PCB

EMERGENCY GUIDANCE


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for Training and Research

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INTRODUCTION

Introduction

PCB had been widely used and produced as dielectric oil in the electrical sector due to its unique properties, non-flammability, chemical stability, high boiling point and electrical insulating properties. Its use has been beneficial also in many more applications to the society, however it also represented a risk, as it was determined that PCBs negatively affect humans and the environment due to their persistence, bioaccumulation, toxicity and ability travel long distances. As a responds, many countries stopped their production in the late 1970s and a global agreement was initiated in 2002, the Stockholm Convention on Persistent Organic Pollutants (POPs).

PCB are listed in the Stockholm Convention and requires all parties to stop the use of PCB by 2025 and to ensure good management of PCB waste by 2028.

It is well known that PCBs can contaminate humans and organisms through inhalation, ingestion, absorption through skin and direct contact with other tissues. It can also enter ecosystems through air, water and soil. Workers working in the electrical sector can be particularly exposed to PCB.

Accidents with PCB can be problematic. To name one example. In October 2015, a fire started in a transformer tank at an electrical facility located in the municipality of Laurelty-San Lorenzo in Paraguay. The facility provides electricity to the country and is located in a densely populated metropolitan area 11 km from the capital, Asunción. The fire was extinguished within 4 hours, however the impact in the surrounding ecosystems and populations are still not fully understood.

This guidance presents the actions and procedures to follow in case PCB related accidents happen. It also provides examples of other PCB accidents in different parts of the world as well as recommendations on how to best prevent these accidents. It is intended for workers dealing with PCBs, managers of the electrical facilities, as well as the local emergency response teams and organizations. This guidance provides a step-by-step approach to mitigate and reduce the impacts of the PCB accidents and to prevent those accidents in humans and the environment.

1

BACKGROUND INFORMATION

1.1 Background Information

WHAT ARE PCBs ?

Polychlorinated Biphenyles (PCBs) are a group of organic chemicals consisting of carbon, hydrogen and chlorine atoms. PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until manufacturing was banned in 1979. They have a range of toxicity and vary in consistency from thin, light-colored liquids to yellow or black waxy solids.

WHY PCBS WERE USED IN TRANSFORMERS AND OTHER EQUIPMENT?

Due to their excellent electrical properties, non-flammability, chemical stability, high boiling point and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including:

- Electrical, heat transfer and hydraulic equipment;
- Plasticizers in paints, plastics and rubber products;
- Pigments, dyes and carbonless copy paper;
- Other industrial applications.

WHICH CONVENTIONS REGULATE PCB AT THE GLOBAL LEVEL?

Stockholm Convention

The parties to the Stockholm Convention can no longer produce PCBs and are obliged to stop using theml. However, existing equipment that contains or is contaminated with PCBs may continue to be used until 2025. To ensure that all PCB uses are ceased by 2025, parties, especially those that are developing countries or countries with economies in transition, will need support:

- To complete national inventories of all PCBs and related contaminated equipment;
- To improve the capacity and increase the knowledge of PCB equipment owners on proper maintenance of equipment to avoid further contamination;
- To establish proper storage of discontinued equipment and to ensure disposal of all the PCB oils and contaminated equipment in an environmentally sound manner.

Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was created to protect people and the environment from the negative effects of the inappropriate management of hazardous wastes worldwide. It is the most comprehensive global treaty dealing with hazardous waste materials throughout their lifecycles, from production and transport to final use and disposal.

Rotterdam Convention

The Rotterdam Convention on the Prior Informed Consent Procedure for certain hazardous Chemicals and Pesticides in international trade provides Parties with a first line of defense against

hazardous chemicals. It promotes international efforts to protect human health and the environment as well as enabling countries to decide if they want to import hazardous chemicals and pesticides listed in the Convention.

WHERE CAN PCBs STILL BE FOUND?

Although no longer commercially produced, PCBs may be present in products and materials produced before the 1979 PCB ban. Products that may contain PCBs include:

- Transformers and capacitors
- Electrical equipment including voltage regulators, switches, re-closers, bushings, and electromagnets
- Oil used in motors and hydraulic systems
- Old electrical devices or appliances containing PCB capacitors
- Fluorescent light ballasts
- Cable insulation
- Thermal insulation material including fiberglass, felt, foam and cork
- Adhesives and tapes
- Oil-based paint
- Plastics
- Carbonless copy paper
- Floor finish

1.2 Transformers and capacitors

Electrical transformers and capacitors are widely used in the energy sector and other productive sectors in the country. It is important to indicate that countries are currently implementing the Stockholm Convention and have focused on managing transformers and capacitors as these items might contain a significative amount of PCBs.

