



SAPP PCBs MANAGEMENT GUIDELINES

CONFIGURATION MANAGEMENT

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Foreword

The PCBs guidelines are prepared for the general management of PCBs with a plan for the removal and destruction of PCBs shall be known as the SAPP PCBs Management Guidelines. The objective of the guidelines is to provide guidance relative to the General Management of PCBs with a view for disposal and ultimately the phase-out of PCB and items containing PCBs in accordance with the relevant international standards/conventions, regional protocols and national statutory and legislation requirements / framework. This specification was prepared on behalf of the Southern African Power Pool, Management Committee (MANCO).

The Environmental Subcommittee working group on the development of these PCB management Guidelines comprised members from all the SAPP member power utilities and the SAPP Coordination Centre.

Introduction

The SAPP Safety Health and Environmental Guideline (SHE) provides for the development of relevant guidelines and framework for common management and standardization of approaches to general safety and environmental management among member utilities. These guidelines have been developed:

- *based on the human health impact and environmental risk that PCBs poses,*
- *and outlines the general threshold concentrations and notifiable quantities,*
- *and outlines basic approaches starting with inventory collection, general management, safe disposal and record keeping, and*
- *seek to incorporate dates for the cessation and generation of PCB waste, type, cessation of the use of articles containing PCBs and disposal of PCBs in terms of a phase-out plan.*

These guidelines have been prepared to develop and establish and promote uniform requirements for management of PCBs in all SAPP member utilities.

It is the desire and wish of the SAPP Environmental Subcommittee that all utilities and relevant national authorities will assist in the adoption of these guidelines. The local adaptation should be in line with the provisions of the local or internal minimum requirements *for the Trading, Handling, Classification and Disposal of Hazardous Waste*".

Keywords

Polychlorinated biphenyls, PCB, Askarel, Aroclor

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1.0 SCOPE

These guidelines apply to all SAPP member utilities as well as their contractors and suppliers. It is developed to ensure that the SAPP SHE guideline is implemented, and to prevent health risks to persons exposed to PCBs. Furthermore to minimize or remove adverse impacts on the environment and the general public.

2.0 NORMATIVE REFERENCES

This guideline is aligned with existing international, regional and national environmental and safety legislation¹. The following documents contain provisions, which, through reference in this text, constitute provisions of this specification:

- Stockholm Convention on Persistent Organic Pollutants (POPs)
- The Basel Convention on Trans-boundary Movement of Hazardous Waste and its Disposal
- The SADC Protocol on Environment
- The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)
- SAPP Vision of ensuring sustainable energy developments through sound economic, environmental and social practices.
- SAPP SHE Guideline
- Relevant and applicable respective national environmental legislation and power utility standards where available.
- Bamako Convention on the ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa (1991)

3.0 COMMON TERMS AND DEFINITIONS

Capacitor

Device for accumulating and holding a charge of electricity and consisting of conducting surfaces separated by a dielectric.

Clean up

Action of remediation

NOTE may include soil excavation, bio-remediation, solvent soil wash, land farming or electrochemical treatment.

Commercial building

Non-industrial, non-substation building typically accessible to both members of the general public and employees and include public assembly properties, institutional properties, residential properties, stores, office buildings and transportation centres

Concentration

Refers to the level in terms of parts per million (ppm) of PCBs in the sample

Congeners

Group of chemicals, which have the same basic structure

Containment

Prevention of the spreading of the oil spill

De-chlorination

Removal of chlorine from the dielectric fluid through chlorine stripping chemical process

De-chlorinated oil

PCB contaminated oil which has passed through a chlorine stripping chemical process and has been treated in such a manner so as to render it safe and no longer a safety, health and environmental hazard

Diluent

Medium within which PCBs are distributed, such as oil, concrete and certain equipment parts

NOTE: It does not refer to the bulk casing or other solids surrounding the PCB material.

Dielectric fluid

The fluid used in electrical equipment, such as transformers and capacitors, for electrical insulation and thermal cooling. e.g. mineral oils, PCB and it's substitutes.

Disposal:

Disposal is the process of removing and storage of disused or contaminated equipment or material, in a controlled and approved manner, by a competent contractor.

Electrical equipment

Transformers, capacitors, voltage regulators, re-closers, switchgear and cables, which contain dielectric fluid

Emergency Action Plan

The Emergency Action Plan provides procedures for the containment and clean up of spills associated with mineral oil containing PCB when transported or contained in bulk quantities.

Emergency Response Personnel

The individuals listed in the Emergency Action Plan, which are responsible for the operation and are the first to be notified in case of an emergency during the loading and transportation process.

Inhibitor additive (anti-oxidant additive)

Product that renders oxidation reaction inactive

NOTE: Organic compounds found in a transformer will undergo oxidation. During the oxidation process, chemically unstable intermediate compounds are formed, with the production of final oxidation products such as organic acids and sludges. Oils do contain a certain portion of natural inhibitors, but additional inhibitors also referred to as anti-oxidant additives may be added to oil. The most commonly used inhibitor is Diiso - butyl - para - cresol (DBPC) or also known as Butyalated hydroxy - toluene (BHT).

Leak

Continuous dripping that will result in pooling of oil and will require corrective action, as the electrical equipment will have to be topped-up

License

An operating permit obtained relating to the handling, storage and disposal of PCBs, from the relevant government authority

Non PCB

Any fluid, including that in electrical equipment and any item, which has a measurable PCB, concentration of less than 50 ppm of PCB is considered a non-PCB item.

Notifiable quantity

More than the allowable amount of a scheduled / hazardous waste held on any one premises

Off-site

Road or property not belonging to the owner of the particular piece of electrical equipment

On-site

Road or property belonging to the owner of the particular piece of electrical equipment

Parts per million

Measure of concentration

NOTE Also referred to as ppm or milligram of PCB per kilogram of oil, soil or water (mg/kg). 1 percent (%) of PCB in a kilogram of oil will relate to 10 000 ppm PCB.

PCB contaminated

Any fluid, including that in electrical equipment and any item which has a measurable PCB concentration of 50 ppm or greater.

PCB contaminated item

Any PCB article, container that contains PCB or PCB articles and whose surfaces have been in direct contact with PCB.

PCB-free

PCB non-detectable by chemical analysis from an accredited and approved laboratory.

PCB Hazards

PCBs are carcinogenic agents, that can cause cancer, induce infertility, may cause certain skin disorders and liver damage. Furthermore PCB is not biologically degradable and therefore tends to be passed on through the food chain, creating major environmental pollution and health hazards. The combustion by-products of PCB are a hazard.

