



Occupational health and safety in PCB management



Introduction: Polychlorinated biphenyls (PCBs)

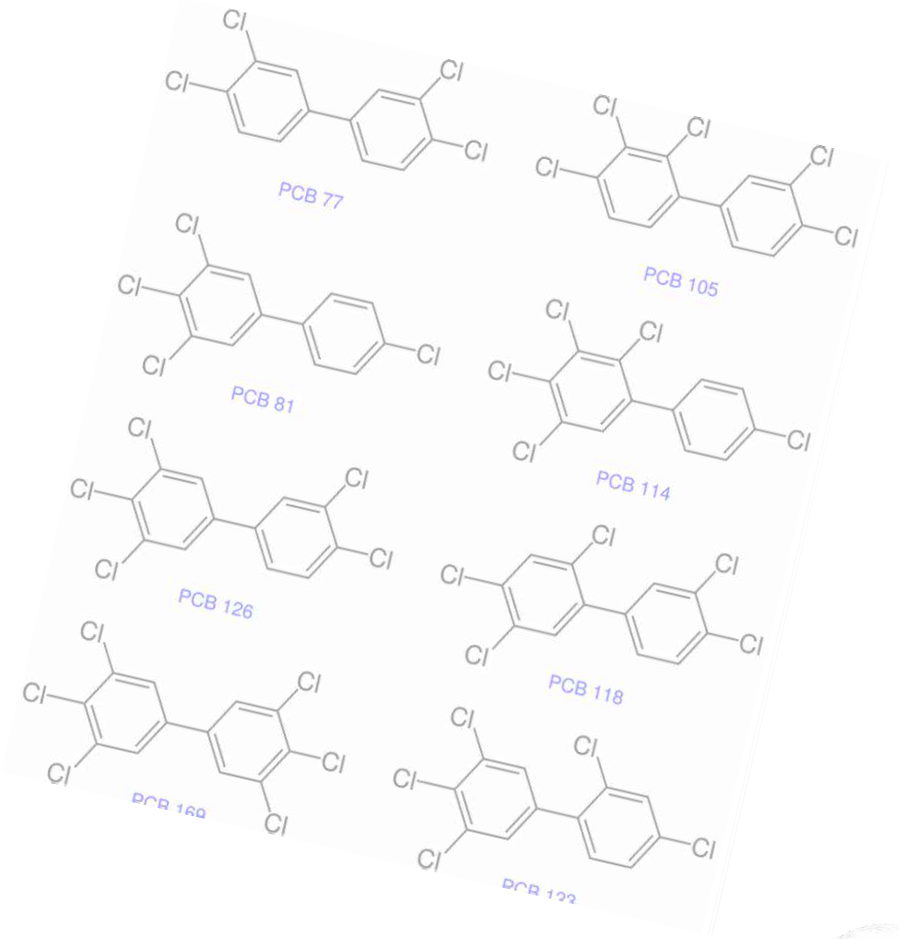


Polychlorinated biphenyls (PCB)



PCBs are man-made organic chemicals that had been widely used in industry and consumer products.

- Characteristics: non-flammability, chemical stability, high boiling point and electrical insulating properties
- Production period 1929 to 1980s



Polychlorinated biphenyls (PCB)

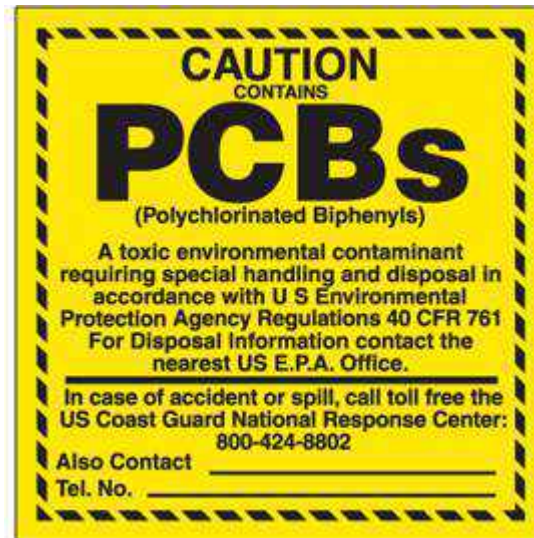


Due to their characteristic's PCBs have been used in hundreds of industrial and commercial applications, e.g.:

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

Polychlorinated biphenyls (PCB)

However, PCBs were discovered to be harmful for wildlife, humans and therefore for the environment. PCB were one of the first chemicals listed in the Stockholm Convention as Persistent Organic Pollutants (POPs).



