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Guidelines for PCBs, PCB–containing equipment and waste interim storage

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1. FOREWORDS

Storage of PCB's contaminated waste is in compliance with the country legislation on the storage of hazardous waste, containing labeling regime with ant other requirement on the hazardous waste and the equipment which is not containing any PCB's waste is not covered by any legislation.

This guideline document is based on the available standards for the safe storage of hazardous waste and materials.

The aim of this guideline is

a. To provide information in technical manner, to store the PCB waste and PCB waste equipment.

b. To give the practical reference and knowledge about the facilities and services related to be PCB's waste storage to be carried out under GEF funded projects on PCB's.

c. To introduce different requirement for small storage sites for temporary storage of PCB's waste and equipment and centralized storage site, which have to be established nearby PCB's disposal facility.

According to Stockholm's convention, all the PCB's equipments identified by the deadline of 2025.Shall have to be stored in compliance with the countries legislation on hazardous waste pending the final disposal deadline of 2028.

2. INDIAN LEGISLATION ON THE STORAGE OF HAZARDOUS WASTE

Indian Legislation on the storage of hazardous waste

2.1. THE HAZARDOUS WASTE RULES

In Indian legislation, 2008, Chapter II, the procedure for handling includes storage are established as a Hazardous Wastes (Management, Handling and Transboundary Movements).

Article 5 is established that:

(1) "Every person who is engaged in the generation, processing, treatment, package, storage, transportation, use, collection, destruction, conversion, offering for sale, transfer or the like of the hazardous waste shall require to obtain an authorization from the State Pollution Control Board"

(2) "The hazardous waste shall be collected, treated, re-cycled, re-processed, stored or disposed of only in such facilities as may be authorized by the State Pollution Control Board for the purpose.

Article 7 (Storage of Hazardous Waste) established that.

"The occupiers, recyclers, re-processors re-users and operators of facilities may store the hazardous wastes for a period not exceeding ninety days and shall maintain a record of sale, transfer, storage recycling and reprocessing of such wastes and make these records available for inspection:

Provided that the State Pollution Control Board may extend the said period in following cases, namely:

i) *Small generators up to ten tones per annum*

ii) *Recyclers, re-processors and facility operators up to six months of their annual capacity;*

iii) *Generators who do not have access to any Treatment Storage, Disposal Facility in the concerned State; or*

iv) *The waste which needs to be specifically stored for development of a process for its recycling, reuse"*

Among other obligations, the Hazardous Waste rules also require that hazardous waste are packaged and labeled *"based on the composition in a manner suitable for safe handling, storage and transport as per the guidelines issued by the Central Pollution Control Board from time to time"* (Chapter VI, article 19).

a. The occupier or operator of the Treatment , Storage and Disposal facility or recycler shall ensure that the hazardous waste are packed and labeled, based on the composition in a manner suitable for safe handling , storage and transport as per the guidelines issued by the Central Pollution Control Board from time to time.

b. The labeling and packaging shall be easily visible and be able to withstand physical conditions and climatic factors.

3. INTERNATIONAL REGULATION ON PCBS STORAGE

3.1. THE USA CFR 761

The TSCA regulations in 40 *CFR* Part 761 distinguishes between two different types of storage:

a. Storage for use or reuse :-

   Storage for reuse deals withfor PCB's containing equipment awaiting installation, servicing, repair, refilling, use as a spare or replacement, or emergency use

b. Storage for disposal :-

   Storage for disposal deals with PCBs waste and PCBs containing equipment that is unfit for service, unauthorized for servicing or use, considered or declared a waste, or destined for disposal.

Any PCB waste must be disposed of within one year from the date it was determined to be a PCB waste and the decision was made to dispose it.

3.2. EU DIRECTIVE ON PCBS

The EU directive on PCB's does not contain any specific provision on the safe storage of PCB's. It requires that the Member States shall individually or jointly take the necessary measure to develop installation for the disposal, decontamination and safe storage of PCB's.

Therefore, the safe storage of PCBs equipment is only regulated under each Member State's legislation, whilst at EU level the storage of PCBs is only regulated under the legislation on hazardous waste.

