



AUSTRALIAN RAIL TRACK CORPORATION LTD

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Discipline

Engineering Standard – NSW

Category

Electrical

Title

Requirements for Handling & Disposal of Material containing PCB

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The technical content of this document has been approved by the relevant ARTC engineering authority and has also been endorsed by the ARTC Safety Committee.

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About This Standard

Polychlorinated biphenyls, commonly known as PCBs, are a family of many closely related chemicals. They were used for insulating electrical equipment from 1930 until 1973 when sales were restricted due to concerns about possible health and environmental effects. Current NSW legislation regards materials containing quantities of PCB of 50 mg/kg or more to constitute a health and environmental risk and so defines them as a controlled substance.

The purpose of this document is to provide guidance to ensure that persons working on ARTC electrical infrastructure, and the environment are adequately protected from exposure to PCBs.

Management must take appropriate measures to ensure that persons under their control are aware of, and understand, the requirements of this document.

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1 Introduction

1.1 Summary of Definitions

Current NSW legislation regards materials containing quantities of PCB of 50 mg/kg or more to constitute a health and environmental risk and so defines them as a controlled substance.

Materials containing less than 50 mg/kg of PCB but more than 2 mg/kg of PCB are not considered to be controlled substances. However, due to the persistence and bioaccumulation of PCBs there is still a need to protect against the release of this level of PCB into the environment.

These levels have been established after extensive investigations into the health effects of PCB. It is therefore necessary to follow the relevant sections of this document pertaining to the handling and disposal of materials containing 2 mg/kg or more of PCB.

Materials containing less than 2 mg/kg are considered as “PCB Free” and no extra controls are required above the usual treatment for the particular material.

Note: Concentrations are in milligrams per kilogram (mg/kg) which are generally interchangeable with parts per million (ppm).

1.2 Nature of PCB and Past Usage

Polychlorinated biphenyls, commonly known as PCBs, are a family of many closely related chemicals. The various PCBs all share the same biphenyl (12 carbon) structure with a varying number of chlorine atoms to produce a large number of possible combinations. They were used commercially from 1930 until 1973 when sales were restricted due to concerns about possible health and environmental effects.

The attraction of PCBs in electrical equipment was due to their excellent dielectric properties combined with a high flashpoint (temperature at which a vapour from a liquid will ignite). PCBs also have a high degree of chemical stability, are resistant to oxidation and degradation by acids and bases, and practically insoluble in water.

Although not used in new equipment, PCBs are still found in some older equipment. In Australian Rail Track Corporation equipment, PCBs are known to be present in two situations:

- In power factor correction capacitors fitted in some light fittings.
- In some transformer oils, 'trace' quantities up to a few hundred milligrams per kilogram can be found. Although ARTC transformers were never insulated with PCB rather than mineral oil, some transformers were contaminated by manufacturers who produced PCB insulated transformers but did not segregate production equipment.

1.3 Statutory Requirements

The "Polychlorinated Biphenyl Wastes (PCB) Chemical Control Order 1994" contains conditions relating to the manufacturing, processing, storing, conveying and disposing of PCB wastes. Under this order PCB wastes are defined as any

waste liquid, sludge or solid (including waste articles and containers) which contain 50 milligrams per kilogram or more of one or more PCBs.

The Chemical Control Order is administered by the Environment Protection Authority (NSW EPA) under the Environmentally Hazardous Chemicals Act, 1985. This Act is binding on the Australian Rail Track Corporation. Notations shown thus '(cco #.#)' are references to sections in the Chemical Control Order.

The Environment Protection Authority (NSW) has also published a document, "Guideline for the Management of Materials Containing PCBs Below Fifty Milligrams Per Kilogram" which is provisional at this stage and is not state legislation. However, it does provide 'good practice' for the disposal, transport and storage of materials containing PCBs below 50 milligrams per kilogram. Materials containing less than two milligrams per kilogram of PCBs are not considered as PCB materials for the purposes of this guideline.

2 Safe Work Practices

All work must be planned and executed in a manner that minimises the number of persons involved, the degree of handling of PCB and the amount of waste material produced.

Every care should be taken to ensure that PCB is not ingested nor otherwise allowed to enter the body by absorption through the skin. Strict hygiene precautions should be observed by thoroughly washing hands and face before eating, drinking, smoking or using toilet facilities whilst working with materials containing PCB. If eye or nose irritation is experienced, the persons exposed should leave the work scene until natural ventilation reduces the vapours to the level where no irritation is felt.

Solvents can produce flammable vapours. There must be no naked flame or source of ignition present during use of solvents. Forced ventilation may be required to some indoor locations.

