

PART I INTRODUCTION

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1. Introduction

- 1.1. Hazardous wastes are by nature very toxic and dangerous. Improper management of such wastes will lead to serious pollution of the environment and the ecosystem as well as immediate /long term impacts to human health. Managing hazardous wastes requires a comprehensive understanding of regulatory framework, waste properties, waste management concepts, and accepted good management practices.
- 1.2. In Malaysia, hazardous waste is legally defined as “scheduled waste”.

2. Definition Of Scheduled Waste In Malaysia

- 2.1. The term “scheduled waste” will be referred to the waste materials that are specified in the “First Schedule of Regulation 2, Environmental Quality (Scheduled Wastes) Regulations 2005”.
- 2.2. Every waste type mentioned in First Schedule must be considered as scheduled waste regardless of its hazardous properties. The list of the waste types is divided into five (5) groups as follows:

Group 1 – SW 1 : Scheduled wastes from metal and metal-bearing wastes

Group 2 – SW 2 : Scheduled wastes from wastes containing principally inorganic constituents which may contain metals and organic materials

Group 3 – SW 3 : Scheduled wastes from wastes containing principally organic constituents which may contain metals and inorganic materials

Group 4 – SW 4 : Scheduled wastes from wastes which may contain either inorganic or organic constituents

Group 5 – SW 5 : Scheduled wastes from other wastes

3. Hazardous Waste Characteristics

- 3.1. A hazardous waste characteristic is a property that, when present in a waste, indicates that the waste poses a sufficient threat to merit regulation as hazardous.
- 3.2. The USEPA under Code of Federal Regulations (CFR) has defined the waste as hazardous if:
 - It is included in one of the four lists of hazardous waste found in the regulations (referred to as “listed waste”)

- It exhibits one of the four defined hazardous waste characteristics of ignitability, corrosivity, reactivity, toxicity (referred to as "characteristic of waste")



Figure 1 : Diagram of Characteristics Of Hazardous Wastes

- 3.3. A waste is considered hazardous if it has one or more of the following characteristics as listed in **Table 1:-**

Table 1: Characteristics Of Hazardous Wastes

Characteristic	Criteria	Examples of Scheduled Wastes
(i) Ignitability	<p>Ignitability characteristic identifies waste materials that can readily catch fire, combustible, flammable and sustain combustion. Many ignitable wastes are in liquid form including paint wastes, spent cleaners and spent solvents. A waste exhibits the characteristic of ignitability if representative sample of waste has any of the following properties:</p> <p>a) If the waste is a liquid and has flash point less than 60°C (140°F) as determined by a Pinsky-Martens closed cup tester or a Seta flash closed cup tester (flash point test - determines the lowest temperature at which the fumes or vapours above a waste will ignite when exposed to flame)</p>	<ul style="list-style-type: none"> ▪ SW 303 – Adhesive or glue containing organic solvents excluding polymeric materials. ▪ SW 322 – Waste of non-halogenated organic solvents ▪ SW 325 - Uncured resin waste containing organic solvents ▪ SW 416 - Sludges of inks, paints, pigments, lacquer, dye or varnish. ▪ SW 417 - Waste of inks, paints, pigments, lacquer, dye or varnish. ▪ It is an oxidizer, SW 432 – Waste

Characteristic	Criteria	Examples of Scheduled Wastes
	<p>b) If the waste is not a liquid but is capable under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and when ignited, burns so vigorously and persistently that it creates hazard</p> <p>c) It is an ignitable compressed gas</p> <p>d) It is an oxidizer</p>	<p>containing, consisting of or contaminated with peroxides</p>
(ii) Corrosivity	<p>Corrosivity characteristic identifies wastes that are acidic or alkaline (basic) which can readily corrode or dissolve flesh, metals or other materials.</p> <p>A waste exhibits the characteristic of corrosivity if representative sample of waste material has either of the following properties:</p>	<ul style="list-style-type: none"> ▪ SW 206 – Spent inorganic acids ▪ SW 201 – Spent organic acids with pH less or equal to 2 which are corrosive or hazardous ▪ SW 401 – spent alkalis containing heavy metals