PCB as Persistent Organic Pollutants (POPs)



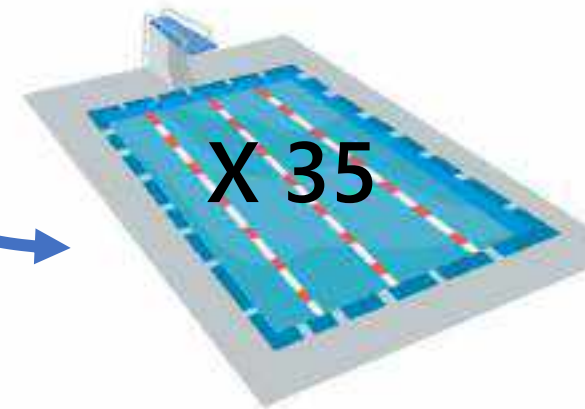
POPs once released in the environment:

- are persistence in the environment,
- travel long distances,
- bioaccumulate in humans and wildlife
- and have harmful effects for humans and wildlife.

Two important remarks:

- PCBs can be detected everywhere
- PCBs can have adverse effects for humans and wildlife at very low concentration!! → at parts per billion (ppb) or trillion (ppt) level

That is equivalent to 1 grain of sugar ★

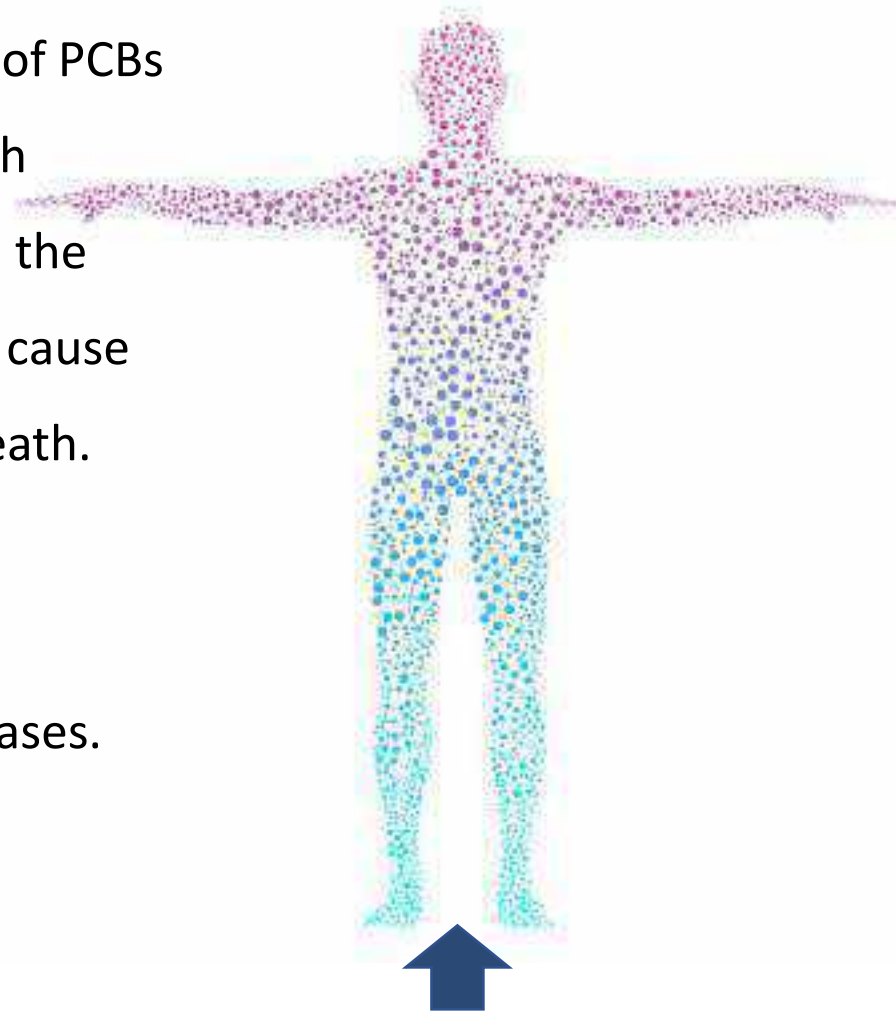


dissolved in 35 Olympic pools

PCBs - Linked health effects*

*<https://www.epa.gov/pcbs/learn-about-polychlorinated-biphenyls-pcbs#what>

- High exposure to high levels of PCBs causes serious adverse health effects. In poisoning events like the Yusho disease in Japan 1969 cause serious health effects and death.
- Low exposure can cause development of serious diseases.