At normal operating temperatures, PCBs do not readily vaporise, and as such do not represent a major hazard. However, if PCB vapours are suspected or the material has been subject to extreme heat, such as in the case of a fire, then a respirator as specified should be worn.

If contact with skin occurs, the affected area should be washed immediately with soap and water and dried with disposable towels or rags. Do not use kerosene or solvent to remove PCBs from the skin.

If eyes have been exposed to PCBs, they should be washed thoroughly with saline solution (eye wash) in plastic disposable bottles, after which medical attention should be sought. Sufficient eye wash bottles containing sterile saline solution should be provided. In an emergency, clean water may be used.

If normal non-protective clothing, including footwear, becomes contaminated, remove the affected item as soon as practicable and wash thoroughly with soap and water. Check for skin contamination and wash the area if necessary.

If any skin irritation or respiratory tract irritation develops while working with PCBs, then medical advice should be sought.

If accidental ingestion occurs, medical advice should be sought. Vomiting should *not* be induced, nor should oily laxatives be given.

3 Records of Work

A database listing all equipment identified as containing PCB at levels of 2 mg/kg or more, must be maintained. This database should have separate sections for oil containing 50 mg/kg or more of PCB and oil containing between 2 mg/kg and 50 mg/kg of PCB.

A register of all works by persons that involve the handling of materials containing 50 mg/kg or more of PCB must also be maintained. The register must show the date, nature and location of the work and the names of the persons involved.

4 Labelling

Appropriate legible indelible labelling must be conspicuously affixed in accordance with the following:

- Oil insulated equipment containing 50 mg/kg or more of PCB. Labels should read:

“Caution - contains PCB of 50 mg/kg or more”

- Oil insulated equipment containing between 2 mg/kg and 50 mg/kg of PCB. Labels should read:

“Caution - contains PCB between 2 mg/kg and 50 mg/kg”

- Sealable drum used for storing material containing 50 mg/kg or more of PCB. Labels should read:

“Caution - contains PCB of 50 mg/kg or more”

- Sealable drum used for storing material containing between 2 mg/kg and 50 mg/kg of PCB. Labels should read:

“Caution - contains PCB between 2 mg/kg and 50 mg/kg”

- Heavy duty plastic bags that are to be placed in sealable drums. Labels should read:

“Caution - Contaminated waste”

- Miscellaneous equipment used for work involving material containing 50 mg/kg or more of PCB. Labels should read:

“Caution - PCB contaminated”

5 Personal Protective Equipment

Persons who are required to carry out any work exposing them to materials either proven or suspected to contain 50 mg/kg or more of PCB, must use the appropriate protective equipment. This includes impermeable gloves, coveralls or aprons, overshoes, chemical type safety goggles and respiratory protective equipment.

Clothing manufactured from absorbent materials should be avoided.

A summary of the appropriate personal protective equipment required for various situations is presented below:

	Maintenance involving no contact	Maintenance with possible contact	Minor Leakage	Internal fault without rupture	Internal fault with rupture without fire	Fire
Impermeable gloves		+	+		+	+
Eye protection		+	+		+	+
Overshoes					+	+
Apron		+*	+*			
Coveralls		+*	+*		+	+
Respiratory equipment						+

(*): Apron or Impermeable coveralls can be used alternatively.

6 Temporary Storage

In order to dispose of material containing 2 mg/kg or more of PCB in economical quantities, it may be necessary to allocate a suitable secure area in a suitable location, for storage purposes. The materials must be stored in a prominently labelled sealable drum. All drums must be maintained in good order. The area should have no drainage outlets which could cause pollution of the environment.

In addition, the following requirements are to be met:

- Leaking capacitor cans containing PCB or other contaminated solid material must be first sealed in a labelled heavy duty bag prior to being placed in a sealable drum.
- All rags, overalls, absorbent material, etc., that are contaminated with PCB from a source that contains 50 mg/kg or more of PCB must first be placed in a labelled heavy duty plastic bag prior to being placed in a sealable drum.
- Any solvent contaminated with PCB from a source that contains 50 mg/kg or more of PCB must be poured into a metal screw top container which must then be placed in a labelled heavy duty plastic bag prior to being placed in a sealable drum

The notifiable quantity of material contaminated with PCB from a source that

contains 50 mg/kg or more of PCB is 50 kg. When the level of temporary storage at one location exceeds 50 kg the EPA must be notified in writing, and thereafter annually (cco 6.3.2). The total quantity of the waste stored in any one location must not be allowed to exceed 1000 kg as a licence is required for storage over this amount (cco 6.3.3).