Characteristic	Criteria	Examples of Scheduled Wastes
	<p>a) If the waste has an aqueous component and has a pH less than or equal to 2, or greater than or equal to 12.5 as determined by an approved/calibrated pH meter; or</p> <p>b) If the waste has a liquid component and corrodes steel at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55 °C (130°F).</p>	<ul style="list-style-type: none"> ▪ SW 402 – Spent alkalis with pH more or equal to 11.5 which are corrosive or hazardous
(iii) Reactivity	<p>Reactivity characteristic identifies wastes that readily explode or undergo violent reactions or react to release toxic gases or fumes.</p> <p>A waste is reactive if it is unstable or undergoes rapid or violent chemical reactions, such as catching fire, exploding, or giving off fumes, when exposed to or mixed with water, air or other materials.</p>	<ul style="list-style-type: none"> ▪ SW 317 – Spent organometallic compounds including tetraethyl, tetramethyl lead and organotin compounds ▪ SW 431 – Waste from manufacturing or processing or use of explosives

Characteristic	Criteria	Examples of Scheduled Wastes
	<p>A waste exhibits the characteristic of reactivity if a representative sample of waste has any of the following properties:</p> <ul style="list-style-type: none"> a) If the waste is normally unstable and readily undergoes violent changes without detonating. b) If the waste reacts violently with water. c) If the waste form potentially explosive mixtures with water. d) If the waste when mixed with water generates toxic gases, vapours or fumes to cause danger to human health or the environment. e) If the cyanide or sulfide bearing waste when exposed to pH between 2 and 11.5 generates toxic 	

Characteristic	Criteria	Examples of Scheduled Wastes
	<p>gases, vapours or fumes to cause danger to human health and the environment.</p> <p>f) If the waste is capable to cause detonation or explosion when subjected to a strong initiating source or if heated under confinement.</p> <p>g) If the waste is readily capable to cause detonation or explosive decomposition or reaction at standard temperature and pressure.</p>	
(iv) Toxicity	<p>Waste is hazardous by virtue of the toxicity characteristic if it exceeds specified concentrations of certain metals and organic compounds as listed by reference in the regulations.</p> <p>USEPA designed a laboratory procedure</p>	<ul style="list-style-type: none"> ▪ SW 101 Waste containing arsenic or its compound. ▪ SW 104 Dust, slag, dross or ash containing aluminium, arsenic, mercury, lead,

Characteristic	Criteria	Examples of Scheduled Wastes
	<p>known as Toxicity Characteristic Leaching Procedure (TCLP) to estimate the leaching potential of waste when disposed of in a landfill.</p> <p>The TCLP test is to identify waste likely to leach dangerous concentrations of certain known toxic chemicals into groundwater.</p> <p>If the waste or its extract has any of the contaminants listed in Table 1 and Table 2 of the Guidelines For The Application Of Special Management Of Scheduled Waste at the concentrations equal to/or greater than the respective values given in the tables.</p> <p>Refer to Appendix 1 for Table 1 and Appendix 2 for Table 2.</p>	<p>cadmium, chromium, nickel, copper, vanadium, beryllium, antimony, tellurium, thallium or selenium excluding slag from iron and steel factory.</p> <ul style="list-style-type: none"> ▪ SW 109 Waste containing mercury or its compound ▪ SW 204 Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium ▪ SW 318 Waste, substances and articles containing or contaminated

Characteristic	Criteria	Examples of Scheduled Wastes
		<p>with polychlorinated biphenyls (PCB) or polychlorinated triphenyls (PCT).</p> <ul style="list-style-type: none"> ▪ SW 320 Waste containing formaldehyde. ▪ SW 407 Waste containing dioxins or furans.
(v) Infectious or Pathogenic	<p>A waste is also classified as hazardous if it contains infectious or pathogenic characteristics as follows:</p> <p>Ability to spread diseases or illnesses through bacteria, virus, fungus or other microorganisms:-</p> <ol style="list-style-type: none"> i. Any waste which consists wholly or partly of human or animal tissue, blood or other body fluids, excretions, drugs or ii. Other pharmaceutical products, swabs or dressings, syringes, needles or other sharp instruments, being 	<ul style="list-style-type: none"> ▪ SW 403 Discarded drugs containing psychotropic substances or containing substances that are toxic, harmful, carcinogenic, mutagenic or teratogenic ▪ SW 404 Pathogenic wastes, clinical wastes or quarantined materials