3.3. BASEL CONVENTION

Guidance on storage of PCBs is provided under the Technical Guidelines and Guidance Documents issued under the Basel Convention. The "Updated general technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (POPs)" establish under section B 3 (Specifications for containers, equipment, bulk containers and storage sites containing POPs)that:

"To meet the requirements of ESM and specific clauses in the Basel and Stockholm conventions (for example, Basel Convention Article 4, paragraph 7, and Stockholm Convention article 6, paragraph 1), Parties may need to enact specific legislation that describes the types of containers and storage areas that are acceptable for particular POPs. Parties should ensure that containers that may be transported to another country meet international standards such as those established by the International Air Transport Association (IATA), the International Maritime Organization (IMO) and the International Organization for Standardization (ISO)."

Technical specification on the safe storage of POPs containing waste is provided under section F (Handling, collection, packaging, labelling, transportation and storage) of the same guidance document, reported in Annex I. It is important to remark that the guidelines issued under the Basel convention concern only PCBs containing waste. Specific guidance for PCBs containing or contaminated equipment which is not waste (for instance, online equipment or equipment store pending installation or maintenance) is not covered by the Basel Convention.

4. SITE SELECTION

For storing the PCB's waste, the site selection plays an important role; because PCB's like highly hazardous fluid we cannot store anywhere. So for these we need to study on logistics, infrastructural, environmental and permitting consideration factors have to be considered while selecting the site for the establishment of PCB's storage facility.

Logistic aspects:-

For the selection of the site for PCB's, it is necessary to consider the following,

a. The distance of the storage facility from the PCB's waste generation site ,

b. Transportation cost,

c. Well maintained transport infrastructure.

Infrastructure and utilities:-

Depending on the size of the storage facility, the availability of utilities like industrial and portable water, electricity and infrastructures must be ensured.

Environmental aspects:-

The impact storage facility on the of environment and natural events (floods, storm, lightning, earthquakes, atmospheric precipitation, etc.) play a vital role in the site selection based on environmental aspects.

Permitting considerations:-

Rules are concerning the minimum distance from water bodies, populated areas, protected areas, must be considered while selecting the site for establishment of storage facility.

PCBs storage sites should be

- At least 200m far from the nearest surface water body;
- Built on surfaces where groundwater depth is at least 3m, preferring clay impermeable soil over fracturated rocks;
- Never placed close to populated or sensitive areas;
- Never placed in facilities subjected to risk of fire (fuel deposit, high temperature processes, etc.);
- Never placed in protected areas like natural parks.

Public consultation and public perception:-

The involvement of the public by means of formal public consultation and proper awareness raising campaign since the early stage of the project is recommended.

5. TECHNICAL REQUIREMENTS FOR PCBS STORAGE FACILITIES

5.1. SIZE / CAPACITY

Larger the size of PCB's storage, results in larger the risk associated with the infrastructure.Hence , the need for minimized storage facility arises. This can be achieved by managing the whole PCB 's cycle by reducing the storage time of PCB's.

In most cases, multiple temporary storage sites close to the site of origin of PCBs contaminated equipment, and it should be well maintained and regularly inspected. The storage of PCB's is not only the matter of designing a facility but also of developing a logistic system.

The overall storage capacity should be established by the demand / offer rule:

- Demand: From the side of PCBs generation, on the amount of PCBs which is already available for disposing and the amount of PCBs which will be disposed over a certain period;
- Offer: from the side of PCBs disposal, on the amount of PCBs which may be disposed over a certain period.

Centralized storage:-

The size of the centralized storage takes into consideration, the disposal capacity of the plant. And the need for ensuring continuous running of the facility. For instance, for a dehalogenation plant with a capacity of 2t PCB oil/day, the storage could be designed assuming 2 month of continuous operation (120 tons of PCB oil, or up to 360 tons of PCB transformers).