PCB Levels

As defined in any national or regional or international standard

PCB material / PCB item

Fluid, including that in electrical equipment and in any item, which has a measurable PCB concentration equal to or greater than 500 ppm (pure PCBs)

Polychlorinated Biphenyls (PCB)

The name PCB is a generic name for a group of fire resistant dielectric fluids and synthetic insulating liquids composed of polychlorinated biphenyls. *It includes any* one of a number of 209 congeners containing one to ten chlorine atoms attached to a biphenyl group. PCB is commonly known by various brand names. These include *Aroclor, Askarel, Clophen, Chlorinol, Chlorectol, Interteen, Kaneclor, Phenoclor, Pyralene, Elemex, Pyranol, Santotherm, Sovol, Therminol etc. (expand to include possible equipment containing PCBs).*

Priority area

An area that requires a high level of protection in terms of PCB risk.

NOTE: These areas include, but are not limited to, potable, surface and ground water catchment areas, food processing facilities, animal feed lots, hospitals, schools, aquatic spawning areas and endangered species habitats.

Reclassification

Changing the PCB classification of electrical equipment, by reducing or increasing the PCB concentration or contaminated levels.

Re-classified

The labeling process after the concentration of PCBs in a PCB item or PCB contaminated item has been changed by replacing the dielectric fluid or through PCB decontamination

Re-classifying

Changing the PCB classification of electrical equipment, following the reduction or increasing the PCB concentration or contamination levels

Re-generated or reclaimed oil

Used oil, which has been reprocessed to comply in all respects with any relevant standard.

Remediation

Method of clean-up that will ensure a minimum hydrocarbon or synthetic oil presence of 1 000 ppm or (0,1%) above the background level in the case of petroleum products and 5 000 ppm in the case of mineral based products

Responsible laboratory

Any competent approved laboratory, which is capable of analyzing dielectric fluids, water and soil samples in accordance with internationally accepted standards.

Restricted access area

Any section that is duly declared, and demarcated for purpose of control

Re-trofilling

Process of PCB or PCB contaminated oil being replaced with non-PCB oil

Safe disposal

Process of removal and storage of disused or contaminated equipment or material, in a controlled manner, to a registered site, or total destruction through an approved competent, licensed contractor

Sample

A representative portion of the material (soil, fluid) to be analysed

Spill

Any amount of oil out of its "normal" container – where normal refers to a transformer or a drum etc.

Spillage

The discharge, including leakages, of any quantity of dielectric fluids into the environment.

Temporary PCB storage area

An area specifically designed for the temporary storage of PCB or PCB items. Such areas shall comply with all national statutory requirements and shall be licensed or approved in writing by the relevant national authorities. The same shall apply to transit areas.

Terms

GHS:	Globally Harmonized System of classification & labeling of chemicals
SADC:	Southern African Development Community
SAPP:	Southern African Power Pool
EPA:	Environmental Protection Agency
PPE:	Personal Protective Equipment

PVC: Poly Vinyl Compound

Transformer:

A static electrical device that transfers electricity from one electrical circuit to another by magnetic coupling. It is often used to convert between high and low voltages and accordingly between low and high currents.

Transit/ collection area

Where the PCB contaminated items are temporarily stored

NOTE: Transit areas are also referred to as collection areas in terms of Appendix “Minimum requirements for the handling, classification and disposal of hazardous waste’.

Unused oil

Non-PCB virgin oil or oil never used in electrical equipment which complies in all respects to any relevant, national, regional or international standard.

Weep

Where no free running oil is visible, but the area is damp with oil

NOTE: An area where dust accumulates but no effective loss of oil is evident.

Wetlands

Low-lying areas temporarily or permanently covered by shallow water

4.0 RESPONSIBILITIES

- (a) All SAPP member utilities shall endeavor to adhere to and implement these guidelines.
- (b) SAPP member utilities as well as their contractors shall develop formal action plans for PCB Management, which should include:
 - Corporate Directives;
 - Record keeping;
 - PCB incidents;
 - Risk assessment;
 - Handling, transportation and disposal of PCB;
 - Training of personnel;

- Personal protective equipment; and
 - Emergency planning.
- (c) SAPP member utilities shall not, at any time, trade in PCB.
- (d) All SAPP member utilities should ensure that audits are conducted in compliance with the relevant standards/regulations.

5.0 REQUIREMENTS

5.1 Inventories

An inventory is the starting point for the identification of management options to deal with PCB containing materials. The purpose of the inventory is to identify and record all equipment or material that (might) contain PCBs. This information is essential in compiling a plan for replacement/disposal of the PCB item, PCB contaminated material or PCB contaminated oil.

Every Utility will establish a PCB inventory by inspection and testing of all equipment. A preliminary PCB inventory data collection format is given in Annexure B.

In the case of capacitors, the manufacturer's plate shall display whether the unit contains PCBs in the form of Askarel or other trade names. In the case of transformers the equipment should be handled as if PCB contaminated if no PCB information is displayed on the unit.

Oil samples shall be drawn from the transformer and analyzed for the presence of PCBs. The samples shall be submitted to an approved and accredited laboratory for PCB analysis. A PCB classification sticker indicating the PCB concentration level and date sampled shall be issued by the accredited and approved laboratory. This sticker shall be displayed on a visible part on the equipment and the information captured in the PCB inventory.

5.2 Identification and labelling

All identified PCB containing equipment and facilities must have their external surfaces or perimeter fences labeled in accordance with GHS with a warning label. The following information must appear on the surface of the container or fence.

(a) Use of Hazardous Chemical signs during transportation of PCBs.

Labelling of tested equipment and facilities etc

During transportation of PCB or PCB items the vehicle and container must be marked and labelled accordingly. A description should be given to enable the reader to interpret the warning panel for PCB.

(b) Safety sign for use on entrances and boundary of sites containing PCBs or PCB containing equipment.

An appropriate sign based on the Globally Harmonized System of Classification & Labeling of Chemicals must be affixed and displayed at entrances, gates, exits and all sides of the perimeter fence of sites containing PCBs. The sign must be printed on 2mm thick chrome plates as appropriate and applicable backing to facilitate fixing on fences, gates or any other surfaces. The surface where the label is being affixed onto the equipment or fence or container must be thoroughly cleaned to ensure proper adhesion and label must be clearly visible.

This includes: Capacitor banks, Substations, Storage sites and other areas.

(insert example of a label)

5.3 Approved Personal Protective Equipment

(a) Respirators

- i) Specific respirators for hydrocarbons (for use in open air).
- ii) Self-supporting breathing apparatus when working in confined areas.

(b) Personal Protective equipment

Eye protection - Full-face airtight goggles.

