HAZARDOUS WASTE

A waste due to its chemical activity or flammable explosive toxic or corrosive properties is likely to result in danger to human health or the environment.

Hazardous waste is used as a broad term to denote industrial by product and waste materials discarded from homes commercial establishment and institutions that pose an unreasonable risk to human health and environment.

Hazardous waste can be solid , liquid or gases and semi-liquids like mining sludge and drilling mud.

This include familiar items like used motor oil and mercury, agricultural pesticides and industrial material such as asbestos and PCBS

Sources of hazardous waste

The term hazardous waste often includes by-products of industrial, domestic, commercial, and health care activities.

Rapid development and improvement of various industrial technologies, products and practices may increase hazardous waste generation.

Most hazardous wastes are produced in the manufacturing of products for consumption or further industrial application.

Hazardous waste sources include industry, institutional establishments, research laboratories, mining sites, mineral processing sites, agricultural facilities and the natural environment.

All sources that discharge liquid, gaseous or solid wastes that fit the above definition can be regarded as sources of hazardous wastes.

Major hazardous waste sources and their pollution routes in the environment are listed below.

1. Agricultural land and agro-industry:

Hazardous wastes from agricultural land and agro-industry can expose people to pesticides, fertilizers and hazardous veterinary product wastes.

Farms are a major source of these wastes, and agrochemicals can leach into the environment while in storage or can cause damage after their application.

2. Domestic

Households stock various hazardous substances such as batteries and dry cells, furniture polishes, wood preservatives, stain removers, paint thinners, rat poisons, herbicides and pesticides, mosquito repellents, paints, disinfectants, and fuels (i.e. kerosene) and other automotive products. These can present a variety of dangers during storage, use and disposal.

3. **Mines and mineral processing sites**

Mining and mineral processing sites handle hazardous products that are present in the additives, the products and the wastes.

4. Health care facilities

Health care facilities are sources of pathological waste, human blood and contaminated needles. Specific sources of these wastes include dentists, veterinary clinics, home health care, blood banks, hospitals, clinics and medical laboratories.

5. Commercial wastes

Commercial waste sources include gasoline stations, dry cleaners and automobile repair shops (workshops). The types of hazardous wastes generated by these sources depend on the services provided.

6. Institutional hazardous waste sources

- Institutional hazardous waste sources are mainly research laboratories, research centers and military installations.
- Military establishments also carry out activities that generate other types of hazardous wastes of household, commercial and industrial nature.

7. Industrial hazardous waste sources

Hazardous wastes are created by many industrial activities.

For example, the hazardous wastes from the petroleum fuel industry include the refinery products (fuels and tar), impurities like phenol and cyanides in the waste stream, and sludge flushed from the storage tanks.

8. Solid waste disposal sites

These are mainly disposal sites for municipal solid waste, but hazardous wastes that have not been properly separated from other wastes are also at these sites.

9. Contaminated sites

These are sites that are contaminated with hazardous wastes due to activities that use or produce hazardous substances or due to accidental spills.

Former sites of industries that used or produced hazardous materials belong to this group.

10. Building materials

Roofs and pipes made of materials incorporating asbestos, copper, or other materials may present a source of hazardous waste

Source

The inclusive listing adopted by EPA includes separate lists of nonspecific source wastes, specific source wastes, and commercial chemical Hazardous Waste Lists

- A waste is determined to be a hazardous waste if it is specifically listed on one of four lists (the F, K, P and U lists) found in title 40 of the Code of Federal Regulations (CFR) in section 261.

F-List (Non-Specific Source Wastes)

- It is called “F” wastes because their EPA waste identification codes begin with the letter F, are generic wastes, commonly produced by manufacturing and industrial processes.

- Examples from this list include spent halogenated solvents used in degreasing and wastewater treatment sludge from electroplating processes as well as dioxin wastes, most of which are **“acutely hazardous”** wastes due to the danger they present to human health and the environment. benzene, methylene chloride, trichloroethylene, carbon tetrachloride are few of the solvents listed in F list.

K-List (Source-Specific Wastes)

- The wastes listed under the K-list are produced from 13 specific industries such as pesticide manufacturing, petroleum refining. explosives manufacturing, iron and steel production, secondary lead processing and ink formulation.
- Remember, not all wastes from these industries fall in the K-list. Treatment and production process wastes such as wastewaters and sludges from these industries is mostly what forms the K-list.

Commercial chemical products: “P” and “U” List

- It is denoted by “P” and “U” codes and include specific commercial chemical products or manufacturing chemical intermediates. Commercial pure grade chemicals or any formulations with either of chemicals as active ingredient are listed in P and U list.