Distributed storage close to PCB source:-

Storages close to the PCBs owner facilities should accommodate all the PCBs which are ready for disposal and envisage an additional capacity for PCBs equipment which are planned to be disposed over a certain period of time. The concept here is that distributed storage has the key function to reduce the risk associated to the local improper storage of PCBs, by accommodating in an environmentally sound way PCBs containing equipment which need temporary storage, or PCBs waste which are already read for disposal. Therefore, if for instance at a transformer substation 20 tons of PCBs transformers already offline are improperly disposed in the open air, and a plan for replacing further 10t/ year of PCBs containing transformer exists at that facility, the size of the PCBs storage should be designed to immediately accommodated 20 tons of PCBs contained transformer plus additional room for the storage of the 10 tons of PCBs which will placed offline in one year.

5.2. MITIGATION OF ENVIRONMENTAL IMPACTS

5.2.1. PREVENTION OF LEAKAGE.

For prevention from leakage, some points should be taken into a consideration. If the storage equipment is been leaked it can affect to the human beings and environment with a very harsh manner. To prevent the disaster, the following points should be noted;

- The storage facility must be built over a layer of impermeable soil (permeability coefficient smaller than $1x10^{-9}$ ms-1, with a thickness of at least 1m.
- The groundwater surface should always be below a depth higher than 3m from the ground surface.
- The floor of the storage facility shall be constructed of continuous smooth and impervious materials, such as Portland cement, concrete or steel, to prevent or minimize infiltration of of PCBs.
- Each area where PCBs containing equipment is stored should be surrounded by impermeable curbs. The volume of the curbed area from the floor to the top of the curbs shall be equal to at least 2 times the volume of the liquid PCBs contained in the biggest equipment, or 25% of the total internal volume of the stored equipment, whichever is the bigger. In each storage area, absorption material (sawdust bags or similar) capable to absorb at least the amount of PCBs contained in the biggest equipment should be available at any time.

- Areas for the storage of equipment, barrels or tanks containing liquid PCBs should be compartmentalized to avoid the spreading of PCBs over the whole storage area in case of leakage or spilling.
- Equipment or barrels containing liquid PCBs should never be stored at a height higher than those of the curbs.
- Barrels or tanks containing liquid PCBs or oil contaminated by PCBs should be in good shape and without any presence of rust or damage.
- Any equipment which is in a bad shape, rusty or possible leaking should be drained before being stored; drained oil shall be placed in barrels.
- No draining, pipes, ditches of any type should be present within the curbed areas of storage facility, to prevent PCBs to enter the environment in case of spilling or leakage.
- Barrels should not be stacked for more than two layers.
- The storage should be at least covered by a roof for preventing rainwater hitting stored material. Usually, long term storage sites should be closed buildings, whilesmall, short term storage sites to be built near the PCBs sources (in example, within a transformer substation) can be roofed open buildings.

5.2.2. INDOOR AIR QUALITY:

Another more important parameter is indoor air quality. Because for storage of PCB's pressure and temperature are the important parameters. So the following points to be taken into considerations;

- Closed PCBs Storage facilities should be maintained under negative pressure to prevent built up of dust contaminated by PCBs, especially in case of storage of PCBs contaminated soil.
- Negative pressure should be ensured by draft fan which should allow an air turnover of at least one turnover of the internal volume each 2 hours, when workers are inside the storage facility.
- The air drafted by the draft fan shall be treated before being released in the environment by means of fabric filters and activated carbon filters. To save energy in cold climate, the air can be re-circulated in the building after purification.
- As in case of fire the negative pressure system described above could represent a source of air which would further sustain fire, resulting in even more dangerous conditions, this system should be automatically shut off in case of fire, and all the air inlets hermetically closed.

5.2.3. OCCUPATIONAL SAFETY AND PPES

When performing operation in PCBs storage sites, like packaging or handling of contaminated equipment or waste, the following PPE or equivalent shall be used.