Respiratory equipment is required when:

- Work area is poorly ventilated
- Work involves less chlorinated more volatile congeners
- When temperatures are abnormally high

Trunk protection - Knee-length PVC raincoat over overall with elasticized cuffs and ankles.

Hand protection - PVC-type gloves reaching up to the elbows of the overall.

Foot protection - PVC knee-length gumboots.

One piece disposable chemical resistant suit for body protection

Full-face mask with type CC replacement canister can be used for low-level exposure.

NOTE: Only PVC outer garments shall be worn, as rubber is not resistant to PCB. Any other garments must be approved by the relevant authorities. All disposable PPE must be disposed of after use by an approved PCB disposal method.

5.4 Recommended Monitoring Method

5.4.1 Personal monitoring

Personal monitoring must be performed on workers who are directly exposed to PCBs or its vapours through occupational hygiene monitoring and by conducting medical examination twice per year.

This applies to workers who are involved in activities such as the replacement of damaged PCB filled capacitors, cleaning of spilled PCBs, disposal of PCBs, etc.

5.4.2 Environmental monitoring

Monitoring of the environment where PCB containing equipment is located as well as evaluation of the effectiveness of the protective equipment, from time to time is necessary. This shall include: water, soil, surfaces (walls). This must be done by suitably trained and competent personnel.

5.5 Sampling and Testing for PCBs

This section gives guidelines for sampling, transportation and analyzing of dielectric fluids, solid and water samples for the purpose of determining PCB concentration.

It is recommended that a single disposable sampling apparatus be used as a standard practice. This is in order to determine presence of PCBs. This shall be done by suitably trained and competent personnel.

5.5.1 Dielectric fluid samples from containers and transformers

Since PCB molecules are of a higher density than oil molecules, PCB will tend to be more concentrated at the bottom of a container unless it has been thoroughly mixed. A container shall be considered to be thoroughly mixed if mixing is either

by heat convections from being energized 24 hours prior to sampling, or shaking from being transported within 24 hours prior to sampling.

If the container has neither been energized nor transported within 24 hours prior to sampling, then a representative sample of the entire column of dielectric fluid shall be obtained.

Note: Wear protective clothing when sampling and testing

(a) Techniques for Dielectric Fluid Sampling

All samples must be collected in recommended containers. For oil samples, Glass jars of 125ml or more, with a wide opening should be used. For soil samples, Glass jars of 250ml or more, with a wide opening should be used. For water samples a 1 litre bottle (amber glass) with a narrow opening should be used.

Only new jars should be used for collecting samples. Always store the bottles in a clean, dry cabinet.

The following sampling techniques may be used as appropriate:

(i) Equipment Contents (not mixed thoroughly)

If not thoroughly mixed, obtain a column sample by inserting an appropriate length of disposable plastic tubing through the hand hole, removable lid, fuse opening or oil check hole.

(ii) Equipment Contents (mixed thoroughly)

If thoroughly mixed, use a drain valve if present, or use a disposable plastic pipette with a bulb by inserting it through the hand hole, removable lid, tube opening or oil check hole. To do otherwise could create an unnecessary safety or operating hazard, particularly if equipment is energized. (Rephrase)

NOTE: Only certain transformers may be sampled when energized.

(iii) Substation Equipment

Use oil sampling valve or drain valve regardless of whether thoroughly mixed or not.

Information to consider while sampling oil in transformers:

- Collecting samples from live transformers must be done by qualified personnel
- Transformers should be set off-line and de-energized before sampling where applicable
- A substantial electrical charge will persist for some time
- Take measures to prevent spills, and to contain spills if they occur
- Dielectric fluid is most efficiently collected using disposable flexible plastic tube.
- Transformers in service may be sampled through the drain valve

(iv) Small containers, cans or drums

Obtain a column sample of oil using any length of disposable rigid glass tubing through the bung hole. It is recommended that all drums, cans, etc. be treated as **not thoroughly mixed**.

Information to consider while sampling oil in drums.

- Drums containing liquid waste or new oil may be under pressure or vacuum
- Drums should be sampled in an upright position
- Non-sparking tools should be used to open drums
- Drums are usually sampled using a rigid tube made of glass, plastic or Teflon™
- Oil sampling method must ensure proportional sample from every liquid level.

(b) General procedure for sampling dielectric fluid in containers and transformers

- Make sure contents are thoroughly mixed.
- Establish access into the container by removal of fuse, lid etc.
- Place first **control number** label on the container from which the sample was collected and second control number on sample bottle. This procedure will provide a mechanism for tracking the status of all samples collected, whether on a routine basis or spill related incidents.
- Clean up any spilled or contaminated material and dispose it of.
- Send samples to an approved or accredited laboratory. (See Appendix B Samples submittal form to the laboratory)

(c) General procedure for transporting dielectric fluid samples

Place clean dry labeled bottles in appropriate size container, with labeling as required.

- Secure container with masking tape.
- Place sample and field test form in mailing slip (Appendix A).
- Send to an approved or accredited laboratory.

5.5.2 Soil Sampling

In the event of a dielectric fluid spill, it is necessary to collect samples to document that spill clean up was effective in removing contaminated soil and other materials.

It is more important, however, that a sample of dielectric fluid be obtained from all ruptured equipment prior to clean up so that the concentration of PCB in the equipment can be determined.

After spill excavation and before area restoration, soil samples should be collected (as a minimum) from the bottom and wall of each excavation site and from a background location common to the spill incident.

(a) Techniques for soil sampling

- (i) Damaged equipment
 - Obtain dielectric fluid sample from either damaged equipment or pools on ground using disposable plastic pipette or an appropriate length of plastic tubing.
- (ii) Soil
 - Obtain soil sample using disposable plastic scoop.
 - For a biased sampling, collect samples from obviously contaminated soil
 - Surface sampling of soil involves collecting samples at depth of 0 to 15 cm
 - Equipment which can be used to collect soil samples are Soil auger bucket and a Split spoon. In the absence of the above equipment any other clean spoon can be used.

(b) General sampling procedure before soil excavation and restoration

- i) Determine location of soil sample if possible seek assistance from relevant authority.
- ii) Place first control number on damaged equipment.
- iii) Place second control number on sample bottle.
- iv) Collect enough samples (about 500g per sampling point) representative of the area of contamination.
- v) Label sample and sampling point on site.
- vi) Dispose PCB contaminated items in an approved manner (section 5.12)
- vii) Repeat steps (a) to (e) for each piece of ruptured equipment.
- viii) Send samples to an approved or accredited laboratory.