- Specific effects:
- Cancer
- effects on the immune system
- reproductive system
- nervous system
- endocrine system
- other health effects.

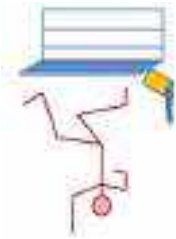
Occupational Health and Safety in PCB management



Preventive measures

Safety

Accident prevention



Work accident

Risks evaluation

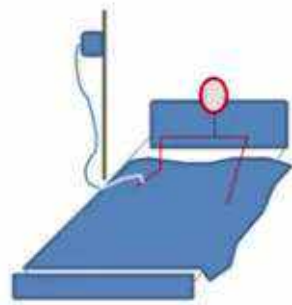
- Electrocutation
- Falls
- Poisoning
- Fire
- Hits

Prevention plans

- Procedures
- Equipment
- Infrastructure
- Training

Occupational Hygiene

Disease prevention



Diseases

Risks evaluation

- Chloroacne
- Hepatic injury
- Cancer
- Brain damage
- Etc...

Prevention plans

- Procedures
- Equipment
- Infrastructure
- Training

Contingency and emergency response

Avoid human, material and
environmental damage

Risks
evaluation

Emergency
Plans

Disaster response



Disaster

- Fire
- Spills
- Flood
- Natural disasters

- Procedures
- Equipment
- Infrastructure
- Training
- Citizen information

It is important to promote safety and health measures for workers and those in contact with dielectric oils in PCB-contaminated equipment or materials through the general principles of:

- Prevention,
- Assessment,
- Risk management.

Prevention and emergency plans

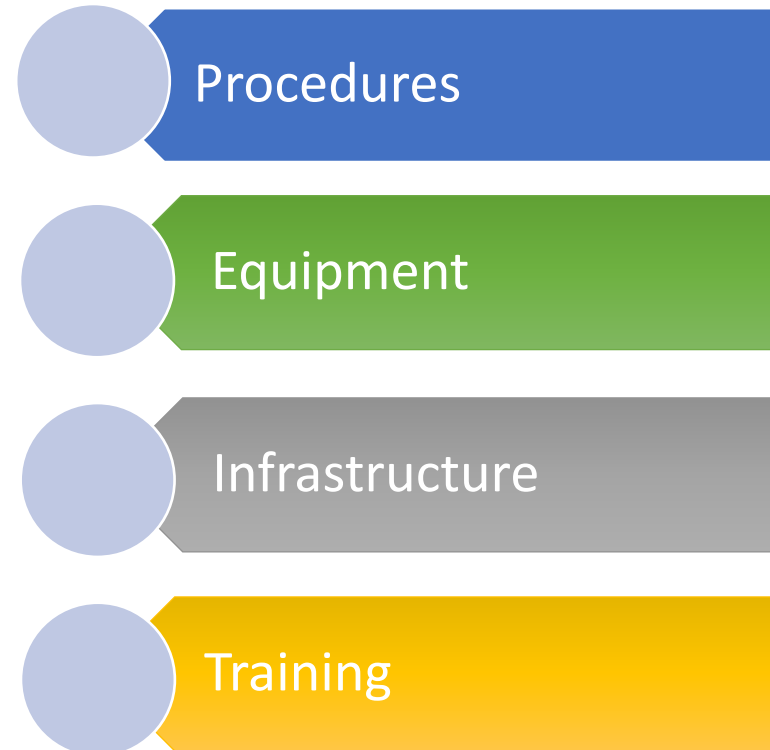
Prevention plans

They should be designed based on risk analysis and should include training, inspections, audits, drills, and awareness events.

Emergency plans

Needed for an unpredictable emergency response.