- Chemical protective suits providing protection to the full body against airborne solid particulates (Level C protective clothing compliant with EN ISO 13982-1 Dry particle suit) and anti-dust masks (i.e. EN 149 or EN 143 FFp2 or FFp3) when moving or packaging PCBs contaminated soil;
- Chemical protective disposable suits (Level B protective clothing i.e. compliant with EN14605 Liquid tight suit, EN14605 Spray tight suit, EN ISO 13982-1 Dry particle suit) providing additional protection to the full body against liquid chemicals / aerosols and mask equipped with anti-dust filters and filters against gas / vapors (i.e. EN 149 with FFp2 and A-1 class filter) when draining / packaging PCBs capacitors and transformers or filling barrels with PCBs
- Safety goggles
- Heavy duty rubber gloves (neoprene or butyl)
- Reinforced safety shoes
- Overshoes
- Helmet

The personnel should always wear proper PPE when working inside the PCBs storage facility. PPE should be always removed before leaving the storage facility and entering the general environment or public buildings. Therefore, storage facilities should always include an area dedicated to the wearing and putting off PPEs.

Workers in charge of operations in the storage facility should pass a health check before starting their assignment at the PCBs storage sites, and subsequently at least once per year. These tests should include:hepatic functionality; functionality of the endocrine system; functionality of the immune system; checking for epidermis irritation or anomalies. Protection of the worker privacy with reference to the medical check results and the adoption of severe countermeasure to avoid misuse of medical data by shall beestablished.

5.3. EMERGENCY PLANNING AND PREVENTION

5.3.1. FIRE

PCBs exposed to fire may generate smoke and fumes highly contaminated by PCDD/F and PCBs. In addition, while pure PCBs are usually not flammable, PCBs contaminated oil is flammable and dangerous for its content in PCBs.

Fire prevention system must then be established at any PCBs storage site. Fire prevention should be both passive and active. Passive prevention includes avoiding PCBs being exposed to any source of fire or heat; compartmentalize the storage to ensure that in case of fire each compartment is insulated and air is not available to sustain fire; ensure that all the rooms where PCBs waste is stored can be completely insulated by switching off any air circulation system and closing air inlets.

Active prevention system includes the availability of fire extinguisher at the proper places within the storage facility, and in any case in the close vicinity of all flammable material. Fire extinguisher of the

proper class and size, like for instance ABC dry powder extinguishers, 35 kg type, should be used. Fire extinguisher must be properly signaled.

The fire protection system shall also include safe evacuation rules and paths, fire protection signs, fire protection safety warning system, fire-retardant covering for the walls and the roof of the main building, and eligible fire-retardant coating for the steel structure.

5.3.2. FLOODS

Large PCBs storage facilities should never be located within areas subject to flood. A safe rule should be to establish storage sites outside (above) the areas of centennial recurrence of a flood. This rule may be hard to be fulfilledin case of small PCB storage sites located near the PCBs source. Where small PCBs storage site are located in areas subjected to floods, the following countermeasures should be adopted:

- Make sure that drums and other containers of PCBs are closed, sturdy and leak proof.
- Secure containers to floor or walls by proper retaining systems.
- Place containers in an appropriate storage location not placed in lower areas such as basements.
- Make sure that all the containers and PCBs containing equipment are clearly labelled with indestructible labels.

5.3.3. EARTHQUAKES

Storage facilities must be built in compliance with the anti-seismic standards in force in the area.

5.3.4. LEAKAGE

If spill, leakage, or similar emergency accident occurs, emergency measures must be carried out to control pollution. Spill or leakage must be enclosed, blocked, and contained immediately, and the spilled or leaked wastewater will be absorbed by soils, sawdust, or other dry materials. All the wastewater ran out of the container shall not be allowed to run out the storage building or discharge into environment. So these waste water should collected for treatment and later measures should be taken to prevent surface water and ground water from pollution of PCB's.

5.4. MONITORING AND SITE INSPECTION

5.4.1. SITE INSPECTION

1) Site inspection should be performed regularly. The following shall be inspected weekly:

   a) Condition of all the stored PCBs equipment and containers, with specific reference to any damage, formation of dust, cracks, leakage

   b) Functionality of all the alarm and fire suppression systems

   c) General condition of the fencing and external signaling, with special reference to any evidence of vandalism or attempted intrusion.

2) The following should be checked at least monthly:

   a) Condition of the impermeable floor and curbs for cracking or damaging (deriving for instance by the operation of vehicle inside the building)

   b) Availability and condition of the absorbing material

   c) General condition of the building, including the functionality of the electrical system.