5.5.3 Water Sampling

If a spill results in the contamination of any water, it is necessary to collect water samples near the spill site both upstream and downstream (in running water) to document levels of PCB contamination and effectiveness of clean-up actions. Spills into water will require close co-ordination, the responsible authority shall be notified immediately upon gaining knowledge that dielectric fluid has entered water systems.

As with any PCB spill, it is important to sample dielectric fluid from all ruptured equipment for the determination of PCB concentration.

The sampling of water may require special attention since PCB may be present as a bottom layer sediment, surface film, emulsion solution, or any combination of the above. Soil samples from the bank may also be needed.

(a) Techniques for water sampling

- Surface water sampling can be done by using Van Dorn bottle or Kemmerer sampler.
- Ground water sampling can be done by using a Bailer or an Air-lift sampler. In the absence of the above samplers a reasonable clean water bucket can be used to collect the water samples.
- Samples will be collected in glass bottles (see section 5.5.4 above for the description)
- Samples should be collected below water surface by both removing and replacing cap while bottle is submerged.

(b) General procedure for water sampling

- (i) Sample ruptured equipment as in Section 5.4.4.2
- (ii) With guidance from relevant authorities determine best locations to sample water.
- (iii) Collect 1-litre samples making sure that bottle cap is removed, bottle is filled and cap is replaced while bottle is submerged.
- (iv) Wipe bottle clean using paper towel and then dispose of paper towel as PCB contaminated article.
- (v) Dispose of PCB contaminated items in an approved manner
- (vi) Send samples to the approved or accredited laboratory

Where contamination has affected matrices (media) other than soil, water and sediments, samples of surfaces (porous and non-porous) should also be obtained. Inform relevant authorities if you have problems collecting samples.

5.5.4 Laboratory PCB Testing Methods

The analysis of dielectric fluids, soil and water samples by an approved or accredited laboratory, must adhere to the guidelines as given below.

(a) Laboratory Analysis by Gas Chromatography (GC)

This will only be done by sending samples to an approved and or accredited laboratory with GC facilities.

(b) Procedures for testing PCB in dielectric fluids and soil

It is recommended that one screening test be used on site to determine if dielectric fluid or soil is PCB contaminated. The recommended test kit is Clor-N-Oil and Clor-N-Soil. These are colorimetric tests without use of any equipment. Other tests which involve use of equipment are Kwik Skrene and L2000 test apparatus.

(c) Procedures for testing PCB in water.

This will only be done by sending water samples to an approved or accredited laboratory.

5.6 Handling

Ensure that before handling any PCB containing equipment, wear PPE (refer to section 5.3.). The PCB status of any equipment shall be verified prior to any work or disposal undertaken by the handler.

5.6.1 Field Handling

(a) PCB and PCB contaminated fluid handling

- (i) Do not mix other fluids with dielectric fluids. Separate drums must be used for solvents, paint waste, contaminated water, etc and labeled accordingly.
- (ii) Any dielectric fluid of unknown concentration must be assumed to be PCB contaminated and labeled, transported accordingly. It is not necessary that these dielectric fluids be sampled prior to transportation.
- (iii) Drums should not be completely filled. Leave at least Fifty (50) mm for expansion of liquids.
- (iv) The container for all liquid PCB wastes shall be a 210 litre UN approved drum, or similar drums conforming to the same specification. The drums shall be stored in an approved storage area in such a manner that will prevent pollution of the environment.
- (v) Any dielectric fluid with an unknown concentration, or with a concentration greater than 50 ppm of PCB must be placed in a temporary storage area.
- (vi) PCB liquids (liquids which contain PCB concentrations equal to or greater than 500 ppm) shall not be stored in a temporary storage area for extended periods. These MUST be disposed of as soon, as is practically possible (recommended period not exceeding twelve months).

5.6.2 Handling of PCB & PCB contaminated electrical equipment, other than capacitors

- a) All electrical equipment tested for PCB must be labeled accordingly. (Section 5.6.5) In addition, any non-labeled electrical equipment in which PCB concentration of the fluid is unknown must be assumed to be PCB contaminated unless tested. This includes transformers, circuit breakers, voltage regulators, cables, switchgear, reactors and reclosers.
- b) Only approved containers for leaking PCB and PCB contaminated electrical equipment shall be used. The containers shall be stored in an approved

storage area (as per USEPA PCB storage area standard or equivalent) in such a manner that will prevent pollution of the environment.

- c) Leaking electrical equipment must either be placed (if small) in a drum or drained and sealed immediately for storage and transportation. No leaking electrical equipment may be stored or transported unless in an approved PCB storage container.

5.6.3 Handling of PCB and PCB contaminated non-liquids

All PCB and PCB contaminated non-liquids, once drummed, MUST be placed immediately in a temporary designated PCB storage area.

5.6.4 Handling of Capacitors

- a) There will be **no disposal** of capacitors on local level unless an approved disposal facility is available within that country, in accordance to the Basel Convention on trans-boundary movement of hazardous waste.
- b) Information on all capacitors, which are defective, not scheduled for re-use, or have failed, must be forwarded to the relevant authorities, this is to arrange for disposal, only for exportation to another country for disposal.
- c) Name plates on capacitors **should not** be removed before transportation.
- d) Leaking and unserviceable capacitors **must** be placed in an approved container for temporary storage and transportation.
- e) Storage containers containing spill debris or leaking capacitors should be placed in temporary storage areas prior to transportation with sufficient sorbent materials to absorb any free liquids.

5.6.5 Labeling

(a) Drummed PCB or PCB contaminated materials.

All drums containing PCB or PCB contaminated materials being prepared for transportation shall be labeled with the appropriate PCB label.

(b) Electrical equipment

All PCB containing electrical equipment shall be labeled according to the different concentration level. The date the PCB or PCB contaminated item is removed from service must be shown on each item.

5.6.6 Temporary Storage

A facility shall be established in a designated area for the temporary storage of PCB contaminated materials and selected PCB electrical equipment **designated for disposal**. The size of the temporary storage is to be determined by each responsible utility according to anticipated storage needs. This temporary storage **must** be properly marked and should be built in accordance with USEPA or equivalent specifications for a PCB storage facility.

All temporary storage areas **must** have a Spill Prevention, Control and Counter measure Plan. (Refer to section EMP for emergency response procedure).

PCB liquids and other material (containing PCB concentrations greater than 500 ppm) shall be considered for priority disposal and shall not be stored in a temporary storage area for extended periods, not exceeding the temporary storage license period. These must be transported to a permanent disposal area as soon as possible.

A temporary storage area should be used for the storage of PCB and PCB contaminated items only.

