The following controls shall be implemented when handling cable belt papers or cores on assumed pre-1990 armoured type, paper insulated, oil impregnated cables.

- Procedure
  - The work must be performed in accordance with a documented risk assessment and safe work method statement specific to the task to be performed.
- Equipment
  - For cutting, use hydraulic cutting tools or similar jaw head cutting tool. This is to avoid excessive dust/fillings during cutting.
  - Do not use reciprocating saws on these cable types.
- Ventilation
  - Ensure work area is well ventilated. Consider natural and/or mechanical ventilation. Use local exhaust ventilation with HEPA and Organic Vapour filters (in Substation/enclosed areas) located adjacent to works and vent externally from the work area.
- Use and handle any material in accordance with the corresponding Safety Data Sheet (SDS).
- The following Personal Protective Equipment shall be worn:
  - chemically-impervious disposable overalls.
  - mid-arm nitrile, neoprene or Teflon gloves
  - safety glasses
  - rubber boots.
- Use a P2/ABEK1 silicon-fitted respirator (for particulate and vapour). Contact your Safety Partner to organise face fit testing of respirators.
- When heating binding agent, ensure all workers in the vicinity have required RPE/PPE or they must leave the immediate area during works.
- After working on pre-1990 cables, any contaminated PPE and Materials shall be bagged, labelled, and quarantined in a safe manner for disposal:
  - Upon completion of work, gloves and disposable coveralls shall be placed into contaminated waste bags and disposed of with cable waste.
  - All lead cables must be tested prior to disposal (see below).
- Practice good personal hygiene. Ensure you wash hands thoroughly with soap and water before eating, drinking, or smoking.
- When removing sections of paper lead cables, a 50 mm sample of the cable must be retained for chemical analysis. Please leave the sample in a safe place for later collection (a small cross-sectional sample only). Please contact the NSSQ Senior Occupational Hygienist for collection.

Contact

The EDU Team
RailElectricalSafety@transport,gov.nsw.au

Engineering System Integrity
Electrical Network Safety Rules

Engineering Specification
Electrical Distribution Unit

Working Near or On/Within

SP D 79052

Cables – Work near or on/within

Version 1.0
Date in Force: 1 February 2022

Transport Sydney Trains

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Document control

Version	Date	Author/ Prin. Eng.	Summary of change
1.0	1 February 2022	ENSR Project Team	First issue as Sydney Trains document. Extracted from SMS-06-GD-0268 V3.2. Reviewed as part of the ENSR Project.

Table of Contents

1 General

This document applies to persons authorised in accordance with *PR D 78701 Personnel Certifications – Electrical* who are permitted to work on cables. It is a offence to interfere with cables without authorisation and doing so may result in disciplinary action.

Prior to the commencement of any excavation, penetration or earthwork, an underground services search shall be undertaken refer to *PR D 78102 Electrical Hazards and Warnings* Section 5.5.2 Underground cables and buried services.

Underground services exist within the rail corridor, adjoining rail property, public streets, public property, and within private property. The presence of power poles and aerial conductors should not be taken as an indication that there are no buried services in the area. Prior to the commencement of any excavation work or earthwork, an underground services search shall be undertaken.

The Person in Charge of the Business Undertaking (PCBU) is to make sure all service searches are initiated. The person in charge of the work is to make sure that work does not begin until the services search has been completed with a copy on site, as well as the Line Manager in charge of the work approving the commencement of work.

The PCBU must contact "Dial before you Dig" and obtain a search of buried services in the vicinity of the worksite. This applies to location on and outside of the Rail Corridor.

A Detailed Service Search (DSS) identifies all services within the rail corridor, including those above and below ground and those owned by other organisations (e.g. Ausgrid). An Internal Service Search (ISS) identifies Sydney Trains Maintained services only.

The excavation plans shall be developed in accordance with the latest SafeWork NSW *Work near Overhead Power Lines: Code of Practice 2006* and *Work Near Underground Assets – Guide* which can be viewed at www.safework.nsw.gov.au.

2 Definitions

Refer to the **Electrical Safety Definitions** page available on the **RailSafe** site.

3 Hazards

Induced voltages and transferred earth potentials from adjacent cable or substation faults present a danger at cable worksites. Persons must either:

a. **not** to bridge themselves between conductors or sheath or earth and to work on one conductor or sheath only at a time, or

b. **bond** to ensure continuity of the cable conductors and sheath/s:

- a conductive mat bonded to the cable sheath shall be installed to provide a work platform for the jointer to work on
- work on one conductor or sheath only at a time.

4 Approach to high voltage or 1500 Volt cables

For the purpose of approach by persons, tools, materials or plant, workers must treat cables that do not have an earthed metallic sheath or screen as exposed equipment and apply the relevant minimum Safe Approach Distances (SADs).

Where an earthed metallic sheath or screen exists but its condition is doubtful or suspect, treat the cable as exposed equipment.

NOTE

As detailed in *SP D 79049 Safe Approach Distances (SADs)* Section 3.3.3 1500 Volt cables, a reduced SAD may apply to 1500 Volt cables.

When an earthed metallic sheath or screen exists and is exposed, take precautions where necessary to avoid danger from induced voltage and transferred earth potential before approaching the cable.