5.4.2. INDOOR MONITORING

- Sampling and analysis of indoor air (VOC, PCBs and chlorine) and dust (total particulate and PM10) inside the storage facility should be performed at least two times per year to ensure that PCBs are stored in the proper way without any risk for the environment.
- Indirect online monitoring of PCBs and other organics by means of VOC and chlorine sensorsshould be installed in closed PCB storage facilities.

5.4.3. ENVIRONMENTAL MONITORING

- Sampling and analysis of soil and atmosphere in the vicinity of the storage facility should be performed at least once per year. The following shall be measured:
  - PCBs in soil in at least 4 key places near the PCB storage plant, at surface level and at a depth of 25cm from the soil surface;
  - PCBs in the ambient air and at the outlet of the air purification system.
- The methodological analysis adopted should allow the measurement of the most significant PCBs isomers, including dioxin like isomers.

5.5. DESIGN CONSIDERATIONS FOR A CENTRALIZED PCB STORAGE FACILITY

5.5.1. GENERAL LAYOUT

The PCB storage site should include the following areas:

1) Waste acceptance facility;
2) Loading and unloading area;
3) Workshop for the dismantling / draining of PCBs containing equipment;
4) Compartmentalized storage for equipment or tanks containing pure PCBs
5) Compartmentalized storage for equipment or tanks containing oil contaminated by PCBs
6) Storage area for solid waste contaminated by PCBs

7) Storage area for solid non-PCBs material which may be considered as “end of waste”, like reclaimed carcasses, metal sheets, uncontaminated electrical component dismantled from PCBs equipment, etc.

The storage shall be a closed warehouse with doors of a sufficient size to allow trucks to enter the storage building. The entire area shall be fenced, surveyed and clearly marked with warning signs.

5.5.2. WASTE ACCEPTANCE FACILITIES

Large, centralized storage facilities:-

Large storage facilities receiving PCBs from other areas should establish a dedicated system (staff and infrastructures) for waste acceptance. This system shall carry out the following tasks:

- Inspection, weighting and analysis of PCBs waste brought to the plant;
- Filling the relevant hazardous waste manifest form to be returned to the PCBs owner; same.

Waste acceptance facility should therefore include:

- A temporary area were waste under acceptance must be temporary stored, or where trucks transporting PCBs waste may park before unloading;
- Scales for weighing trucks and for equipment;
- A computerized database of the PCBs waste and equipment entering and stored in the PCB storage facility;
- Laboratory equipment for sampling and testing PCBs in dielectric oil and in other matrixes.

Small storage facilities :-

Small storage facilities located inside factories or facilities, receiving and storing PCBs only from the factory or facility where they are located, do not require to carry out the procedure for hazardous waste manifest, as this procedure is intended only for the transportation of waste by public roads. However, if these facilities accept PCBs waste coming from other areas or industries, they must put in place the same waste acceptance procedure described above for large PCBs storage facilities.

5.5.3. WASTE RECORD KEEPING

In any case, PCBs equipment stored must be properly labeled and registered. For any PCBs equipment or waste accepted for storage, the data reported in the hazardous waste manifest form should be recorded on a computerized database. In addition, data provided by the PCBs owner which is delivering the equipment or waste should be also recorded

5.5.4. LOADING AND UNLOADING AREAS

The loading and unloading area must be equipped with moving crane which will be used to swing and carry the wastes in the storage building. As the biggest transformercould weight several tons, according to the weight and volume of the hazardous wastes, the crane will have a lifting capacity of at least 10 tons.

A fork lift truck is to unload and carry PCBs wastes in the storage building with a lifting capacity of 2 tons shall be available at the site. There should be a path of at least 4 m wide for the fork lift truck to move.

5.5.5. EQUIPMENT DRAINING AND DISMANTLING AREAS

All draining or dismantling of PCBs contaminated equipment shall be carried out in a dedicated dismantling and draining area. Transformers containing PCBs contaminated oil or pure PCBs shall be drained over impermeable platform where any leakage may be intercepted and promptly recovered. The draining and dismantling area shall be equipped with tools, draining pumps, tanks.