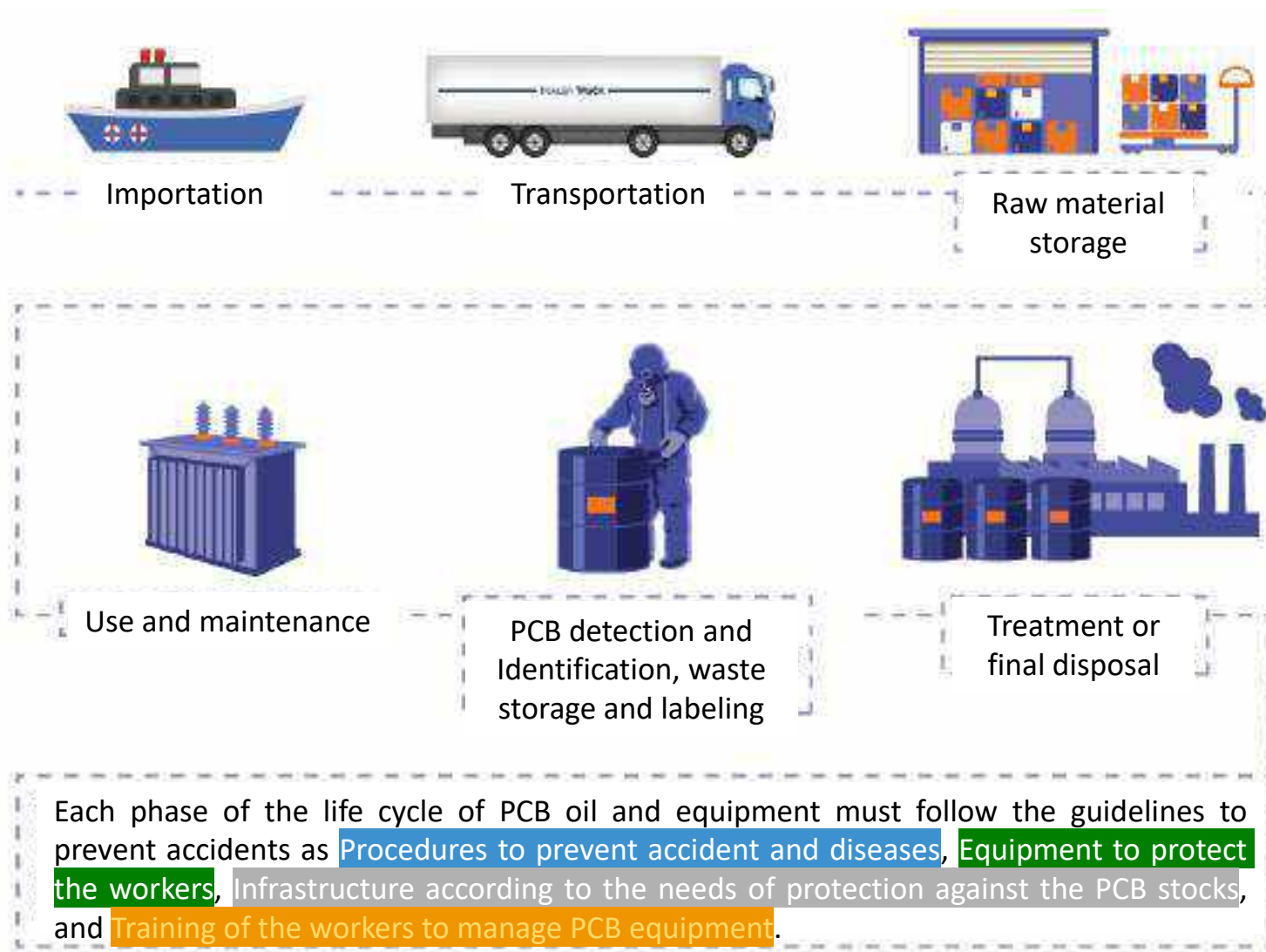
Security Instruments



Security Instruments



Procedures



Stockholm Convention

- Use only in intact and non-leaking equipment and only in areas where the risk from environmental release can be minimized and quickly remedied.
- Not use in equipment in areas associated with the production or processing of food or feed.
- When used in populated areas, including schools and hospitals, all reasonable measures to protect from electrical failure which could result in a fire, and regular inspection of equipment for leaks

Import of dielectric oil

Countries will monitor the prohibition on the import, and nationalization of dielectric oil and equipment containing PCB-contaminated dielectric oil at any concentration.

Importing equipment or materials that may contain PCBs must be PCB screened or having a valid PCB's Certificate.

Have a Material Safety Sheet.

Specific instruction and training, to minimize any accidents.

Ground transport of dielectric oil

Vehicles dedicated to the transport of hazardous materials and wastes must comply with the guidelines of current environmental and safety regulations.

Have a Material Safety Sheet.

Specific instruction and training, to minimize any accidents.

Ground transport of dielectric oil

The driver must comply with the following recommendations .

The driver

The driver must be in optimal physical condition, there should be no tiredness, vision problems, no work or family stress, etc.

Know the route and road signs throughout the mobilization path.