4.1 1500 Volt cables

4.1.1 Unscreened Insulated 1500 Volt cable

Treat 1500 Volt unscreened insulated cable as exposed 1500 Volt equipment.

Authorised Persons may approach an unscreened insulated 1500 Volt cable to a distance of not less than 50mm, on condition that:

- the reduced SAD is applied to the normally insulated cable only, and not applied to exposed conductor or conductive components connected to the conductor.

4.1.2 Screened 1500 Volt cable

Persons may touch a screened 1500 Volt cable provided it is visually inspected, by an Authorised Operator or Cable Jointer, and found to be in good condition and the screens confirmed that they are connected to earth.

5 Excavation and earth works near or on/within of cables

Where excavation or earth works will be required to, or might inadvertently come within 3 metres to Transport Asset Holding Entity of New South Wales (TAHE):

- buried power cables, or
- cables in ducts, galvanised steel troughing (GST), ground line troughing (GLT), or
- cable pits,

the Regional Electrical Engineer shall be contacted. The Electrical Engineering Manager or nominated representative, who are electrically certified person that holds the appropriate function, shall determine the appropriate risk mitigation strategy to be implemented.

An Electrical Permit may not be required if the work is:

a. to be carried out in accordance with an approved SWMS accepted by the Electrical Engineering Manager or nominated representative, who are electrically certified person that holds the appropriate function, and

b. carried out under the supervision of a Safety Observer whom shall be verified as competent on site in accordance with *SP D 79050 Safe Use of Mobile Plant around Electrical Equipment* Section 6 On site verification of competence of mobile plant operators and safety observers and fulfil their duties as per *PR D 78700 Working around Electrical Equipment* Section 5.4 Safety Observer.

NOTE

Excavation by mobile plant shall not be carried out within 2.0 m horizontally of the expected position of buried cables without first exposing all the buried cables by non-destructive techniques, such has hand excavation or vacuum extraction. In cases where ground conditions make non-destructive techniques impracticable, a mechanical excavation method may be used subject to the written approval and conditions of the Electrical Engineering Manager or nominated representative, who are electrically certified person that holds the appropriate function.

In addition to any risk mitigation strategies required to be implemented, excavation and earth works near or on/within of electrical cables shall be carried out in accordance with *SMS-06-OP-3026 Work Health and Safety (WHS) Risk Management*, in particular Section 2.4.

When an earthed metallic sheath or screen exists and is exposed, take precautions (such as seeking electrical advice) where necessary to avoid danger from induced voltage and transferred earth potential before approaching the cable.

NOTE

Refer to Transport for NSW (TfNSW) standard *T HR EL 20003 ST Underground Installation Configurations for High Voltage and 1500 V DC Cables*.

5.1 Cable protection covers

When it is necessary to remove or cut through the cable protection cover to allow further excavation or other work to proceed, the following precautions shall be undertaken:

- Even if an Electrical Permit has been issued for working on the de-energised cable, all other live cables in the same trench, conduit, tray or trough should also, where reasonably practicable, be de-energised.
- Suitable equipment (e.g. non-penetrating manual cutting equipment) shall be used to minimise the risk of cutting blades contacting cables protected by a cable protection cover, such as a cable cover, conduit tray or trough.
- Excavation by non-destructive techniques.

6 Handling high voltage or 1500 Volt cables

When it is necessary to move or bend a high voltage or 1500 Volt cable, the persons handling the cable are to be signed onto an appropriate Electrical Permit before handling the cable.

NOTE

If the cable is to be flexed significantly or moved, an insulation resistance test is to be carried out before the cable is moved and again before returning the cable to service to make sure of the continued integrity of the cable.

7 Work on cables

Persons are **not** to begin work or cut any cable until:

- the cable has been positively identified at the worksite by independent methods (e.g. survey layouts, cable protection methods, visual tracing, cable markings etc.), and
- the cable shall be Isolated and proved dead
- Persons signed onto appropriate Electrical Permit with details of the electrically safe work area between the spikes and/or terminations that are proven to be traced on both sides of the worksite.

A Low Voltage Access Permit is not required for work on low voltage cables when the work is being carried out by a Qualified Electrician or an Authorised Person (Low Voltage).

Refer to *PR D 78701 Personnel Certifications – Electrical* for details of who is permitted to carry out cable jointing and termination work on TAHE's high voltage and 1500V DC cables.

7.1 Work on abandoned cables

When it is necessary to carry out work on abandoned electrical cables or near the exposed cores of abandoned electrical cables, Line Managers are to make sure that:

- the cable is identified by its former identifier and designated as abandoned e.g. FORMER IS 12 (ABANDONED), and
- the cable is proved dead by spiking screened or metallic sheathed cables or testing unscreened cables with a non-contact device, and
- unless the cable is visually and continuously traced from end to end, an appropriate Electrical Permit endorsed ABANDONED is issued.

WARNING

Take care when tracing cables to include tee-offs that branch from the cable.

8 Reference documents

PR D 78102 Electrical Hazards and Warnings

PR D 78700 Working around Electrical Equipment

PR D 78701 Personnel Certifications – Electrical

SMS-06-OP-3026 Work Health and Safety (WHS) Risk Management

SP D 79049 Safe Approach Distances (SADs)

SP D 79050 Safe Use of Mobile Plant around Electrical Equipment

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