5.5.6. WASTE PRETREATMENT AREAS

Depending on the type of pre-treatment, special areas need to be arranged as following:

- Areas for shredding of PCBs containing equipment (capacitors);
- Areas for mixing PCBs containing waste with other hazardous waste (i.e. before incineration)

These areas shall be arranged to prevent the specific risk deriving from the equipment used and the material processed.

5.5.7. WASTE STORAGE AREAS

The storage area shall be arranged in the following sub areas:

Waste containing liquid PCBs: These wastes shall be stored adopting countermeasures aimed at preventing leakage.

- PCBs contaminated oils
- PCBs pure oil.
- Clean or decontaminated dielectric oil
- Transformers
- Capacitors

Waste contaminated by PCBs, but not containing liquid PCBs:-

Except for drained transformers, the other shall be stored on metallic container or barrels to be placed on a concrete platform.

- Drained transformers and transformer components;

- Used tools and PPEs to be wasted;
- Non metallic PCB contaminated waste, like insulating paper, wood, etc.

5.6. SITE CLOSURE

At the end of its operational life, the entire PCBs storage facility as to be decontaminated from PCBs prior to be reused for other purposes. Depending on the level of contamination and on the size of the storage facility, it could be convenient to proceed to the complete demolition of the site instead of its cleanup. Demolition or cleanup costs for the PCBs storage facility should be always included in the calculation of the investment and operational cost for that facility.

5.6.1.CLEANUP OF PCBS STORAGE FACILITIES

The cleanup of the PCBs storage facility shall be based on the following steps:

1) Mapping of the PCBs storage facility compartments based on the expected level of contamination; in general, the expected order of contamination can be as following;
   - Pretreatment and dismantling areas;
   - Draining areas;
   - Loading and unloading areas
   - Storage of PCBs contaminated material
   - Storage of closed tanks;
   - External areas

   This rank has to be adjusted on the basis of the history of the site (for instance, change of the use of certain storage compartments, leakage episodes, other accidents).
2) Sampling and analysis of each area of compartment to confirm its level of contamination, when necessary;
3) Drafting of a cleanup plan. The cleanup plans should be arranged in such way to avoid cross-contamination between low and high PCBs contaminated areas; the cleanup plan should contain:
   - Arrangement of PPEs and emergency measures;
   - Cleaning of equipment for instance, shredding equipment shall be cleaned by operating it with non contaminated material, which subsequently has to be wasted, and by cleansing with non

contaminated oil; tools used for dismantling transformers shall be cleaned with solvents; empty tanks shall be repeatedly rinsed / sprayed with clean oil and solvents;

- Cleaning of surfaces: dust shall be removed and collected from all surfaces; impermeable surfaces shall be cleaned with solvents or surfactants.
- Concrete which has been contaminated by PCBs shall be either washed with solvents and subsequently by absorbing material, further coated with additional impermeable layers, or scrapped.
- Collection and packaging of all the contaminated waste and of all the materials (solvents, oil, sand, sawdust) and equipment (PPE) used for cleaning up the site; all this material shall be classified and stored in one of the PCBs storage compartment, and disposed by an appropriate disposal technology as soon as possible. After removal of these wastes, a final round of cleaning of this storage compartment will be carried out.

1) Conduction of the cleanup plan
2) Sampling and monitoring for final compliance check by relevant authorities with the desired level of cleanup.

5.6.2.DEMOLISHING OF STORAGE FACILITIES

In some cases (small PCBs storage site, PCBs storage site heavily contaminated, permitting conditions requiring the dismantling of the storage facility after use) it is necessary to demolish the whole facility instead of clean it up. In these cases, it is recommended to conduct the demolition activity in the following order:

- Cleanup activity aimed at removing all the highly contaminated waste, on the basis of the same procedure depicted in the previous chapter;
- Removal of medium / low contaminated waste (for instance, concrete platforms, soil in the loading / unloading areas, etc.);
- Dismantling and demolition of the facility. The facility shall be dismantled only after all the waste removed during its cleanup have been disposed;
- Disposal of all demolished material.
- Final monitoring.