TRANSFORMERS

Transformers are devices that can increase or decrease the voltage level of an electrical current. Every transformer which can commonly be seen, in electrical sub-stations, in streets, in the countryside, on poles, etc., has the role of reducing voltage. These transformers must be adapted to the task to which they are assigned. This means that they can be very large, if dealing with high voltages and currents, or relatively small if placed in the last step in the supply chain to serve a single house or user with electricity.

Regardless of their size, all transformers have the same basic design which is a magnetic metallic core coated with two sets of conducting (copper) wires. It is the number of wires, in the two separate coils, which decides the ratio of the input to the output voltage.
The metallic core is usually supported by wooden struts (which have insulating properties). Two electrical circuits equipped with inlet electrodes allowing electrical connections to the outside. These electrodes are isolated from the metallic casing by ceramic insulators.
Lastly, and more importantly, the empty space inside the transformer casing must be filled with a

fluid which will prevent short-circuits and sparking. This fluid, depending on the age of the transformer, can contain PCB-base oil mixtures. The transformer may be sealed, or in some cases fitted with a "breathing device" which allows changes in the volume of the oil to occur (due to temperature fluctuations).

CAPACITORS

Capacitors have in common with transformers the characteristic of possibly containing PCBs. However, their nature is different in that they are always sealed structures. The question of maintenance is thus not a major issue, as long as the capacitor remains in good condition and does not leak.

Capacitors are devices that can accumulate and hold an electrical charge. The main structure of a capacitor consists of electrical conducting surfaces (thin metallic foils) separated by a dielectric, i.e. non-conducting, material. These surfaces are coils of metallic foil. There are two electrically separated foil coils, each fitted with contacts leading out of the capacitor. The dielectric material is usually a dielectric fluid which or may not contain PCBs.

At the end of their lifetime they most likely represent the same potential danger as transformers; also of course they are used in similar conditions as transformers.

BACKGROUND INFORMATION

EMERGENCY MEASURES, PROCEDURES & INCIDENTS

2.1 Emergency measures and protective equipment

Emergencies involving PCBs can occur with equipment in service, during maintenance, in storage, during transport or at a disposal facility. These emergencies may take different forms for example as a leak or spill of PCB liquid, or the failure of a piece of in-service equipment or explosions due to internal failures.

All companies operating storage facilities, maintenance or transportation of PCBs should develop and implement a fire and emergency action plan. Such a plan should be developed in conjunction with the local fire department. All personnel working with PCBs should become familiar with the contents of the emergency plan. It is recommended that employees be trained in the use of the plan, preferably through emergency simulations.

Furthemore, personnel should be trained in the use of personal protection equipment, spill control kits, and fire extinguishers. They should also be made aware for the hazards of PCBs. In case of incidents, accidents or spills the company shall notify all competent authorities in line with national regulation and environmental permit standards.

PROTECTIVE CLOTHING

An incident with PCB equipment might require to be in direct contact with oils, parts of a transformer, or with contaminated material. Using a Personal Protection Equipment (PPE) is considered as a basic action for any activity involving handling PCBs.

For example, to sample oils it is necessary to use protective gloves and protective glasses. If the samples are to be taken in short intervals, a respiratory protection is needed. Similar requirements are needed when drilling contaminated surfaces. The respiratory mask must have a filter for vapors and inorganic dust and ear protection.

The following table summarizes the equipment needed according to the task to be undertaken:

TASK	PERSONAL PROTECTIVE EQUIPMENT
LIQUID OR SOIL SAMPLING	• GLOVES (VINYL OR NITRILE, NOT LATEX) • LIGHT RESPIRATORY MASK (FILTER A2P2; FOR ORGANIC VAPORS AND PARTICLES)
SAMPLING A CAPACITOR	• GLOVES (VINYL OR NITRILE, NOT LATEX) • SAFETY GLOVES, ONLY WHILE OPENING OR DRILLING THE CAPACITOR • LIGHT RESPIRATORY MASK (FILTER A2P2)
CONCRETE SAMPLING OR BRICK WALL	• LEATHER GLOVES • SAFETY GLOVES, DURING PERFORATION ACTIVITY. • LIGHT RESPIRATORY MASK (FILTER A2P2)
CAPACITOR DISMANTLING (NO FILTRATION)	• OVERALL WORKING • HEAD PROTECTION (ACCORDING TO SAFETY RULES OF EACH COMPANY) • BOOTS WITH STEEL TOE (RUBBER) • LEATHER GLOVES • LIGHT RESPIRATORY MASK (FILTER A2P2)
CAPACITOR DISMANTLING (WITH FILTRATION)	• PROTECTIVE SUIT (TYVEK) • BOOTS WITH STEEL TOE (RUBBER) • NEOPRENE GLOVES • LIGHT RESPIRATORY MASK (FILTER A2P2)
CLEANING ACTIVITIES	• PROTECTIVE SUIT (TYVEK) • BOOTS WITH STEEL TOE (RUBBER) • SAFETY GLOVES (HEAVY WORK) • LIGHT RESPIRATORY MASK (FILTER A2P2)

2.1.1 Emergency and Contingency Plans

To prevent or minimize the impact of unforeseen PCB accidents that lead to human injuries, environmental contamination, or fire, every facility should have a Contingency Plan that includes the following measures:

1. Identify all potential hazards, risks, and cases or probable accidents and determine potential prevention measures.

2. A plan for emergency situations with possible response measures.

3. Training sessions for personnel on emergency response, including simulated emergencies and first aid.

4. Maintaining capacities for mobile response in case of spills or guarantee of having the services of a specialized provider for such incidents.

5. Notification of fire brigade, police, and government agencies involved in emergency situations of the location of the PCB and transport route (see Annex A).

6. Adoption of mitigation measures, such as a fire extinguishing system, spill containment equipment, water deposits for extinguishing fires, fire and spill alarms, and firewalls.

7. The communication system for emergency situations must include exit signs, emergency telephone numbers, alarm locations, and instructions in case of emergencies.

8. Facilities and maintenance of equipment and tools for emergency situations, that contain absorbents, personal protection equipment, portable fire extinguishers, and first aid equipment.

9. Integrating facility plans with regional, national and international planning instruments for emergency response, if applicable.

10. Periodic verification of emergency response equipment and revision of emergency response and Contingency Plan.

2.2 Accidents and response mechanism

Capacitors and transformers are usually involved in Cold and Hot incidents. Cold incidents are the infiltration of PCB from a device into the environment. Spills can happen after unintended mechanical damage to the transformer's cooling fans or by corroded transformer walls, or capacitor draining activities or handling of stored oil. Hot incidents are usually short circuits or a fire in the vicinity of the equipment, making the device to exceed the boiling point of PCB (approx. 300 °C). If this happens locally even for a short time only (e.g. short circuit), PCB vapors can be released, and they can contain highly toxic furans (PCDFs). If PCB gets in contact with oxygen (fire), not only furans, but also dioxins (PCDDs) can be formed. These vapors can deposit viscous oil films on fittings, floors and walls, even at a distance from the place where the incident happened.

When accidents happen that involve hazardous chemicals such as PCBs three major mechanisms are usually involved, rapid response, evaluation and mitigation. Rapid response will be discussed in detail in the following chapters (A, B and C). In general, it involves discovering the accident, then alerting personnel onsite as well as the relevant authorities and the duty doctor, followed by clearing the area, confining the area and clean-up. After the accident, the situation of the area needs to be evaluated, e.g. in case of spillage into soil or water, samples should be taken and analyzed to determine the degree of contamination. Then mitigation measures should be identified if the area got contaminated. Personnel that enter the confined area need to be trained professionals and have suitable PPE.

Wastes from PCB accidents are hazardous wastes and should be therefore packed according to the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR). The hazardous wastes should be then managed in environmentally sound manner, for that methods are provided in the technical guidelines of the Basel Convention.

To avoid accidents preventative measures should be established to avoid risk of cold pollution, such as good safety measures for personnel, good storage, and maintenance practices. The following chapters A, B and C about measures to be taken in the event of different PCB accidents were adopted from the "Training Manual" of the Basel Convention[1]. In that document also detailed information about preventive measures can be found.