You must take into account respect for other drivers, cyclists and pedestrians, to meet the speed limit allowed by the traffic law.

Perform timely maintenance of the vehicle.

The carrier must be trained to act in cases of an emergency.

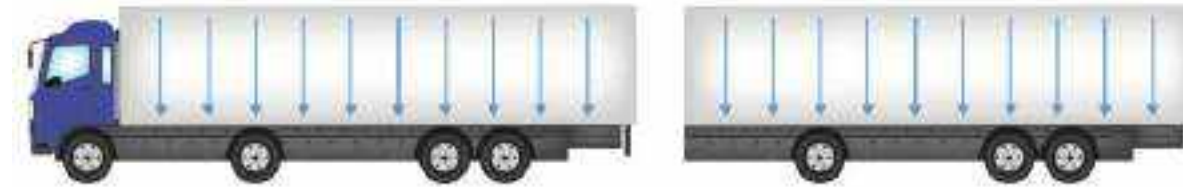
Carriers shall have official authorization and operating permits.

The vehicle will be operated by at least 2 trained persons, driver, and assistant without additional passengers.

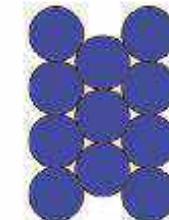
Loading and unloading

- Check the correct condition and operation of the vehicle.
- Check the safety sheets, perform a physical inspection of the load.
- The container must be ventilated for at least 15 minutes before loading or unloading.

Stacking



Weight balance



Drums
arrangement

Medical surveillance

An initial medical examination, at the beginning of work or project.

An annual examen.

An examen at the end of work or project.

In the event of an accident the worker exposed to a high PCB concentration, another medical examination will be performed instantly.

- Occupational and clinical history.
- Vision and hearing tests.
- Medical examination of urine, lungs, liver and blood enzymes
- PCB level

Personal hygiene

Remove contaminated personal protective equipment without skin contact with dielectric oils. Clothes used to work with dielectric oil should be washed at work in order not to take home and contaminate.

Wash the hands with soap and water.

To abstain from smoking, drinking, or eating while handling dielectric equipment and oils.

Sampling in energized transformers

1. Sampling shall be carried out between two trained technicians.
2. Use of personal protective equipment (do not wear metal rings or watches).
3. Maintain distances greater than the minimum allowed.
4. The tools to use must be insulated.
5. Do not sample in environment conditions of extreme humidity.
6. Use a tray to receipt oil drips.
7. Properly label the bottle, so that its identity of the equipment is the same to which it belongs.
8. Take the sample from the valve located at the bottom of the equipment (30 ml in an amber bottle).
9. Close the bottle and clean the spilled liquid on the floor or valve.
10. Any material used that has been contaminated is a hazardous waste and must be stored and eliminate in accordance with the country's legal and environmental guidelines.

Sampling in off-service transformers

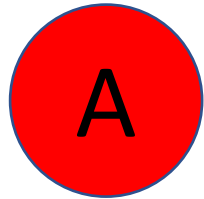
1. Sampling shall be carried out between two trained technicians.
2. Use of personal protective equipment.
3. For sampling the criteria described above will be followed, from the number "6" to the "11".
4. For equipment that does not have a lower valve, they may have a valve or cap on top. In this case, the sample should be removed with a long plastic pipette or with a syringe and hose that reaches at least half the body of the equipment

Security Instruments

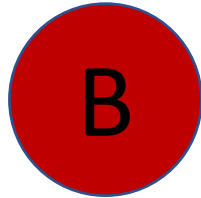


Personal
Protection
Equipment

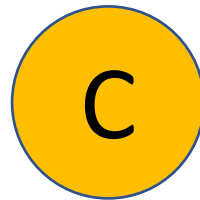
Individual Protection



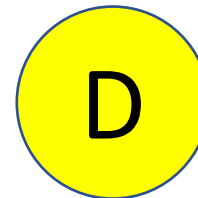
Higher level of personal protection (high concentration of PCBs)



High level of respiratory protection, (little potential for contact of PCBs with the skin)



Non-high respiratory hazard, (PCB concentrations are expected to be above acceptable levels)



No respiratory risk (Probably minor contact damage to PCBs)