- P list is differentiated from U list based on the quantity at which the chemical is regulated.

- Acute toxic wastes whose accumulation or waste generation exceeds 1 kg per month is categorized under unlike U list whose waste generation 25 kilograms per month. This list includes chemicals such as chloroform and creosote, acids such as sulfuric and hydrochloric, and pesticides such as DDT etc.,

M-List (Discarded Mercury-Containing Products)

- The M-list includes discarded products or wastes containing mercury. Some of the examples of wastes listed on the M-list are mercury switches, fluorescent lamps, and mercury-containing novelties.

When categorizing hazardous waste, the EPA breaks it down by four characteristics:

- **ignitability**, or something flammable
- **Corrosivity**, or something that can rust or decompose
- **Reactivity**, or something explosive
- **Toxicity**, or something poisonous
- These high level categories each have their own characteristics that further help you as a generator define with what your are dealing**.**

Hazardous Wastes Characteristics

- According to US EPA (Environmental Protection Agency) wastes may be listed as hazardous wastes if they exhibit one of these four characteristics.

  1. Corrosivity – Solid wastes that are acids or bases, or produce acidic or alkaline solutions are termed as corrosive wastes.
- Similarly, liquid wastes that can corrode metal containers such as barrels, drums or storage tanks also fall under the category of corrosive wastes.
- A corrosive is anything liquid with a pH of less than or equal to 2 or greater than or equal to 12.5, or has the ability to corrode steel.
- Everyday example of corrosives include battery acid and rust removers

2. Ignitability –

- It can create fire under certain condition.
- Ignitable substances are easily ignited and burn vigorously and persistently.
- Example : Include volatile liquid such as solvents whose vapors ignite at relatively low temperature(60 c or less)
- Example : Solvents ,gasoline and oil

3. Reactivity – . Mostly wastes that can explode or release toxic fumes, gases or vapors under normal conditions are termed as reactive wastes. Some examples of reactive wastes are unused batteries and lithium-sulfur batteries.

4. Toxicity – Wastes that contain constituents such as lead, mercury, PCBs, DDT or more, and prove fatal or can cause harm when ingested or absorbed, are termed as toxic wastes. When disposed, toxic wastes discharge toxic constituents that pollute ground water.

CLASSIFICATION OF HAZARDOUS WASTE

- Hazardous wastes are classified as:

1. **Radioactive substance:**

- Substances that emit ionizing radiation are radioactive.
- Such substances are hazardous because prolonged exposure to radiation often results in damage to living organisms.
- Radioactive substances are of special concern because they persist for a long period.

2. **Chemicals:**

- Most hazardous chemical wastes can be classified into four groups:
- Synthetic organics, inorganic metals, salts, acids and bases, and flammables and explosives.
- Some of the chemicals are hazardous because they are highly toxic to most life forms.
- When such hazardous compounds are present in a waste stream at levels equal to, or greater than, their threshold levels, the entire waste stream is identified as hazardous.

3. Biomedical wastes:

- The principal sources of hazardous biological wastes are hospitals and biological research facilities.
- This group mainly includes malignant tissues discarded during surgical procedures and contaminated materials, such as hypodermic needles, bandages and outdated drugs.

4. **Flammable wastes:**

- Most flammable wastes are also identified as hazardous chemical wastes.
- This dual grouping is necessary because of the high potential hazard in storing, collecting and disposing of flammable wastes.
- These wastes may be liquid, gaseous or solid, but most often they are liquids. Typical examples include organic solvents, oils, plasticizers and organic sludge's.

5. Explosives:

- Explosive hazardous wastes are mainly ordnance (artillery) materials, i.e., the wastes resulting from ordnance manufacturing and some industrial gases.
- Similar to flammables, these wastes also have a high potential for hazard in storage, collection and disposal, and therefore, they should be considered separately in addition to being listed as hazardous chemicals.
- These wastes may exist in solid, liquid or gaseous form.

Control of Hazardous Waste

1. Whom or what to control?

There are five types of hazardous waste generators:

(1) The primary generator,
(2) The transporter,
(3) Waste storage,
(4) Treatment, and
(5) Disposal facilities.

All the producers and the recipients of waste need to follow certain standard operative procedures (SOP) to manage the waste in accordance with the existing law and waste regulations.

Basic data/recordkeeping, reporting, manifesting, protocols of SOP, and contingency planning in cases of emergency are very essential for waste tracking purpose.