All temporary storage areas must be checked on a regular basis (not exceeding monthly intervals) to ensure there are no leaking items being stored in these areas. Any PCB contaminated electrical equipment, which develops a leak that cannot be easily corrected, must be drained into a storage drum immediately and any contaminated areas should be rehabilitated. A checklist register shall be maintained and shall record all incidents and status of PCB equipment.

5.6.7 Transportation

All transportation shall be undertaken in accordance with the relevant environmental and road ordinances for the transportation of hazardous substances.

5.6.8 Emergency Action Plan

5.6.8.1 *Emergency Management and Reponse Requirements*

- a) As a strategy to reduce risks, owners of PCB materials and waste, PCB transporters and PCB disposal facilities shall develop Emergency Management and Response Plans for the containment and clean-up of accidental release of PCBs into the environment.
- b) The EMP identifies the potential environmental impacts and mitigation actions to avoid their occurrence or to reduce environmental impact should they occur.

All PCB transportation operations shall be undertaken in accordance with the applicable and acceptable standards and requirements for transportation of hazardous waste. The following procedure shall be followed in the event of an accidental leak or spill during the loading and transportation operation.

The transport vehicle operator shall:

- i. Determine the source of the leak or spill.
- ii. Take the necessary action to stop the leak or spill and contain any free liquid
- iii. Block off area of the spill if possible immediately report the incident to the Emergency Response Personnel (ERP) as listed in the Emergency Action Plan. The transport operator shall furnish the following information to the responsible individuals;

- The time, location and nature of the leak or spill
- The estimated quantity of PCB leaked or spilled
- The PCB level of the liquid
- Whether or not the leak has been stopped
- Whether or not the free liquid has been contained.

iv.) The ERP shall promptly move to the incident or accident and should additional assistance be required, contact the local Emergency Services for Dangerous Goods Incidents, operating in the particular area. The ERP shall provide the Emergency Services with the following information;

- Name of the product/Shipping name
- United Nations Identification number (*UN Number*)
- Hazard class and subsidiary risk of the substance
- Type and size of Dangerous Goods Incident

This Emergency Action Plan provides procedures for the containment and clean up of spills associated with PCB oils when transported in bulk quantities.

5.6.9. Emergency Action Procedure

In the event of a leak, spills or incident occurring during transport, the following action shall be taken:

- i. Determine the source of leak or spill
- ii. Take such action as necessary and possible to stop the leak or spill and contain any free liquid.
- iii. Block off the area of the spill if possible
- iv. Immediately report the incident to the Supervisor.
The following information shall be included in the report:
 - Time, location and nature of leak or spill
 - Quantity of liquid leaked or spilled
 - PCB classification of liquid (and concentration, if known)
 - Whether or not leak is stopped
 - Whether or not free liquid is contained

5.6.9 Materials and Equipment

The following materials and equipment shall be maintained on the vehicle when transporting bulk liquids.

- Absorbent Material,
- Shovel,
- Drip Pan,
- Identification Labels,
- Wood Dowels,
- Warning Markers and
- Protective Clothing.

5.7 Guidelines for spill clean up

5.7.1 Clean-up responsibility

Each unit responsible for maintaining electrical equipment containing dielectric fluids should be prepared to clean up dielectric fluid spills. If there is any problem contact the supervisor.

The materials management procedure must provide for the required equipment to be available for dielectric fluid clean up.

5.7.2 Clean-up requirements for public access areas

These requirements apply to all dielectric fluid spills regardless of PCB concentration. See section 5.7.2 (b) below for special requirements regarding dielectric fluid spills from capacitors.

(a) Isolating and containing the spill

Isolate and contain the spill to minimize the area affected and to prevent spreading. Every effort should be made to stop further discharges of dielectric fluid from leaking equipment and containers, for example by tightening connections, using wooden plugs or duxseal in holes, and placing leaking items in drums. Secure drums, including sealing the tops, for transportation to the temporary storage area. If the PCB content of the dielectric fluid is unknown, obtain a fluid sample for testing. It is important that a fluid sample be obtained even if only a few drops of fluid are available. See section 4.4 for the recommended sampling procedures.

Treat the dielectric fluid like PCB until the analysis of the sample is known.

- (i) Pooled liquids: Where possible, pump all pooled liquids into 210 litre drums for disposal.
- (ii) Solid material: Clean up solid materials containing visible traces of dielectric fluid. Place these solid materials along with all clean-up materials and other debris in drums for disposal.
- (iii) Hard surfaces: Clean up all hard surfaces (vehicles, sidewalks, buildings, etc.) by using oil sorbent materials and by wiping the surfaces with solvents (mineral spirits) three times. Place the used clean-up materials in drums for disposal.
- (iv) Asphalt surfaces: Clean up asphalt surfaces by using oil sorbent materials and by scrubbing the surface three times with detergent. Place the used clean-up materials in drums for disposal.

(b) Electrical Equipment dielectric fluid spills

The following procedure shall be used for dielectric fluid spills from all capacitors **regardless of PCB concentration**:

- (i) Leaking electrical equipment: Place leaking equipment in appropriate drums with sufficient oil sorbent material to absorb any fluid remaining in the capacitor(s). **Do not place soil, debris, or clean-up materials in the same drums with capacitors.**
- (ii) Solid materials: Clean up solid materials containing visible traces of dielectric fluid. Place these solid materials along with all clean-up materials and other debris in drums for disposal.
- (iii) Hard surfaces: Clean up all hard surfaces (vehicles, sidewalks, buildings, etc.) by using oil sorbent materials and by wiping the surfaces with solvents (mineral spirits) three times. Place the used clean-up materials in drums for disposal.
- (iv) Asphalt surfaces: Clean up asphalt surfaces by using oil sorbent materials and by scrubbing the surface three times with detergent. Place the used clean-up materials in drums for disposal.

(c) Verifying adequacy of clean-up

Verifying the adequacy of clean up is required for all dielectric fluid spills except those involving dielectric fluids KNOWN to contain less than 10 ppm of PCB.

- (i) Obtain soil samples from the bottom and wall of the excavated area. One sample for every 3 square metres of excavated area is sufficient. In addition, obtain a sample outside the spill site to be used to determine the background PCB levels of the area. See Section 5.4 for the sampling techniques and equipment.
- (ii) Send both the dielectric fluid and soil samples to the approved testing laboratory for analysis. See section above for the proper sample documentation and transportation. An analysis of the dielectric fluid sample will determine if soil samples need to be tested to determine the adequacy of clean up.
- (iii) After clean-up is completed, return the affected area to its original condition by replacing soil, planting grass in case of substations crushed stones should be replaced etc.