Characteristic	Criteria	Examples of Scheduled Wastes
	waste which unless rendered safe may prove hazardous to any person coming into contact with it	<ul style="list-style-type: none"> SW 405 Waste arising from the preparation and production of pharmaceutical product

3.4. In summary scheduled wastes have the following hazardous properties, characteristics and criteria:

	Ignitability
	Corrosivity
	Reactivity
	Toxicity
	Infectious properties

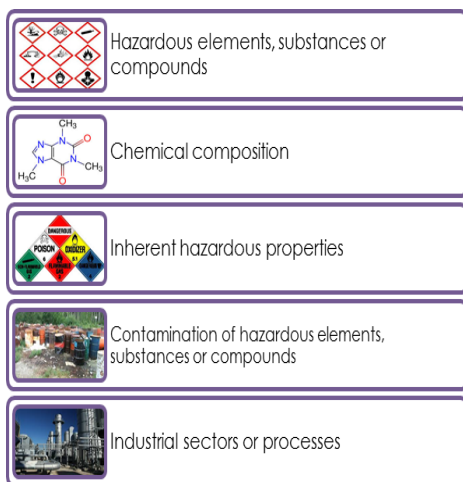


Figure 2 : Hazardous Properties, Characteristics And Criteria Of Scheduled Wastes

- 3.5. It is very important to understand and know the basic nature, properties and characteristics of hazardous wastes, due to these aspects:
- Hazardous exposure of waste components to workers during handling.
 - Safety of the facilities during handling and storage.
 - Safety during transportation of scheduled wastes.

PART II IDENTIFICATION AND CLASSIFICATION

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4. Identification And Classification Of Scheduled Waste

- 4.1. Identification of scheduled waste is the process of determining whether a specific waste has to be considered as scheduled waste. After having determined that a material is waste, it is necessary to assess whether it falls into one of the category codes of the scheduled wastes. In Malaysia, all wastes shall be classified by referring into:
- First Schedule, Environmental Quality (Scheduled Wastes) Regulations 2005 of the Environmental Quality Act 1974 (Scheduled Waste Category Codes).
- 4.2. To decide whether a waste may cause a serious threat to human health or the environment, it can usually be determined by identifying:
- The source of the waste (nature, where and how it is generated)
 - The types of process/activity
 - The basic physical and chemical properties of the waste
 - Composition and constituent of the waste

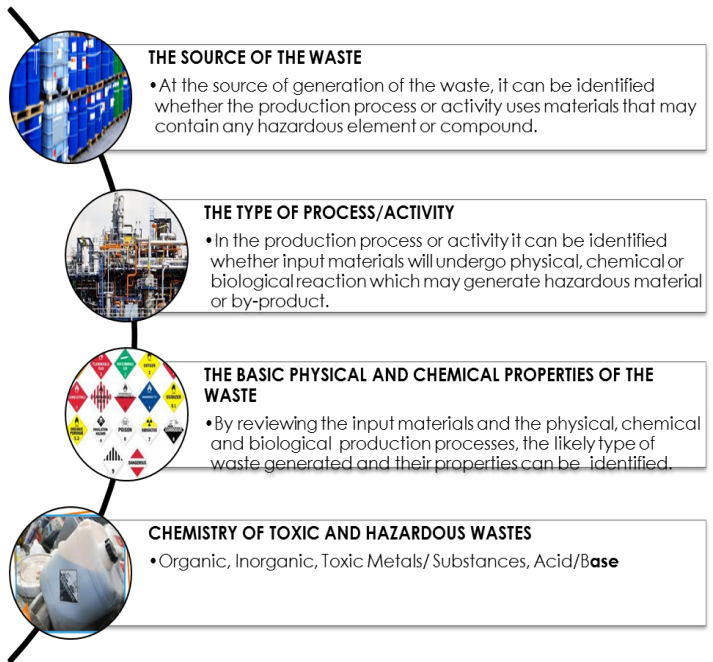


Figure 3 : Identification Of Hazardous Wastes

4.3. **Figure 4** shows the identification process of scheduled wastes from the printing industry.