- **Storage and collection of Hazardous waste**

- Onsite storage practices are a function of the types and amounts of hazardous
- Usually, when large quantities are generated, special facilities are used that have sufficient capacity to hold wastes accumulated over a period of several days.
- When only a small amount is generated, the waste can be containerized, and limited quantity may be stored.
- For example, corrosive acids or caustic solutions are stored in fiber glass or glass-lined containers to prevent deterioration of metals in the container.
- Great care must also be exercised to avoid storing incompatible wastes in the same container or locations.

Typical drum containers used for the storage of hazardous waste:

- **Light-Gauge Closed Head Drum**
- **Light-Gauge Open Head Drum**

The waste generator, or a specialized hauler, generally collects the hazardous waste for delivery to a treatment or disposal site.

The loading of collection vehicles is completed in either of the following ways:

- Wastes stored in large-capacity tanks are either drained or pumped into collection vehicles
- Wastes stored in sealed drums or sealed containers are loaded by hand or by mechanical equipment onto flatbed trucks.

The stored containers are transported to the treatment and disposal facility.

To avoid accidents and the possible loss of life, two collectors should be assigned when hazardous wastes are to be collected. The equipment used for collection vary with the waste characteristics.

- **Collection:**

  Elements of collection, includes not only the gathering of solid waste and recyclable material, but also the transport of these materials after collection, to the location where the collection vehicle is emptied.

- **Handling and Separating Hazardous Solid Waste:**

- Waste handling and separation involves activities associated with waste management until the waste is placed in storage containers for collection.
- Handling also include the movement of loaded containers to the point of collection.
- Separating different types of waste components is an important step in the handling and storage of solid waste at the source.

Equipment for Collection of Hazardous Waste

Waste Category	Collection equipment and accessories
Radioactive substances	Various types of trucks and railroad equipment depending on characteristics of wastes; special marking to show safety hazard; heavy loading equipment to handle concrete-encased lead containers.
Toxic chemicals	Flatbed trucks for wastes stored in drums; tractor-trailer tank truck combination for large volumes of wastes; railroad tank cars; special interior linings such as glass, fibreglass or rubber.
Biological wastes	Standard packers' collection truck with some special precautions to prevent contact between wastes and the collector; flatbed trucks for wastes stored in drums.
Flammable wastes	Same as those for toxic chemicals, with special colorings and safety warning printed on vehicles.
Explosives	Same as those for toxic chemicals with some restriction on transport routes, especially through residential areas.

- **Transfer and Transport:**
- Transfer and transport refers to the facilities used to transfer of wastes from one location to another.
- - Small collection vehicles are transferred to larger vehicles that are used to transport the waste over extended distances to disposal sites.

- **RESPONSIBILITIES OF THE HAZARDOUS WASTE TRANSPORTER**

1. Vehicle used for transportation shall be in accordance with the provisions under the Motor Vehicle Act, 1988, and rules made there under. He should also require obtaining requisite authorization from SPCB/PCC for transport of hazardous waste.

2. Transporter shall possess requisite copies of the certificate (valid authorization obtained from the concerned SPCB/PCC for transportation of waste by the waste generator and operator of a facility) for transportation of hazardous waste.

3. Transporter should have valid “Pollution under Control Certificate” (PUCC) during the transportation of hazardous waste and shall be properly displayed.

4. Vehicle shall be painted preferably in blue colour with white strip of 15 to 30 cm width running centrally all over the body. This is to facilitate easy identification.

5. Vehicle should be fitted with mechanical handling equipment as may be required for safe handling and transportation of the wastes.

6. The words “HAZARDOUS WASTE” shall be displayed on all sides of the vehicle in Vernacular Language, Hindi and English.

7. The trucks shall be dedicated for transportation of hazardous wastes and they shall not be used for any other purpose.

8. Each vehicle shall carry first-aid kit, spill control equipment and fire extinguisher.

9. Hazardous Waste transport vehicle shall run only at a speed specified under Motor Vehicle Act in order to avoid any eventuality during the transportation of hazardous waste.

10. Educational qualification for the driver shall be minimum of 10 th pass The driver of the transport vehicle shall have valid driving license of heavy vehicles from the StateRoad Transport Authority and shall have experience in transporting the chemicals.

11. Driver (s) shall be properly trained for handling the emergency situations and safety aspects involved in the transportation of hazardous wastes.

12. Transporting the wastes in closed container at all time.

13. Cleanup in case of contamination.

14. Cleaning of vehicles shall be carried out at designated places as authorized by SPCB/PCC