(d) Notification of local safety officer/supervisor

Notify above mentioned as soon as possible after **each** dielectric fluid spill. The above mentioned should also as soon as possible inform the appropriate authorities. Be prepared to furnish as much of the information as possible:

- (i) Date and time of incident (estimate if unknown).
- (ii) Date and time of discovery.
- (iii) Location of incident.
- (iv) Source of material released (e.g. transformer, capacitors, give all name plate data).
- (v) Type and volume of fluid released.
- (vi) Cause of release.
- (vii) If release entered a body of water or sewer: give name and general description of body of water or sewer.
- (viii) Clean-up or containment steps taken.
- (ix) Name and phone number of person to contact for further details.

5.7.3 Clean-up requirements for restricted access areas

(a) The guidelines to all dielectric fluid spills restricted access areas regardless of PCB concentration.

See Section 5.6.2 (b) for special requirements concerning dielectric fluid spills from capacitors.

Isolate and contain the spills to minimize the area affected and to prevent spreading. Every effort should be made to stop further discharge of dielectric fluids from leaking equipment and containers, for example, by tightening connections, using wooden plugs or duxseal in holes, and placing leaking items in drums. Secure drums, including sealing the tops if possible, for transportation to the temporary storage area. *It is important that a fluid sample be obtained even if only a few drops of fluid are available.* See Section 5.4 for the recommended sampling procedures.

- (i) Pooled liquids: Where possible, pump all pooled liquids into drums for disposal.
- (ii) Other liquids: Clean up all liquids which cannot be pumped by using oil dry, oil sorbent material, pads, etc. and place these materials into drums for disposal.
- (iii) Solid materials: Clean up solid materials containing visible traces of dielectric fluid. Place these solid materials along with all clean-up materials and other debris in drums for disposal.
- (iv) Hard surfaces: Clean up all hard surfaces (vehicles, sidewalks, buildings, etc.) by using oil sorbent materials and by wiping the surfaces with solvents (mineral spirits) three times. Dispose of the used clean-up materials by placing them in drums for disposal.

(b) Verification of the adequacy of clean-up

Adequacy of clean up in restricted access areas is achieved by:

- (i) The removal and proper disposal of spilled fluids and/or visibly contaminated solid materials, and by the three solvent wipe downs for hard surfaces contacted by the fluid spilled.
- (ii) Restoring the affected areas to good condition with replacement of soil and gravel as required.

5.8 Servicing and Reclassifying of Electrical Equipment

PCB contaminated oil shall not be diluted to result in PCB waste becoming non-PCB or PCB free waste. Only with the approval of the relevant authorities may blending be used to facilitate the treatment of PCB waste (see section 5.8.2).

5.8.1 Servicing

Listed below are minimum requirements for servicing electrical equipment. Workers must consult and adhere to individual work practices that are contained in their procedures.

The dielectric fluid used in the maintenance work of electrical equipment shall not increase the PCB classification of such equipment.

(a) Service non-PCB electrical equipment using standard work practices for maintenance and repair.

(b) Service PCB-contaminated electrical equipment after complete draining of the PCB-contaminated electric fluid, use standard work practices.

NOTE: Minor repairs not involving the handling of the dielectric fluid, may be performed without draining. The original PCB-contaminated dielectric fluid may not be re-used. PCB fluid must be phased out during maintenance. PCB-contaminated electrical equipment retrofilled with non-PCB fluid is still considered "PCB-contaminated" and must be labeled as such.

(c) Servicing PCB electrical equipment has the following limitations:

- (i) Transformer: Any work requiring the removal of the core and coil from a PCB transformer case is prohibited, unless it is done by a registered contractor for packaging and shipping to an approved incinerator.
- (ii) Electrical equipment other than transformer: Any work requiring the removal of the internal components is prohibited.
- (iii) Draining or adding of dielectric fluid is permitted as prescribed in sub-section 5.7.1(d) below.

(d) Dielectric fluid replacement

- (i) No original dielectric fluid may be returned to same equipment.
- (ii) The preferred method is to retrofill with non-PCB dielectric fluid.

NOTE - PCB electrical equipment retrofilled with a non-PCB dielectric fluid is **still considered containing PCB and must be labeled as such.**

5.8.2 Inspections

(a) Inspection frequency

Regular inspections shall be conducted based on a predefined risk to health and environment.

- (i) Weekly: A visual inspection of each piece of PCB electrical equipment that is used or stored for reuse, which poses an exposure, **risk to food or feed** shall be performed at least once a week.
- (ii) Three monthly: A visual inspection of each piece of PCB electrical **in use or stored** shall be performed at least once every three months.
- (iii) Twelve monthly: A reduced visual inspection frequency to at least once every twelve months applies to PCB electrical equipment that utilise either of the following risk reduction measures:
 - PCB electrical equipment that has 100 percent containment capacity for the total fluid volume of all equipment so contained.
 - Retrofilled PCB electrical equipment that has been tested after three months in service and found to contain less than 60 000 ppm PCB.

(b) Minimum inspection requirements

- (i) The extent of the visual inspections will depend on the physical constraints of each electrical equipment installation. Electrical shutdown of the equipment being inspected is not required.
- (ii) The inspection must include investigation for any leak of dielectric fluid on or around the electrical equipment.

(c) Corrective maintenance requirements

- (i) When PCB electrical equipment is found to have a leak which results in any quantity of PCB running off or about to run off the **external surface** of the equipment, such equipment shall be repaired or replaced within 48 hours to eliminate the source of the leak.
- (ii) Until repairs are complete, any leak of PCB must be contained to prevent exposure to humans or the environment and must be inspected **daily** to verify containment. Lined concrete trenches, buckets or pans are examples of proper containment measures.
- (iii) The leaking dielectric fluid must be cleaned up and disposed of in accordance with Section 5.7.

5.8.3 Housekeeping of PCB electrical equipment

Records of PCB electrical equipment shall be maintained in accordance with the local regulation after disposing of the equipment. The records shall contain the following information for each unit of PCB electrical equipment:

(a) Inspection record keeping

- (i) Location of equipment
- (ii) The date of each visual inspection and date that leak was discovered if different from the inspection date.
- (iii) The person performing the inspections.

(b) Maintenance record keeping

- (i) The location of any leaks and the estimated amount of dielectric fluid released.
- (ii) The date of any clean-up, containment or repair or replacement.
- (iii) A description of any clean up, containment or repair performed.
- (iv) The result of any containment and daily inspection required for uncorrected active leaks.