1 *Secretariat of the Basel Convention. Preparation of a National Environmentally Sound Management Plan for PCBs and PCB-Contaminated Equipment. Training Manual. 2003*

A) Measures to be taken in the event of "cold" accidents:

Evaluation of the area after the accident (according to the "Training Manual" of the Basel Convention):

- Soil with a pollution level higher than 100 ppm must be treated;
- At a concentrate between 10 and 100[1] ppm it should be disposed of in an approved landfill or kept on site;
- At under 10 ppm[1] it is considered non-contaminated;
- Water cannot be thrown out unless its PCB content is less than 0.5 µg/litre.

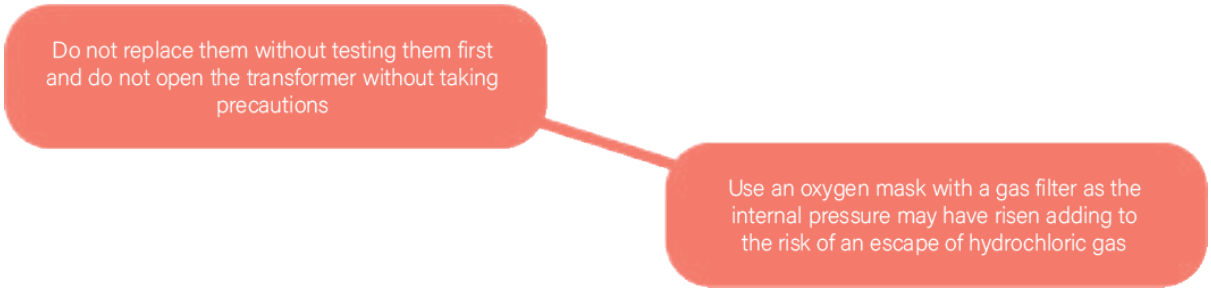
1 *Secretariat of the Basel Convention. Preparation of a National Environmentally Sound Management Plan for PCBs and PCB-Contaminated Equipment. Training Manual. 2003*

B) Measures to be taken in the event of "hot" incidents:

A failure such as an electrical short circuit may generate a heat causing excess pressure in the equipment without bursting it. To avoid the possibility of dielectrical decomposition that can occur when toxic vapours reach 300°, the following steps must be taken:

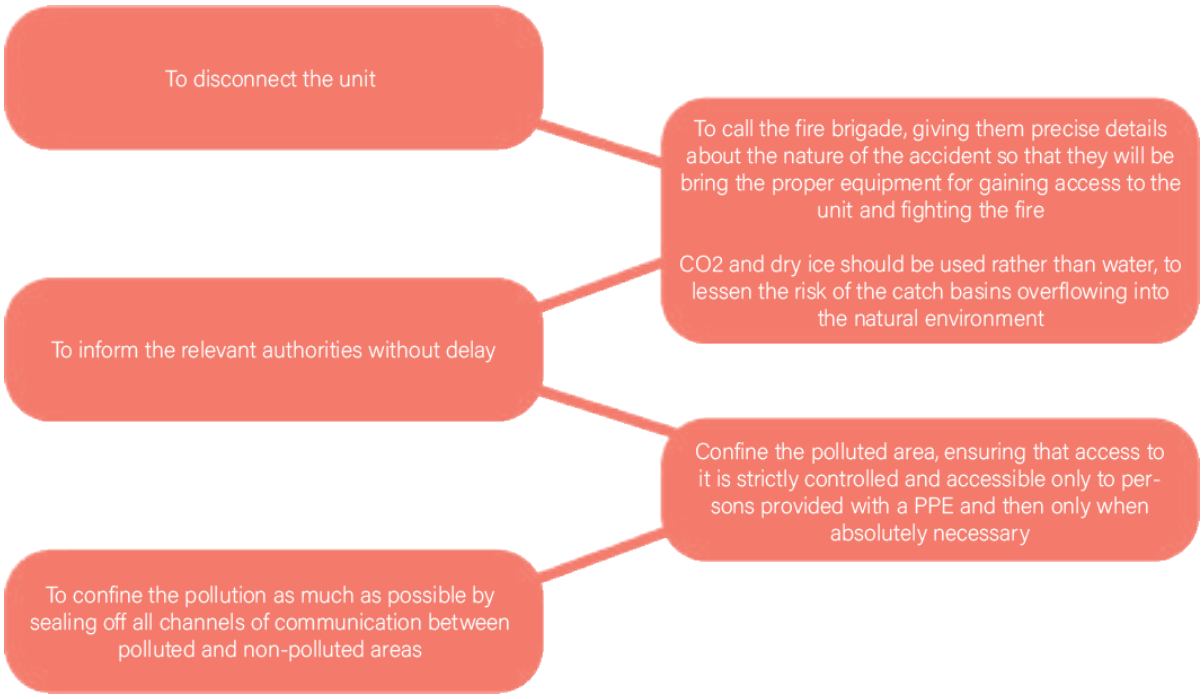
C) Action to be taken in the event of an accident caused by an electrical fault or a fire:

First scenario: The transformer is intact, there may have been some internal priming, and melting of the fuses:



Second scenario: Arcing has occurred, leading to a crack in the tank of the appliance but no fire has occurred. This type of accident involves the spread of PCBs in a liquid state with hydrochloric acid vapours. It is a "cold accident" situation and the measures to be taken are those prescribed for the previous scenario.

Third scenario: There has been re-priming of an open, run-down appliance or a fire in the plant. Both cases present a risk of PCB decomposition due to heat and the presence of oxygen and the formation not only of hydrochloric gas but even more significantly of toxic compounds, furans and dioxins. There is consequently a risk of "hot pollution". In this case, it is necessary:



Evaluation of the area after the accident:

The authorities may order the evacuation of the polluted area (if it is widespread) and an inspection of the contamination. This inspection is an extremely complex and delicate exercise and must be carried out under the strictest conditions. According to the results of these inspections, the classified installations inspectorate might ask the owner to take certain essential steps for the decontamination of the area.

INSTRUCTIONS FOR THE FIRE BRIGADE OR EMERGENCY RESPONSE UNIT SHOULD INCLUDE:

- Avoid the use of water to extinguish fire, as it becomes contaminated
- Use CO2 to extinguish the fire
- If water is used at all, then only to cool down the environment
- If water is used, it must not flow into the sewage system or open waters (pump!)
- Use of protection overalls that cover the skin to prevent exposure to PCB containing smoke
- Clothes and protective clothing that has come into contact with PCB or decomposition products (soot) must be regarded as toxic waste
- All firefighters should shower thoroughly to remove any soot that may have contacted uncovered skin
- If a firefighter develops a skin rash after a fire, he/she should go for a medical check-up

Additionally, employees should be trained in the use of PPE, spill control kits, and fire extinguishers. They should also be made aware for the hazards of PCBs. In case of incidents, accidents or spills the company shall notify all competent authorities in line with national regulation and environmental permit standards. All details about the incident must be reported so that the population can be warned, if necessary (e.g. contamination of drinking water).

FIRST AID IN CASE OF CONTACT WITH PCB

The following table summarizes the immediate actions that have to be taken after an exposure to PCB. Additionally, a doctor should be seen in any case.

LIQUID PCB ON THE SKIN	USE WATER AND SOAP TO WASH THOROUGHLY	SEE DOCTOR IF RASH DEVELOPS
LIQUID PCB IN THE EYES	RINSE EYES WITH LUKEWARM JETS OF WATER FOR 15 MIN (EYES WIDE OPEN)	SEE DOCTOR
LIQUID PCB IN THE MOUTH & STOMACH	RINSE MOUTH WITH WATER, DO NOT DRINK ANYTHING ELSE	GO TO HOSPITAL EMERGENCY OR SEE A DOCTOR IMMEDIATELY
HIGHLY CONCENTRATED VAPORS OF PCB	TAKE AFFECTED PEOPLE OUTSIDE IN THE OPEN AIR	IF DISCONFORT DOES NOT CLEAR UP, SEE A DOCTOR

2.3 Examples of PCB Incidents

Yushō disease (JAPAN)

In 1968, one of the largest PCB related contaminations occurred in northern Kyūshū, Japan. Rice bran oil got contaminated by PCBs and polychlorinated dibenzofurans (PCDFs) during its production through leaking pipes. The rice bran oil was sold to poultry farmers that used the oil as feed supplement for poultry and for cooking. Farmers started to report mass dying of their poultry and about 14 000 people had consumed the contaminated oil by then and showed adverse health effects. Common symptoms were fatigue, headache, cough, and unusual skin sores as well as dermal and ocular lesions. More than 500 people died. In children the cognitive development was affected.