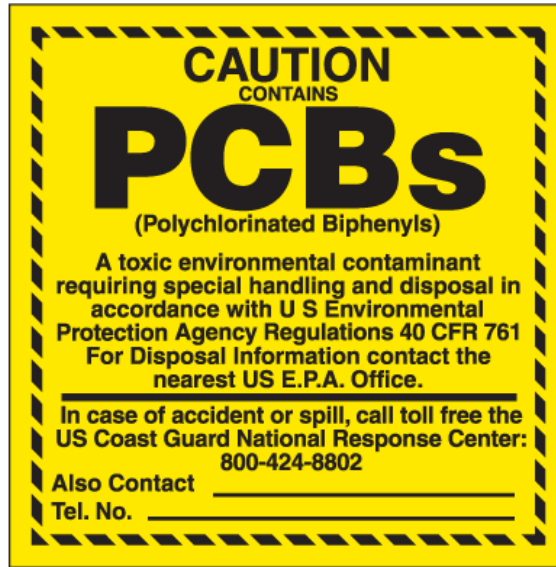


Waste containers with PCBs

- Electrical appliances with dielectric oil must be on spill trays containing at least 110% of the liquid volume of the equipment.
- Small electrical appliances that are in good condition can be on pallets, while those in poor condition must be drained before being placed on pallets.
- Liquids will be stored in steel barrels with double hole lid.



Labels



Oil

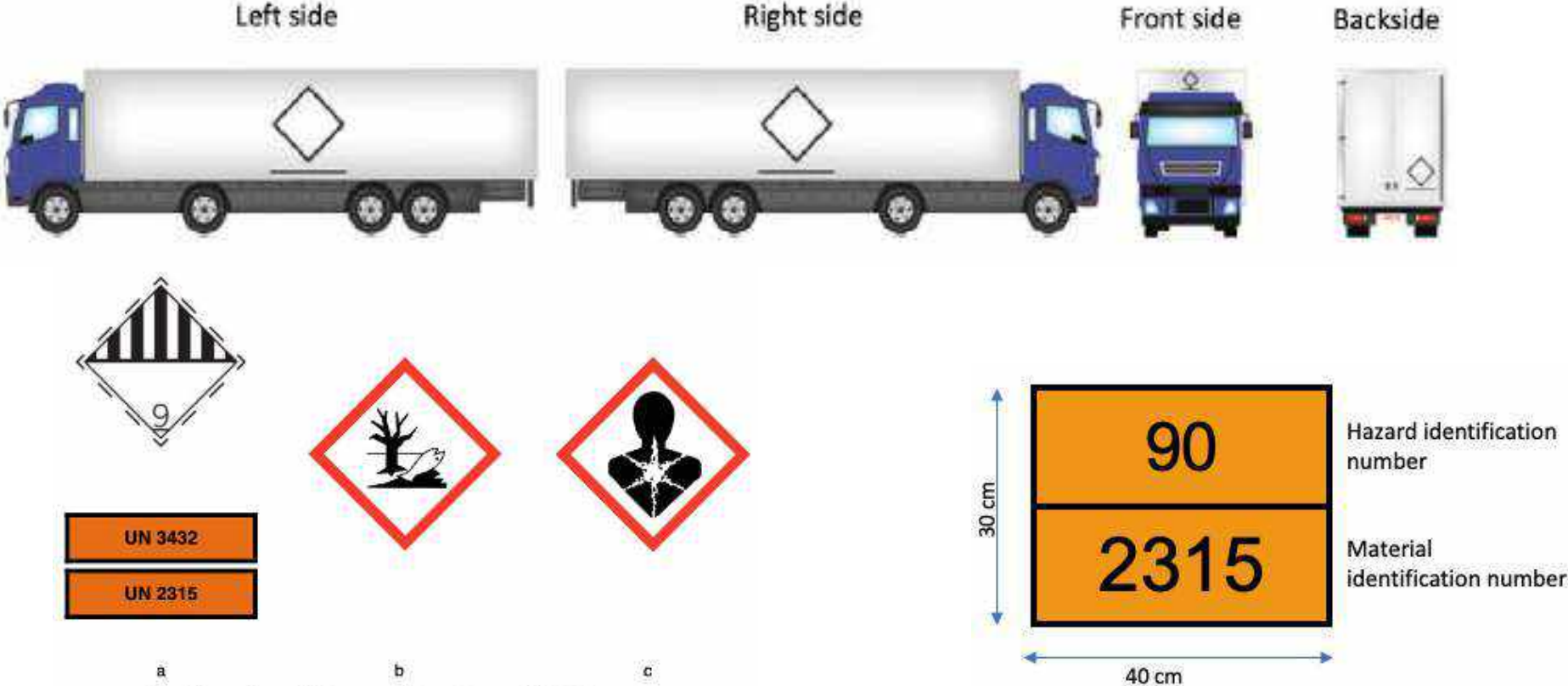


Dot regulations.
For any type of land or
marine container.