7 Containment and Clean-up Requirements in Case of Leakage or Spillage

In case of leakage or spillage, if the material contains more than 2 mg/kg of PCB, then the following actions should be taken:

- (i) The access to polluted areas should be restricted as far as practical to the minimum number of personnel required to deal with the incident.
- (ii) The leakage should be contained.
- (iii) The leakage point should be repaired if possible, or temporarily sealed, without heat source.
- (iv) The spillage should be cleaned up. Spilled oil must *not* be hosed away into normal waste channels. It should be absorbed using an inert absorbent material, such as Apporb or Chemsorb, which should be collected and later disposed of in the appropriate manner. Details of disposal methods are detailed in clause 11 : Disposal.
- (v) Any residual material should be wiped from impervious surfaces using wipes or rags soaked in a suitable proprietary solvent, such as Electosolv. These rags should afterwards be disposed of in the appropriate manner. Appropriate precautions should be taken when handling solvents.
- (vi) Contamination of other areas by transferring pollution on footwear or protective clothing should be avoided. All such contaminated items should be removed and retained in the working area together with all cleaning materials, prior to disposal of the whole in the appropriate manner.
- (vii) If applicable the leakage or spillage must be reported in accordance with the reporting procedure of clause 9.
- (viii) The equipment should be repaired or replaced and disposed of in the appropriate manner.

8 Precautions in Case of Fire

If materials are contaminated with PCBs, in fire conditions, toxic gases and vapours and other degradation products can be produced. In any incident in which material containing 2 mg/kg or more of PCB is involved in a fire, the following precautions must be taken in addition to the containment and clean-up requirements.

- (i) The areas polluted by fumes should be evacuated. Wherever practicable, smoke emanating from a fire should be contained, for example, ensure that all ventilation systems are switched off.
- (ii) The contamination of adjacent areas should be limited. Every precaution should be taken to prevent ingress of soot and contaminated fire fighting water into normal waste channels.

- (iii) When the fire has been extinguished, barriers should be erected and security arrangements made to control access into the affected area.
- (iv) The airborne and surface contaminants should be measured and evaluated in consultation with the Environmental Protection Agency. (This is only required if the level of PCB contamination is 50 mg/kg or more, unless otherwise requested by the EPA).
- (v) After use, soot-contaminated fire fighting apparatus, including protective clothing, should be removed and stored in a secure area in heavy duty plastic bags or sealable drums, as detailed in clause 6 : Temporary Storage.

9 Reporting of Spills

Spills of materials containing less than 50 mg/kg of PCB are not required to be reported. However the guidelines for cleaning up a spillage or leakage should still be followed rigorously.

All spills of materials containing 50 mg/kg or more of PCB must be reported on the WorkCover Authority Accident Report form ANF1. In the event of a spill occurring during transport, the Environment Protection Authority must also be notified (*cco 6.4.1*). The report is to be comprehensive and include sketches, photographs, etc. The clean-up of PCB spills and reporting is to be treated as most urgent.

Following the clean-up operation, samples are to be taken from the contaminated areas and tested to verify that the clean-up has been performed satisfactorily. The results must then be forwarded to WorkCover as an addendum to the report.

10 Transport

Materials containing less than 50 mg/kg of PCB must be conveyed in a safe manner that minimises the risk of spillage and therefore the release of PCB into the environment.

Materials containing 50 mg/kg or more of PCB may be transported by an ordinary vehicle provided that the total amount of PCB waste is under one tonne and the following precautions are taken:-

- (i) The material containing PCB is in secondary containment, eg. leaking capacitors placed in a heavy duty plastic bag and then stored inside a sealable drum.
- (ii) The driver or other personnel being conveyed in the vehicle must have an understanding of the hazards and precautions associated with PCBs and be instructed in procedures to contain the PCB should it be spilt. The appropriate personal protective equipment and other equipment required to contain a leakage or spillage, are to be provided.
- (iii) All PCB material must be well secured to the vehicle and should be clearly marked with details of the contents in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail.
- (iv) If a leakage develops en-route, the vehicle must be stopped and the appropriate procedures for cleaning and reporting followed before the journey is

continued.

Note: Where one tonne or more of PCB wastes are to be conveyed, the PCB wastes must be conveyed under the authority of, and in accordance with the conditions of a licence granted by the Environment Protection Authority (NSW).

11 Disposal

Deliberate dilution of waste contaminated with PCBs to reduce the concentration level is forbidden.

Materials containing less than 2 mg/kg of PCB

Materials containing less than 2 mg/kg of PCB can be disposed of under the standard procedures for the particular material. For example, selling mineral oils to an oil refinery.