Binghampton (USA)

In February 1981, a short circuit on a circuit breaker caused a fire that pyrolized 400 litres of PCB oil in a transformer tank located in a 18-story building in Binghampton, New York. The smoke from the fire spread through the ventilation ducts so that the entire building contaminated and had to be evacuated. Access to the building was forbidden except protective overall and mask decontamination, which took 4 years, cost the equivalent of 30 million USD.

Reims (FRANCE)

On January 14, 1985, a transformer containing PCBs exploded in the basement of a six-story residential and office building in Reims. Due to the extreme cold (-24 C°), the transformer was overloaded beyond its capacity and provided an estimated power of 360 kVa.
The fire following the explosion was quickly brought under control by the fire brigade, but the black and viscous smoke spread through the stairwell, the garbage chute and the ventilation ducts on the various floors, obliged the inhabitants to evacuate the building. Luckily, there were no casualties but many where intoxicated and the public pressured the government to take responsibility which led to the ban on PCBs two years later.

Laurelty – San Lorenzo (PARAGUAY)

On October 14, 2015, a fire started in a transformer tank of the National Administration of Electricity (ANDE), located in the municipality of Laurelty-San Lorenzo (Paraguay). The facility provides electricity to the country and is located in a densely populated metropolitan area 11 km from the capital, Asunción.
The site covers approximately 27 hectares and the fire, which took 4 hours to extinguish, affected approximately two hectares. The burned equipment (weighting about 10 tons and containing 2 tons of contaminated oil) included stored transformers, capacitors and other materials.
Due to the fire an unkown quantity of dioxins and furans may have been released. Clean up and sampling activities were undertaken but the results were inaccurate as essential data was missing in

the reporting. Surveys were conducted among households and firefighters around the area to gather health information and identify a possible increase of medical conditions.

2.4 Training of personnel

The company should provide training sessions to all personnel that handle PCB related equipment or wastes, particularly on the following subjects

1. Electrical risks
2. Security and hygiene risks
3. Handling PCB
4. Emergency and contingencies response
5. PPE
6. First aid

3

STORAGE, PACKING & TRANSPORT

3.1 Storage

In order to successfully prevent a PCB incident, it is important to know where the PCB-containing and PCB-suspected transformers and equipment are located. PCB containing wastes should generally be stored on sites that are specifically designed for interim storage of hazardous wastes. In general, locations close to rivers, groundwater, residential or farming areas, food storages, food processing companies or ecological reserves cannot be considered suitable. If possible, the interim storage should be specifically designed for PCB containing equipment and wastes.

To facilitate the handling of damaged PCB-containing electrical equipment or PCB contaminated materials during an emergency situation, the local government (fire fighters and emergency response team) should identify staging and temporary storage areas, or debris management sites, prior to a natural disaster, taking into account debris storage areas identified in the broader disaster debris management plan. The fire fighters and emergency team should also be familiar and trained with accidents related to PCB management. Additionally, they should also wear the protective clothing needed for these operations.

PCB wastes can be held in storage for up to one year before their disposal. This one-year time period begins when the decision was made to dispose of the PCB wastes (referred to as the date of removal from service for disposal). If PCB equipment is to be stored for more than one year, continuous and periodic monitoring and inspection should be performed.

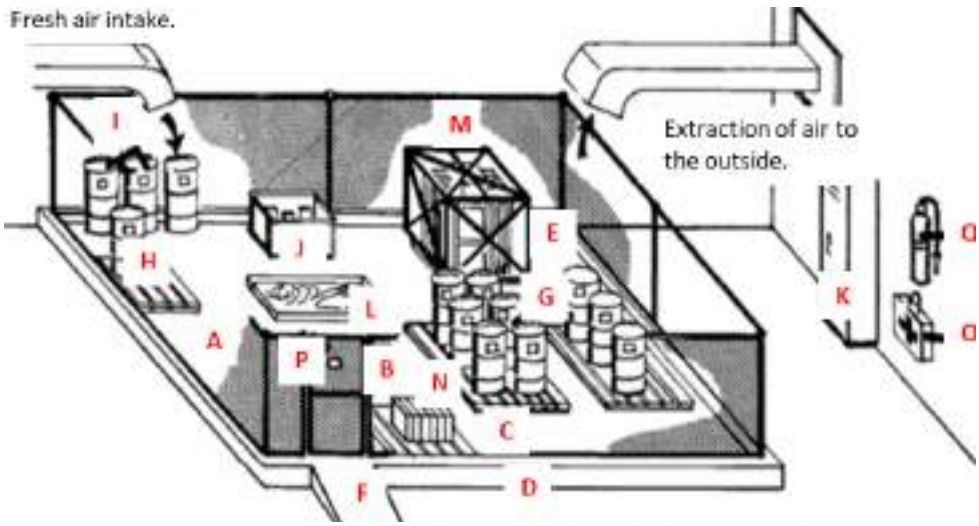
Storage Building:

A transformer in use, for repair or for dismantling and disposal should not be in the middle of the factory and cannot be placed without any separation. It should be in a specific area. PCB transformers that have reached the end of their lives are to be stored properly. The floor of a temporary storage must be solid and tight, with continuous curbing (the EPA recommends a 6 inch high curb) to provide a containment volume equal to at least two times the internal volume of the largest PCB item or container, or 25 percent of the total internal volume of all PCB stored.

The storage must be walled and protected against the weather on all sides. All entrances to the storage must be marked with an appropriate warning, and access for unauthorized people must be forbidden. The area must be fenced and controlled, with emergency procedures and best working practices displayed. The building should have openings for permanent ventilation (ventilation systems with filters).

Increased risks of fires must be excluded avoiding wooden shed, storage of inflammable goods in the same building or in the neighborhood. Therefore, a smoke and fire alarm system should be installed. The site must be equipped with locker rooms, sanitary facilities, showers, an eye wash station as well as lockers with all the necessary PPE equipment and disposable clothing. Fire extinguishers and absorbents must be available and easily accessible.

The building should be separated in different areas (reception, handling, separate storage of different waste categories, equipment, etc.). Entrance and exits on the area must be adapted for transport vehicles such as firemen.



A: Security fence (metal wire)

B: Door with padlock

C: Concrete floor (no drain)

D: Concrete sidewalk around the perimeter of the storage area; the interior of the bench must be painted with epoxy paint

E: Sealant mixture (plastering) in the corners of the curb to prevent seepage underneath it

F: Access ramp on the concrete sidewalk

G: Steel cylinders containing PCB liquids, used capacitors and contaminated materials stored on pallets (stretchers) for easy mobility

H: Steel cylinders containing PCB liquids that have not been used, stored on platforms (stretchers)

I: Replacement steel cylinders for liquid PCB materials

J: Contaminated cleaning materials stored in properly labeled drawers.

K: Wardrobe for clothes used when working with PCB

L: Pumps and hoses for use with PCB liquids placed in an open tray to collect spills

M: Transformer used in protective box

O: First aid kit

P: PCB label on the door

Q: Powder or foam extinguisher

3.2 Packing

Packing on site:

Special attention is needed during dismantling and packing of leaking PCB containing capacitors and transformers. The main aim shall be to avoid cross contamination. Therefore, immediately after the phase out of the equipment, the devices need to be placed in a drip or steel tray with an absorbent material, or a containment bud. The surface should be cleaned and if necessary, a leakage stopping device can be used. Capacitors must always stand upright, and leaking devices should be sealed.

PCB containing devices should be packed safely and in compliance with the applicable laws as soon as they have been phased out, even if their disposal takes place at a later stage. Irrespective of the quality of the temporary storage, the final and environmental sound disposal of the waste must be scheduled and coordinated so that storage will not exceed twelve months.

Generally, electrical equipment should only be phased out and stored, once an appropriate method of disposal has been chosen. All PCB items in storage shall be checked for leaks at least once every 30 days. Any leaking PCB items and their contents shall be transferred immediately to properly marked non-leaking containers. Any spilled or leaked materials shall be immediately cleaned up and the materials and residues containing PCBs shall be disposed of.

In case of an incident or natural disaster, not only will PCB-containing disaster debris have to be cleaned up, but, depending upon the circumstances, the debris may also need to be temporarily stored before it can be ultimately managed.

Due to the easy handling, open head steel drums are usually used for solids and tight head steel drums for liquids, respectively. UN approved drums or containers should only be procured from an authorized manufacturer (ask for UN Certificate). For contaminated soil it might be advisable to use UN-approved Big Bags.