(c) Retro-filling and Reclassification record keeping

(i) Retro-filling of transformers

- Equipment may be re-classified through retro-filling or treated in situ provided it is managed through an approved procedure. Management requirements shall be based on the PCB concentration in the diluent, measured after at least three months of normal operation following retro-filling or treatment of the equipment. PCB waste derived from retro-filling or in situ PCB treatment shall be disposed of as required under these guidelines.
- Insulating fluid should be drained from transformer, and if necessary flushed with a suitable solvent.
- Retro-fill with a non-PCB or PCB-free oil
- Maintain the original PCB classification label on the equipment and introduce a second label indicating that it has been retro-filled for purposes of changing its PCB classification (based on the GHSS labeling standard).

(ii) Re-classification of transformers

- The original PCB or PCB contaminated fluid shall not be used for reclassification.
- Retro-fill equipment, energise and reclassify after a minimum period of 3 months after last servicing was done, this is to allow for residual PCB to leach from the transformer cellulose insulation in order to obtain the actual PCB concentration of the equipment.
- A reclassification record shall be maintained and should contain the following information:
 - Date on which the last maintenance / retro-fill was conducted on PCB containing equipment
 - Copy of the laboratory report indicating the date, name of approved and accredited laboratory and PCB concentration after the 3 month reclassification period.
- Redundant PCB or PCB contaminated transformers shall be dismantled by an approved contractor and transported to an approved thermal treatment plant for destruction.

(d) Disposal Record Keeping

- (i) Date of disposal.
- (ii) Description of equipment and other PCB related material disposed of.
- (iii) Name and locality of registered disposal site.
- (iv) Name and contact information of contractor employed for disposal.
- (v) Certificate issued by contractor for each load of equipment or materials disposed of..
- (vi) Copy of disposal facility's permit.
- (vii) Copy of waste manifestos (document signed by waste owner, transporter and disposal facility).

Any unserviceable or redundant PCB equipment must be stored in the prescribed manner until such equipment is disposed of in an approved manner. Redundant transformers containing PCBs must be dismantled by a licensed contractor, before packaging and transporting it to an approved storage facility or incinerator.

5.9 Equipment Management and Phase-out

- (i) A risk-based strategy for equipment containing PCBs shall be adopted. This shall comprise the elements of surveying, testing, managing and disposal of identified high-risk equipment. Recommended phase-out steps/phases are illustrated in Section 5.9 of this document.
- (ii) PCB contaminated capacitor cans (unless re-deployed in an existing PCB bank) and capacitor banks shall not be re-deployed after decommissioning.
- (iii) It is recommended that the phase-out plan be started by undertaking surveys to establish a PCB inventory of equipment, with emphasis on priority areas, identifying possible locations and possible quantities of PCB materials or PCB waste. Equipment phase-out in order of their risk profile is recommended.
- (iv) Risk Management Programmes (RMPs), including Environmental Management Programmes (EMPs), should be implemented for all equipment after the completion of the inventory to facilitate phase-out in accordance with the targeted dates as set in the Stockholm convention. It is recommended that;
 - a) in priority areas, removal from service of equipment containing concentrated PCB material (above 500 ppm) and the management

thereof as PCB waste within the specified timeframe, following inventory completion, for the removal of PCB from priority areas as implemented by the end user utility. In other than priority areas, in-situ treatment to less than the threshold concentration or removal from service of all equipment after inventory completion containing concentrated PCB material shall be undertaken within the specified timeframe legislated under any appropriate and approved standard (local, regional or international).

- c) Testing of equipment which could potentially contain PCBs within the legislated timeframe following the initial survey; treatment of PCB material in equipment to less than the threshold concentration or removal of all identified PCB material from service within the legislated timeframe following identification.
- d) Testing of all other equipment which may contain scheduled PCB material at the time of maintenance, repair or decommissioning; treatment to less than the threshold concentration or removal of all identified PCB material from service within the legislated timeframe following identification.
- (v) Other equipment such as some of the older capacitors found in lighting ballasts, are known to contain small quantities of PCBs above the threshold concentration. These shall, at the end of their useful lives, be managed and disposed of as PCB waste.

5.10 Purchasing

- The purchasing and supplies departments must not purchase or accept dielectric fluids and electrical equipment containing PCBs. Dielectric fluids and electrical equipment imported into SAPP member power utilities should be tested for PCBs.

5.11 Trading

- SAPP member utilities will not trade in PCBs and associated equipment. Redundant equipment must not be sold as scrap unless it is certified to be PCB free.

- The decision to use PCB de-chlorinated oil in electrical equipment will be the decision of the equipment owner. The status of the oil shall be made known to prospective buyers for tracking purposes

5.12 Disposal

Any PCB contaminated material must be disposed of only by registered contractors.

Only UN approved containers or other containers conforming to the same specification must be used for storage on site as well as for transportation and disposal. Any disused oil containing PCB must be stored in clearly labeled approved containers in such a manner that pollution of the environment is prevented. Liquid and solid material should not be mixed in the same container.

Unserviceable capacitors must be disposed off into approved containers or other containers conforming to the same specification for final disposal into an approved site, where it should be stored above ground to facilitate future recovery for disposal using proper destruction technology. Redundant PCB contaminated transformers must not be sold as scrap but must be dismantled by a registered contractor before packaging and shipping to an approved incinerator.

5.13 Training and education

SAPP member utilities will ensure the proper training of relevant personnel as a key component of implementing the risk-base strategy. Training shall include, but not be limited to, the SAPP guidelines for the management of PCBs. Training should be conducted by approved trainers as recognized by SAPP ESC.

5.14 Communication

All communication external to SAPP utilities with respect to PCB matters shall be handled by authorized personnel within each utility, after consultations with the personnel in charge of PCB management.

5.15 Documentation

The following documents shall be formalized with regard to PCB management:

- (i) Phase-out strategies
- (ii) action plans
- (iii) emergency plans
- (iv) information systems; and
- (v) environmental and health review reports

These shall be available for audit and investigation purposes.