A. PRINTING INDUSTRY

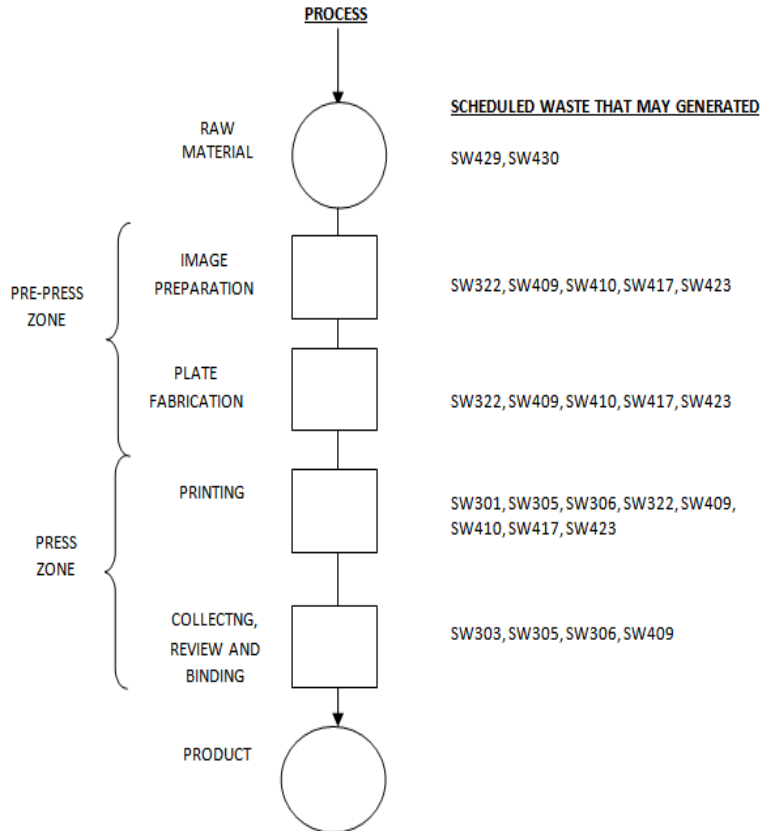


Figure 4 : Example of Identifying Scheduled Wastes from Printing Industry

4.4. **Figure 5** shows the process in the identification of scheduled wastes:-

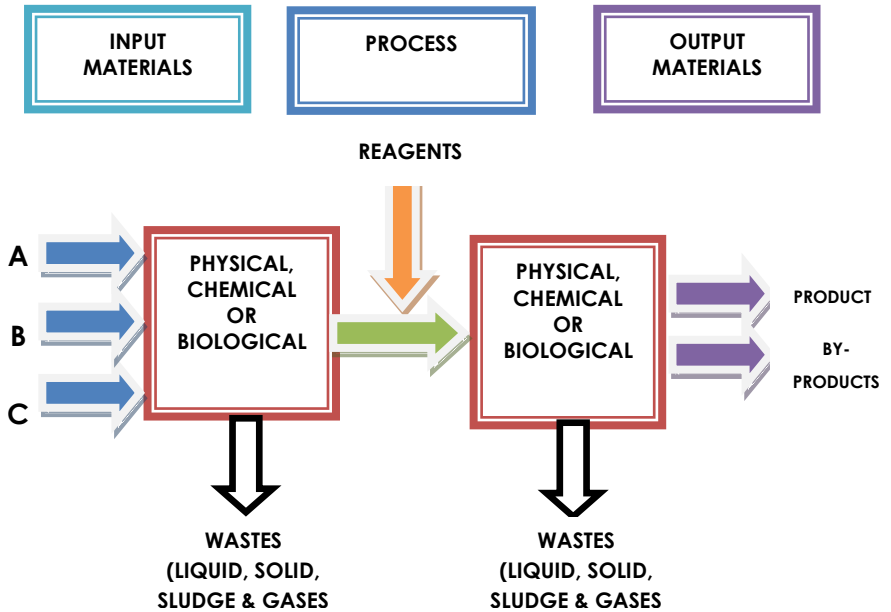


Figure 5 : Scheduled Wastes Identification Process

5. Properties And Descriptions Of Scheduled Waste

5.1. The scheduled wastes described in the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005 are based on the followings:

Table 2: Basis for Scheduled Wastes Identification

DESCRIPTION OF SCHEDULED WASTES ARE BASED ON:	EXAMPLES
a. Names of materials, chemicals or wastes	Waste containing arsenic or its compound
b. Metals, elements, compounds or constituents present in the wastes	Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium.
c. Types of processes	Waste arising from the preparation and production of pharmaceutical product.
d. Usage and application	<ul style="list-style-type: none"> o Spent lubricating oil o Chemicals that are discarded or off-specification o Obsolete laboratory chemicals
e. Contamination	Contaminated soil, debris or matter resulting from cleaning-up of a spill
f. Activity	<ul style="list-style-type: none"> o Contaminated drums o Contaminated rags

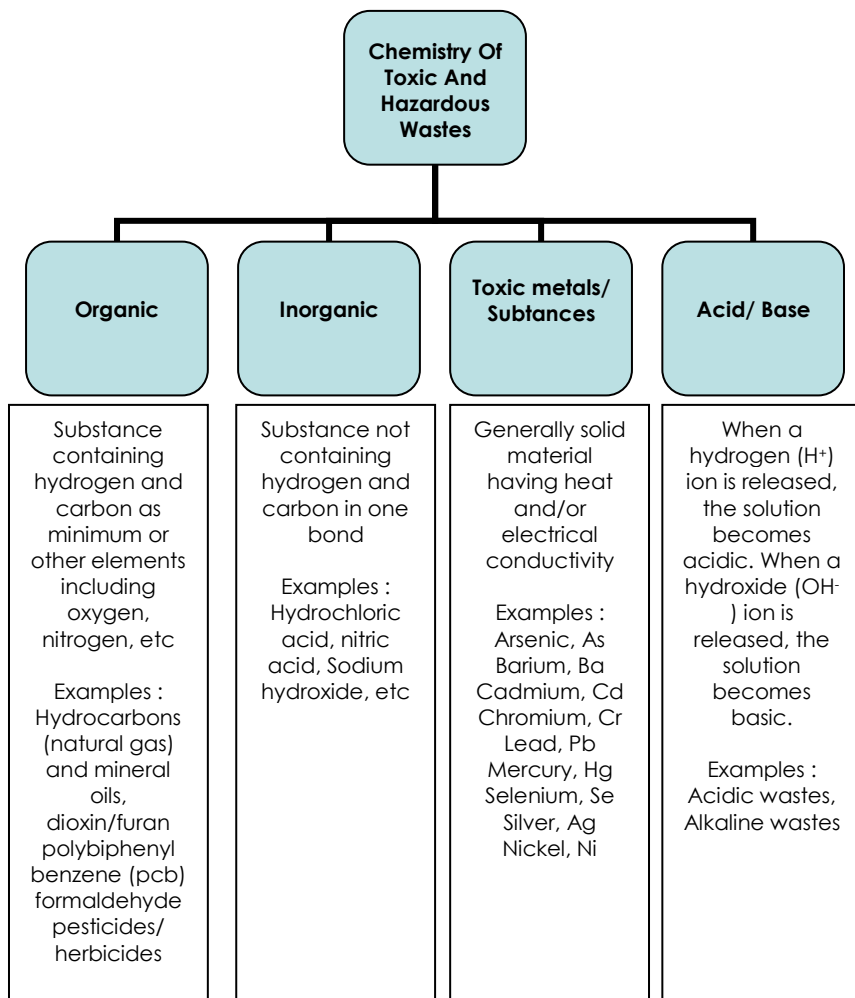
5.2. Some important physical properties of hazardous wastes need to be recorded:

- | | | |
|-----------------|--------------------------------------|---------------------------------------|
| ⊕ Flash point | ⊕ Consistency at room temperature | ⊕ Solubility in water |
| ⊕ Boiling point | ⊕ Volatility | ⊕ Waste heavier or lighter than water |
| ⊕ Density | ⊕ Vapour heavier or lighter than air | ⊕ Sorption properties |

5.3. Some basic chemical properties of hazardous wastes need to be recorded:

- pH and corrosivity of the waste
- Chemical nature and composition of the waste;
 - inorganic composition – metals,
 - organic composition – solvents, mixture of composition
- Matrix of the waste
- Reactivity of the waste with other materials
- Toxicity of the waste

5.4. The chemistry of toxic and hazardous wastes refers to four categories:-



- 5.5. The physical properties of a scheduled waste can be observed through its:
- Appearance and nature.
 - Odour and smell.
 - Release of any vapour, fume or smoke.
 - Phase – solid, liquid or gas.
 - Presence of oil and grease (oily).
 - Colour – brown, black, gray, green, etc.
 - Form (texture and shape) – fine, coarse, soft, hard, gravel, crystal, shiny, sandy, powdery, dusty, granular.
 - Wet and dry conditions
- 5.6. By visual observations, the physical nature of wastes can be divided into five groups:

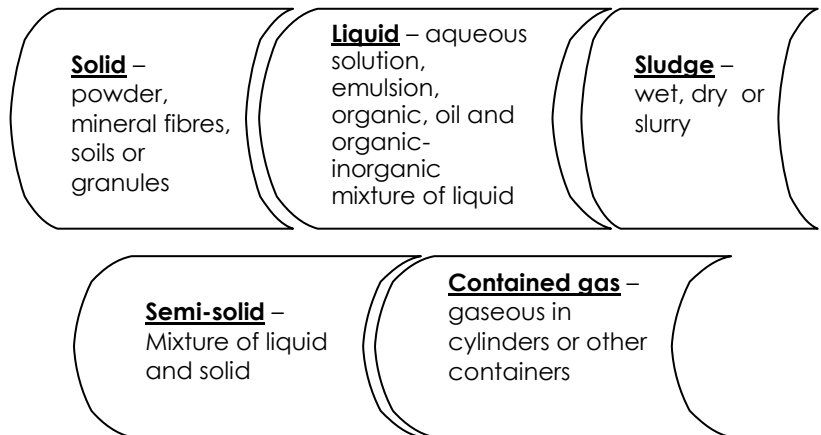


Figure 6 : Physical Nature Of Wastes

6. Criteria for Identifying the Characteristics of Scheduled Wastes

6.1. Waste generators can conduct a systematic approach to determine, identify and classify their wastes through the following steps:

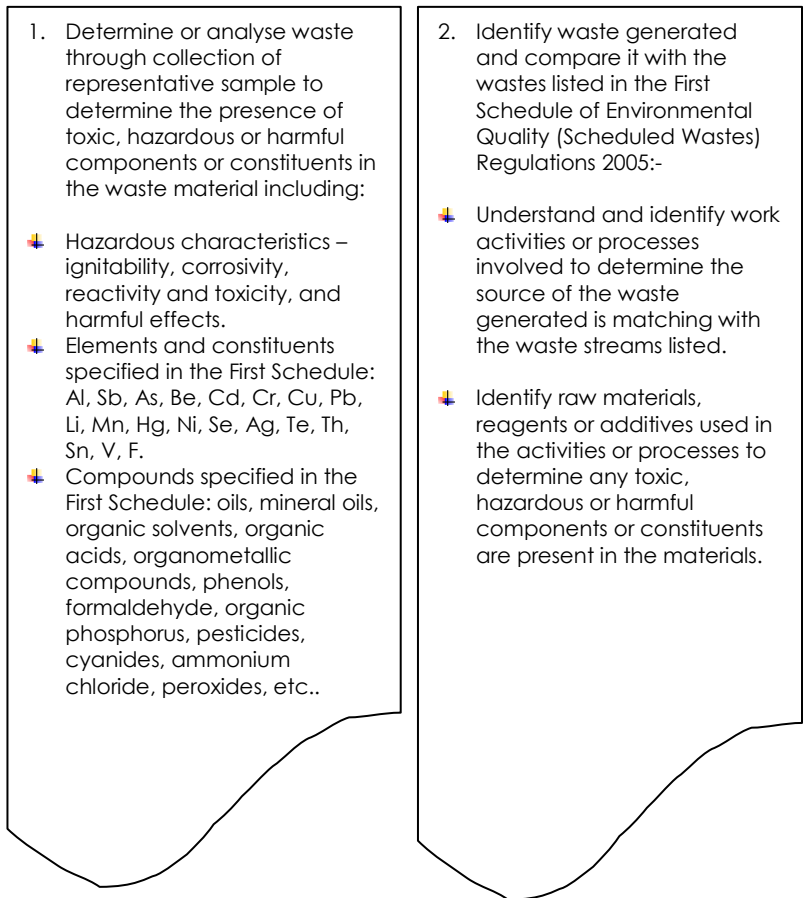


Figure 7: Systematic Approach To Determine, Identify And Classify Scheduled Wastes

6.2. Common metals or elements presence in scheduled wastes:

- | | | |
|-------------|-------------|-------------|
| ● Aluminium | ● Lead | ● Tellurium |
| ● Antimony | ● Lithium | ● Thallium |
| ● Arsenic | ● Manganese | ● Tin |
| ● Beryllium | ● Mercury | ● Vanadium |
| ● Cadmium | ● Nickel | ● Zinc |
| ● Chromium | ● Selenium | ● Fluoride |
| ● Copper | ● Silver | |

6.3. Common components or compounds presence in scheduled wastes:

- | | |
|-------------------------|---|
| ⊕ Ammonium chloride | ⊕ Organic phosphorus |
| ⊕ Calcium hydroxide | ⊕ Organic solvents |
| ⊕ Calcium sulphite | ⊕ Organometallic compounds |
| ⊕ Cyanides | ⊕ Peroxides |
| ⊕ Dioxins and furans | ⊕ Pesticides, herbicides, biocides |
| ⊕ Ethylene glycol | ⊕ Phenols, chlorophenol or phenol compounds |
| ⊕ Formaldehyde | ⊕ Polychlorinated biphenyls |
| ⊕ Oils and mineral oils | ⊕ Polychlorinated triphenyls |

7. Summary for Identification of Hazardous and Scheduled Waste Characteristics

7.1. To identify hazardous and scheduled wastes, a waste generator is required to:-

- Determine hazardous characteristics of the wastes.
- Check the chemical composition of the waste materials against the hazardous constituents specified in the list of hazardous and scheduled wastes.
- Use Material Safety Data Sheet (MSDS) information to identify hazardous components in wastes.
- Check industrial processes against waste streams specified in the list of hazardous and scheduled wastes.

7.2. Hazardous or scheduled wastes may be generated if the following materials are used in the industrial processes/activities:

- Oils or other petroleum products
- Dyes, paints, printing inks, thinners, solvents, or cleaning fluids

- Pesticides or other related chemicals
- Materials that dissolve metals, wood paper, or clothing (acids and bases)
- Flammable materials
- Materials that burn or itch upon contact with the skin
- Materials that bubble or fume upon contact with water
- Products accompanied by shipping papers or labels or an MSDS indicating that the product is hazardous
- Any substance listed as a hazardous waste in the list of common names

8. Typical Categories of Scheduled Wastes

- 8.1. Below are some typical categories of scheduled wastes (**Figures 8a-8bw**)



Figure 8a

- **Code:** SW 101
- **Description:** Waste containing arsenic or its compound
- **Example of Waste:** Spent glass decolorizing agent (arsenic trioxide)
- **Typical source:** Glass decolourization.



Figure 8b

- **Code:** SW 102
- **Description:** Waste of lead acid batteries in whole or crushed form
- **Example of Waste:** Spent lead acid battery component such as plastic casing, lead plate and electrolyte (acid)
- **Typical source:** Lead acid batteries from motor vehicles, etc.