Solids



Labeling



Labeling of containers and wastes with PCBs

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Infrastructure

Storage

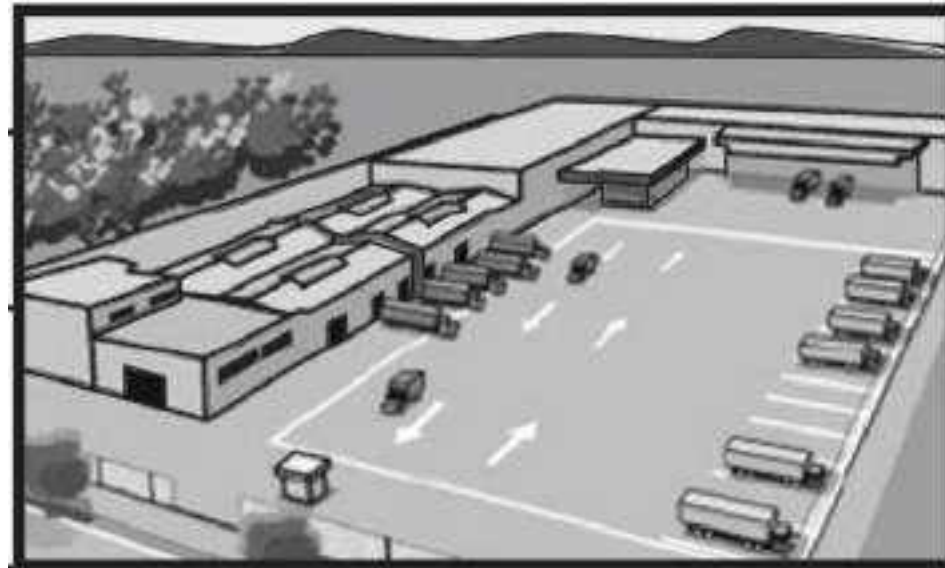
The external part of the warehouse.

Location: Away from residential areas, schools, hospitals, commercial areas, industries that manufacture or process food for man or animals, rivers, wells, canals, or lakes.

Isolated from sources of heat and ignition.

Area not exposed to floods.

The warehouse will have a dressing room, sanitary facilities, eye showers, wardrobes for PPE, absorbent material, and disposable clothing.



Have danger signs in visible places and forms.

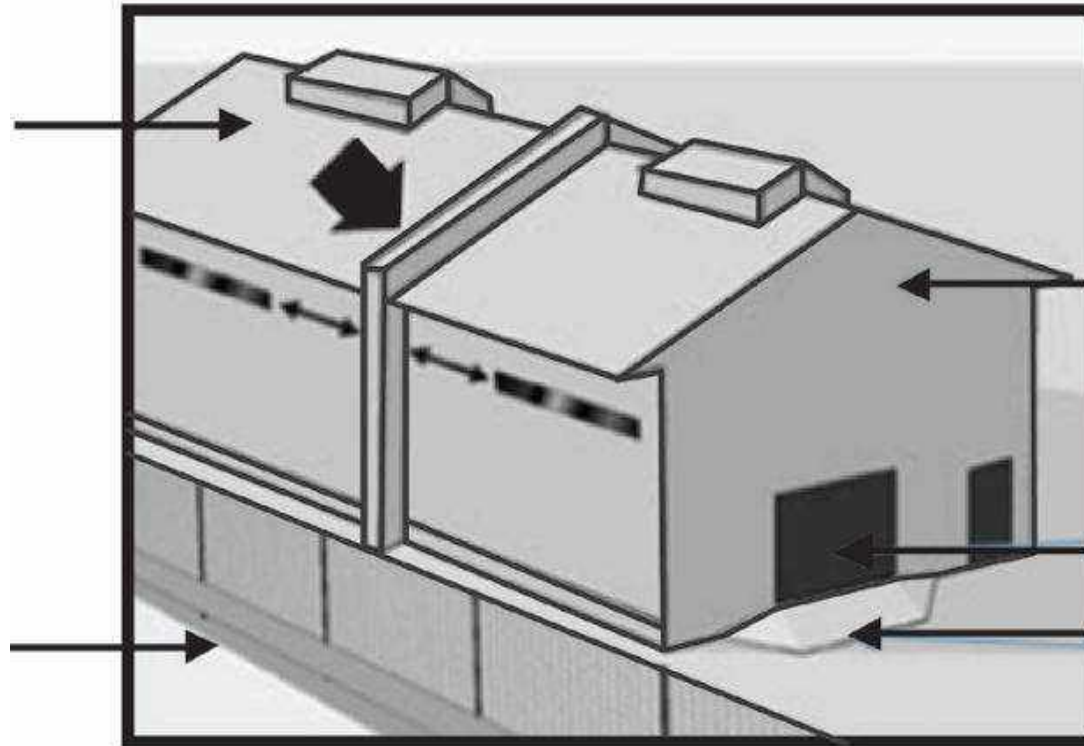
Access restricted to unauthorized persons.