6. TRAINING

Training for the operators of PCBs storage sites will concern the following issues

- Basics of International and national legislation on PCBs
- Basics of PCBs toxicology and ecotoxicology

- Use of PPEs: respiratory masks, protective suits, how to wear and put off PPEs.
- How to handle PCBs contaminated equipment
- Labeling and inventory of PCBs
- Packaging of PCBs equipment
- Procedures related to the hazardous waste manifest
- Emergency procedures: leakage, fire, floods, earthquake
- First aid in case of contamination by PCBs.
- Use of fast screening kits for the detection of PCBs in dielectric oil and soil

Training shall be conducted by specialized and independent staff, repeated yearly and verified by appropriate tests

7. ANNEX I. TECHNICAL SPECIFICATION FOR THE SAFE STORAGE OF POPS UNDER THE BASEL CONVENTION

1) Wastes consisting of, containing or contaminated with POPs should be stored safely, preferably in dedicated areas away from other materials and wastes. Storage areas should be designed to prevent the release of POPs to the environment by any route. Storage rooms, areas or buildings should be designed by professionals with expertise in the fields of structural design, waste management and occupational health and safety or can be purchased in prefabricated form from reputable suppliers.

2) Some basic principles of safe storage of wastes consisting of, containing or contaminated with POPs are as follows:

   a) Storage sites inside multi-purpose buildings should be in a locked dedicated room or partition that is not in an area of high use;

   b) Outdoor dedicated storage buildings or containers[1] should be stored inside a lockable fenced enclosure;

   c) Separate storage areas, rooms or buildings should be used for each type of POPs waste, unless specific approval has been given for joint storage;

   d) Such wastes should not be stored at or near sensitive sites such as hospitals or other medical care facilities, schools, residences, food processing facilities, animal feed storage or processing facilities, agricultural operations, or facilities located near or within environmentally sensitive sites;

   e) Storage rooms, buildings and containers should be located and maintained in conditions that will minimize volatilization, including cool temperatures, reflective roofs and sidings, a shaded location,

1 Shipping containers are often used for storage.

etc. When possible, particularly in warmer climates, storage rooms and buildings should be maintained under negative pressure with exhaust gases vented through carbon filters, bearing in mind the following conditions:

i) Ventilating a site with carbon filtration of exhaust gases may be appropriate when exposure to vapours for those who work at the site and those living and working in the vicinity of the site is a concern;

ii) Sealing and venting a site so that only well-filtered exhaust gases are released to outside air may be appropriate when environmental concerns are paramount;

f) Dedicated buildings or containers should be in good condition and made of hard plastic or metal, not wood, fibreboard, drywall, plaster or insulation;

g) The roofs of dedicated buildings or containers and the surrounding land should be sloped to provide drainage away from the site;

h) Dedicated buildings or containers should be set on asphalt, concrete or durable (e.g., 6 mm) plastic sheeting;

i) The floors of storage sites inside buildings should be concrete or durable (e.g., 6 mm plastic sheeting). Concrete should be coated with a durable epoxy polymer;

j) Storage sites should have fire alarm systems;

k) Storage sites inside buildings should have (preferably non-water) fire suppression systems. If the fire suppressant is water, then the floor of the storage room should be curbed and the floor drainage system should not lead to the sewer or storm sewer or directly to surface water but should have its own collection system, such as a sump;

l) Liquid wastes should be placed in containment trays or a curbed, leak-proof area. The liquid containment volume should be at least 125 per cent of the liquid waste volume, taking into account the space taken up by stored items in the containment area;

m) Contaminated solids should be stored in sealed containers such as barrels or pails, steel waste containers (logger boxes) or in specially constructed trays or containers. Large volumes of material may be stored in bulk in dedicated shipping containers, buildings or vaults so long as they meet the safety and security requirements as described herein;

n) A complete inventory of such wastes in the storage site should be created and kept up to date as waste is added or disposed of;

o) The outside of the storage site should be labelled as a waste storage site;

p) The site should be subjected to routine inspection for leaks, degradation of container materials, vandalism, integrity of fire alarms and fire suppression systems and general status of the site.