Materials containing between 2 mg/kg and 50 mg/kg of PCB

Materials containing 2 mg/kg or more, but less than 50 mg/kg, of PCB should be disposed of in an appropriate manner depending on whether it is in liquid or solid form:

- Liquid materials may be sold to an oil refinery or as fuel for approved boilers or furnaces, with appropriate notification to the purchaser of the PCB contamination level.
- Solid or stabilised sludge may be disposed of at a controlled landfill. Rags, absorbent material, disposable clothing, and the like can be disposed of in this manner. Liquid waste may not be disposed of in a landfill.

Material containing 50 mg/kg or more of PCB including capacitors

Disposal of material containing 50 mg/kg or more of PCB can only be carried out by a registered removal and storage or disposal company.

12 Capacitor Identification

Information available indicates that PCB is present in capacitors manufactured in Australia between 1960 and 1975, in the 3-40 microfarad, 250V ratings (except for special capacitors used in split phase motor starting). The period of use of PCB in imported makes of capacitors may vary.

For Ducon make, capacitors with code starting with 'AP' or 'GP' in front of the part number indicates PCB impregnated.

Leaking capacitors must be treated as if containing PCB unless it can be established that this is not the case.

13 References

- 1) Environment Protection Authority, "Chemical Control Order in Relation to Polychlorinated Biphenyl Wastes", 16 November 1994.
- 2) Price G., Occupational Health & Safety Co-ordinator, "Personal Protective

Equipment for Handling Materials Contaminated With PCBs", 18 February 1992.

- 3) Worksafe Australia, WorkCover Authority, "PCBs in Capacitors - What Are They? What are the hazards?", March 1991.
- 4) AS/NZS 1337-1992 Eye Protectors for Industrial Applications.
- 5) AS1716 - 1991 Respiratory Protective Devices.
- 6) Environment Protection Authority, "Guideline for the Management of Materials Containing Polychlorinated Biphenyls (PCBs) Below Fifty milligrams per kilogram", November 1994.
- 7) Unipede, "The Safe Use of Fully Enclosed Oil-Filled Electrical Equipment Which May be Contaminated With PCBs", January 1994.

14 Appendix A: Main Hazards of PCB

14.1 Health Risks

Currently it is accepted internationally that the threshold level of 50 mg/kg is an appropriate level for PCB wastes to be strictly controlled. This level has been established after extensive investigation into the health effects of PCBs. Below this level, it is not generally considered that regulation is necessary.

Prolonged or repeated exposure to high concentrations of PCBs is known to cause serious health problems. The likelihood of becoming sick from PCBs is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Most of the reported problems have followed high levels of exposure over a long period of time. For example, workers in industries manufacturing PCBs or assembling components containing PCBs and people accidentally poisoned after using PCB contaminated cooking oil.

The health effects of PCBs in individuals exposed to repeated high concentrations include:

- Skin: Repeated and prolonged exposure may cause chloracne, which is a severe, persistent acne-like rash. This symptom is the commonest sign of exposure to PCBs.
- Liver: Repeated and prolonged exposure can cause liver damage.
- Nervous system: High exposures can damage the nervous system, causing numbness, weakness and tingling in the arms and legs.
- Cancer: Liver cancers are produced in animals exposed to PCBs. It is thought that PCBs do not initiate cancer, but can increase the growth of pre-existing cancer. However, as the risk to humans is uncertain, contact with PCBs should be reduced to a level as low as reasonably practicable.
- Reproductive System: Animal studies show that high levels of PCBs can reduce fertility. A pregnant woman exposed to levels sufficient to show signs

of toxicity, has been shown to cause miscarriage or spontaneous abortion. PCBs are excreted in breast milk. At high exposures PCBs are also implicated in the development of birth defects in children of mothers who have eaten PCB adulterated food.

- Immune System: Evidence from animal studies and PCB workers is emerging which suggests that PCBs may suppress the immune system.

14.2 Environmental Factors

PCBs tend to bind to fats and oils, and when released into the environment are generally bio-accumulative. Contaminated material is consumed by micro-organisms and is retained in their fatty tissues. The micro-organisms are then eaten by larger organisms and much of the PCBs are retained in these organisms' fatty tissues whilst other components are passed as waste. The effect is known as "bio-concentration" and is multiplicative at each trophic level in the food chain. The result is that large carnivores, such as the larger fish which we might eat, could have concentrations of PCBs tens of hundreds of times higher than that seen in the microorganism that first consumed the waste. (Such a scenario relies on widespread low level contamination; 1mg of PCB in the environment will never become 1kg of PCB no matter how many trophic levels there are in the food chain. However, a large carnivore could accumulate concentrations several orders of magnitude higher than found in its environment). For this reason, it is essential that PCBs be kept out of the environment.