Accessible for transport vehicles and especially firefighters.

Storage building.

The warehouse cover must avoid the direct incidence of solar radiation and water ingress.

Place a security fence and concrete railing around the perimeter of the warehouse.



Place concrete wall, solid structure, fireproof, and ceiling.

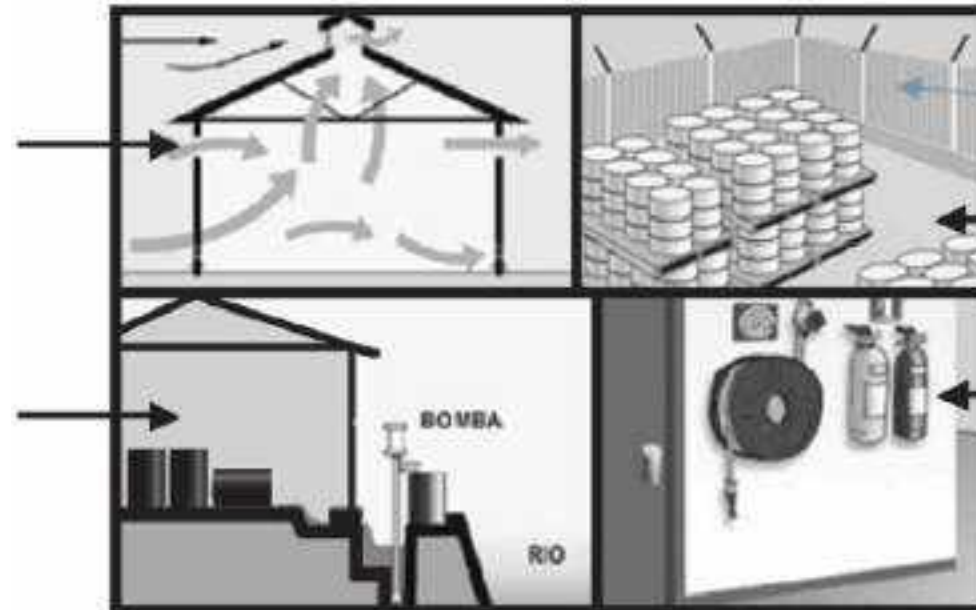
Concrete floor, no drainage, cracks, painted with epoxy paint.

Have access ramp.

The internal part of the warehouse.

It will have ventilation to avoid the concentration of vapors.

In the case of equipment in operation, which is not stored, it will have a bucket capable of storing at least 110% of the volume of the dielectric oil.



The warehouse will be one-story and will have interior aisles suitable for transportation.

The stored products will be at a distance of 1 meter from the perimeter walls.

The warehouse will have 10 lb capacity extinguishers of the chemical powder, CO₂, water spray, or regular foam type.

Collective Protection

- Fire prevention: Proper design of the place that stores easily burning substances.
- Installation of fire detection systems.
- Firefighting facility.
- Sign the way for local evacuation.
- Special measures for installations at risk of explosion.
- To signal the existence of risks and measures to be taken, and to determine the location of devices, safety equipment, other measures of protection and the types of signalling.

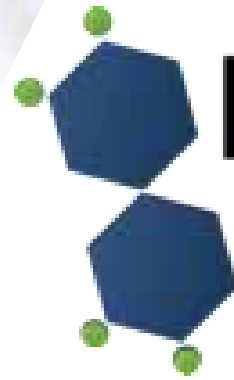
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Training

Training for Dielectric Oil Management

- ✓ Properties and features of PCBs.
- ✓ PCB identification and screening.
- ✓ Storage and labeling requirements for PCBs.
- ✓ Precautions for transporting PCBs.
- ✓ Reporting requirements in PCB transport.
- ✓ Emergency plans and personal emergency protective equipment.
- ✓ Emergency response procedures.



PCB

PLATFORM

**Thank you for your
attention !**

<https://www.pcb.unitar.org/>