It is possible to put capacitors and contaminated solids into containers that are not UN approved. However, such containers must be checked for damage and leaks before use and cannot be utilized for transports. They must have an UN approval plate stating conformity to UN regulations. After use, the containers must be regarded as contaminated and be disposed of as hazardous waste.

Non-leaking and leaking PCB equipment placed in a non-leaking PCB container that contains sufficient sorbent materials to absorb any PCB contaminated liquid may be stored temporarily in an area that does not comply with the requirements for up to 30 days. If possible, cover the select area with an absorbing industrial carpet or sheet to avoid any cross contamination or incidents.

A plastic cover may be installed over stored wastes to protect against weather conditions.

3.3 Transport of PCB equipment

Transportation within the facilities

When transporting PCB equipment within a facility transport over public roads should be avoided. If the equipment shows some damage or leaks it need to be placed pans or tray large enough to be able to contain at 110% of the total liquid that is to be transported. Liquid spilled on the pans or trays must be collected and placed in drums or containers with airtight seals as soon as possible and disposed of as toxic waste.

The personnel involved in this operation must have clear understanding of the risks associated with the packaging and movement of PCB equipment, stocks and wastes, and be prepared for emergencies.

Transport off-site

For transport off site to another facility or to another temporary storage for treatment, maintenance, final disposal or export the following conditions must apply:

- For transportation inside the country, the national legislation, and regulation on the transport of hazardous materials and wastes must be complied with.

- When the transport involves the export of the waste, then ground and maritime transport requirements and permits under the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal must also be applied .

- Labeling for transport must follow the recommendations on the Transport of Dangerous Goods of the United Nations (Orange Book). PCBs are classified as Class 90 (miscellaneous dangerous substances and articles, including environmentally hazardous substances). Fluids containing PCBs carry the code 2315 and solids the code 3432.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2315
3432
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International Regulations

If there are no specific or sufficient national regulations referring to packaging, storage or transport of PCB, the international regulations shall apply.

Transport and packing of dangerous goods are regulated by various international regulations. There is a separate regulation for each means of transport:

- ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road)
- GHS (Globally Harmonized System of Classification and Labelling of Chemicals)
- IMDG (International Maritime Dangerous Goods code/transport by sea)
- RID (Regulation for the international transport of hazardous goods on railways)
- IATA DGR (IATA regulations on the transport of hazardous goods/air transport)
- United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Orange Book)

These regulations are substantially similar to one another. The only difference is that special packaging, labels or quantity limits are specified for the different means of transport, depending on the type of hazardous goods.

Therefore, there are many different types of UN approved packaging available. The choice of the appropriate packaging depends on the above but also foreseen method of disposal/treatment.

CONCLUSION

Conclusion

PCBs are chemicals that have high level of toxicity and that have adverse effects to humans and the environment. The best measure to avoid accidents is prevention. As a planning and prevention measures, companies should prepare a PCB Management Plan, in close coordination with local authorities. The plan should include information on the location and characteristics of the equipment, maintenance regime and plans for disposal. Following the plan, a training course on PCB accidents should take place for those in close contact with PCB containing material and to those who are in charge of the response to accidents. Additionally, a Protocol of Response to PCB emergencies should be adopted at the facility level and strictly followed.

As a preventive measure, PCB containing equipment should be located in safe places, no so close to other transformers and not close from locations that can contaminate waters or land. The monitoring regime would need to be strict with an evaluation of the storage place and status of transformers at least once a month.

As a response to an emergency incident, a Protocol of Response to emergencies needs to be followed. Each person involved should know exactly what to do and when, so there is no confusion. A contact person on emergencies response should be appointed at the facility level.

Using PPE is mandatory and will reduce the risk of exposure. Having protective equipment accessible and well maintained will ensure appropriate safety to workers and those involved in the accident response.

If decontamination is considered, standards for screening, sampling and analysis are necessary for the assessment of existing contamination. PCB removal techniques and associated precautions should be regulated in a national PCB framework.

Taking fast actions using an established protocol and with the appropriate equipment will reduce the risk posed by PCB related accidents and will reduce the risk of contamination to different media.

REFERENCES

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ANNEX A

Emergency contact numbers for PCB related accidents

Person in charge for accidents

Person in charge of facility

Press officer for public relation

Fire department

Police

Local doctor

Hospital

Authority

Authority