5.16 Records

The relevant authorized persons on all aspects of PCB shall maintain records. These records shall include:

- (i) Sampling and field test form (Appendix A)
- (ii) Laboratory analysis form (Appendix B)
- (iii) Inventories; (Appendix C)
- (iv) PCB work performed; (Appendix D)
- (v) Safe Disposal Certificates; (Appendix E)
- (vi) PCB status & incidents, (Appendix F)
- (vii) Personal Protective Equipment (PPE);
- (viii) PCB Labels (Appendix G)

APPENDIX A: SAMPLING AND FIELD TEST FORM

GENERAL INFORMATION		
Inventory No:	Date of sampling:	Time:
Temperature (°C):	<input type="checkbox"/> Sunny	<input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy
Site location: (City / Address)	Owner of site:	
Contact:	Telephone:	
SAMPLE INFORMATION		
Location of sampling station: _____		
Sketch provided on reverse: <input type="checkbox"/> Yes <input type="checkbox"/> No		
Matrix:	<input type="checkbox"/> Oil	<input type="checkbox"/> Soil <input type="checkbox"/> Water <input type="checkbox"/> Sediments
	<input type="checkbox"/> Wipe	<input type="checkbox"/> Other _____
Oil sample:	Soil sample:	Water sample:
<input type="checkbox"/> Drum	<input type="checkbox"/> Surface	<input type="checkbox"/> Potable water
<input type="checkbox"/> Out-of-service transformer	<input type="checkbox"/> Shallow trench	<input type="checkbox"/> Wastewater
<input type="checkbox"/> Transformer in service	<input type="checkbox"/> Deep trench	<input type="checkbox"/> Groundwater
<input type="checkbox"/> Other _____	<input type="checkbox"/> Pile	<input type="checkbox"/> Surface water
Inventory id. No: _____	<input type="checkbox"/> Excavation wall	
	<input type="checkbox"/> Excavation bottom	
Method of sampling: _____		
Depth of sampling (water, soil, sediments): ____ meter(s) Volume of sample (ml): _____		
Sample identification: _____ Duplicate: _____		

Analysis required within : <input type="checkbox"/> 5 work days <input type="checkbox"/> 10 work days <input type="checkbox"/> Other _____	Required detection limits : Oil, soil, sediments and other solids : 0,1 mg/kg Water : 0,1 µg/l (GC/ECD) and 1 ng/l (GC/MS) Wipe : 1 µg total		
Special instructions :			
CHAIN-OF-CUSTODY			
Collected by / Relinquished by	Date	Accepted by	Organization

APPENDIX C: INVENTORY FIELD FORM

GENERAL INFORMATION					
Inventory No:	Date inventory data collected:			Time:	
Site location: (City / Address)			Owner of site:		
Contact:		Telephone:			
EQUIPMENT INFORMATION					
<input type="checkbox"/> Drum	<input type="checkbox"/> Reactor	<input type="checkbox"/> OCB			
<input type="checkbox"/> Out-of-service transformer	<input type="checkbox"/> Capacitor in service				
<input type="checkbox"/> Transformer in service	<input type="checkbox"/> Capacitor out-of-service				
<input type="checkbox"/> Other _____					
Equipment Name	Serial No.	Rating	Manufacturer	Country	Date Manufactured
Status of the Dielectric equipment: _____					
Any other Remarks: _____					
DATA COLLECTOR					
Prepared by: _____ Signature: _____ Date: _____					

APPENDIX D: PCB WORK PERFORMED

PCB WORK PERFORMED		
Date work performed:	Time work performed:	
Site location: (City / Address)		Owner of site:
Contact:	Telephone:	
Details of PCB work Performed: _____ _____ _____ _____ _____		
*Give as much information as possible on the work performed		
SUPERVISOR		
Prepared by: _____ Signature: _____ Date: _____		

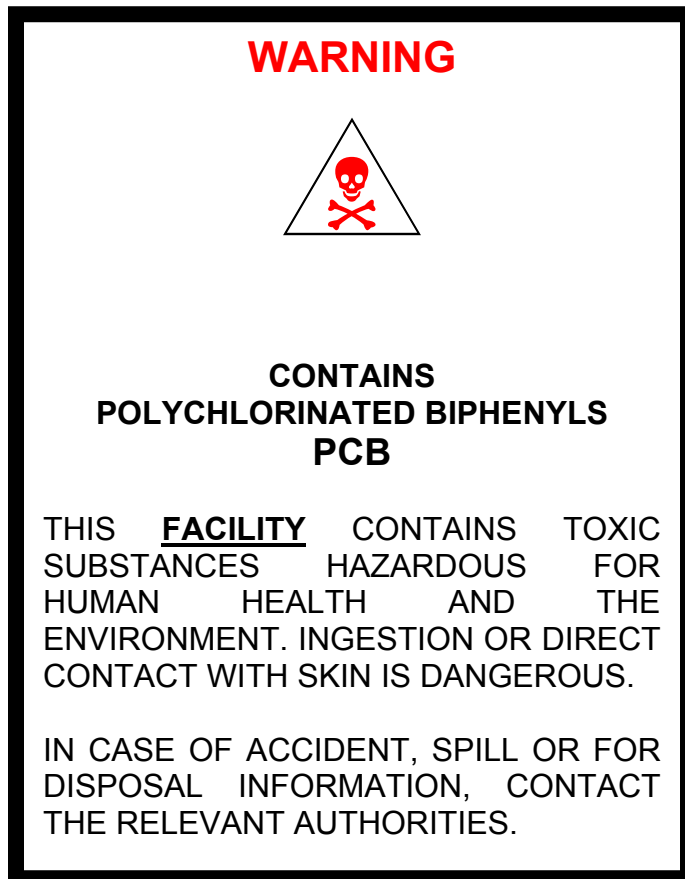
APPENDIX E: DISPOSAL PARTICULARS

DISPOSAL PARTICULARS		
Date of disposal:	Date information collected:	Time:
Site location: (City / Address)		Owner of site:
Contact:	Telephone:	
Details of Disposal particulars: _____ _____ _____ _____ _____		
*Give as much information as possible on the disposal details		
<i>SUPERVISOR</i>		
Prepared by: _____ Signature: _____ Date: _____		

APPENDIX F: PCB INCIDENTS

PCB INCIDENTS		
Date of incident:	Time of incident:	
Site location: (City / Address)	Owner of site:	
Personnel involved:	Telephone:	
Details of PCB incidents: _____ _____ _____ _____ _____		
*Give as much information as possible on the incident		
<i>SUPERVISOR</i>		
Prepared by: _____ Signature: _____ Date: _____		

APPENDIX G: SAMPLE PCBs LABELS



WARNING



**CONTAINS
POLYCHLORINATED BIPHENYLS
PCB**

THIS **EQUIPMENT** CONTAINS A TOXIC SUBSTANCE HAZARDOUS FOR HUMAN HEALTH AND THE ENVIRONMENT. INGESTION OR DIRECT CONTACT WITH SKIN IS DANGEROUS.

IN CASE OF ACCIDENT, SPILL OR FOR DISPOSAL INFORMATION, CONTACT THE RELEVANT AUTHORITIES.





REFERENCES

1. www.pops.int
2. www.basel.int
3. www.sadc.int
4. http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html

5. www.sapp.co.zw