Figure 8c

- **Code:** 103
- **Description:** Waste of batteries containing cadmium and nickel or mercury or lithium
- **Example of Waste:** Spent nickel-cadmium dry cell batteries
- **Typical source:** Dry cell batteries from the use of portable electrical and electronic equipment.



Figure 8d

- **Code:** SW104
- **Description:** Dust, slag, dross or ash containing aluminium, arsenic, mercury, lead, cadmium, chromium, nickel, copper, vanadium, beryllium, antimony, tellurium, thallium or selenium excluding slag from iron and steel factory
- **Example of Waste:** Aluminium dross
- **Typical source:** Aluminium smelting, etc



Figure 8e

- **Code:** SW105
- **Description:** Galvanic sludges
- **Example of Waste:** Galvanic sludges
- **Typical source:** Galvanisation processes



Figure 8f

- **Code:** SW106
- **Description:** Residues from recovery of acid pickling liquor
- **Example of Waste:** Iron salts (ferrous sulfate or ferrous chloride)
- **Typical source:** Recovery of acid pickling liquor



Figure 8g

- **Code:** SW 107
- **Description:** Slags from copper processing for further processing or refining containing arsenic, lead or cadmium
- **Example of Waste:** Slag (impurities)
- **Typical source:** Copper smelting process



Figure 8h

- **Code:** SW108
- **Description:** Leaching residues from zinc processing in dust and sludges form
- **Example of Waste:** Sludge from electrolytic cells
- **Typical source:** Zinc smelting process



Figure 8i

- **Code:** SW109
- **Description:** Waste containing mercury or its compound
- **Example of Waste:** Broken thermometers
- **Typical source:** Chemical laboratory



- **Code:** SW110
- **Description:** Waste from electrical and electronic assemblies containing components such as accumulators, mercury- switches, glass from cathode-ray tubes and other activated glass or polychlorinated biphenyl capacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or



Figure 8j

polychlorinated biphenyl

- **Example of Waste:** Discarded television sets, radios, air conditions, computers, printers, Photocopy machines, facsimile machines, rejected printed circuit boards , etc
- **Typical source:** Households, commercials, factories, industries, etc...



Figure 8k

- **Code:** SW201
- **Description:** Asbestos wastes in sludges, dust or fibre forms
- **Example of Waste:** Spent asbestos pipe insulation
- **Typical source:** Piping system



Figure 8l

- **Code:** SW202
- **Description:** Waste catalysts
- **Example of Waste:** Spent catalysts
- **Typical source:** Catalytic cracking process of crude oil in refinery



Figure 8m

- **Code:** SW203
- **Description:** Immobilized scheduled wastes including chemically fixed, encapsulated, solidified or stabilized sludges
- **Example of Waste:** Solidified sludge with lime, cement and sand
- **Typical source:** Solidification of scheduled waste at waste management facilities



Figure 8n

- **Code:** SW204
- **Description:** Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium
- **Example of Waste:** Wastewater treatment sludge
- **Typical source:** Sludge dewatering and pressing process



Figure 8o

- **Code:** SW205
- **Description:** Waste gypsum arising from chemical industry or power plant
- **Example of Waste:** Synthetic gypsum
- **Typical source:** Coal fired power plant

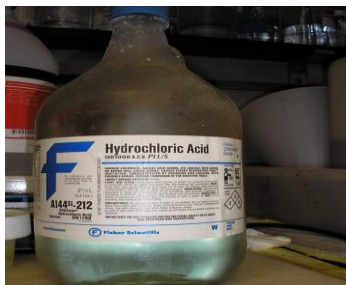


Figure 8p

- **Code:** SW206
- **Description:** Spent inorganic acids
- **Example of Waste:** Spent sulphuric acid
- **Typical source:** Acid pickling process



Figure 8q

- **Code:** SW301
- **Description:** Spent organic acids with pH less or equal to 2 which are corrosive or hazardous
- **Example of Waste:** Spent acetic acid
- **Typical source:** Production of vinyl acetate monomer



Figure 8r

- **Code:** SW302
- **Description:** Flux waste containing mixture of organic acids, solvents or compounds of ammonium chloride
- **Example of Waste:** Spent ammonium chloride
- **Typical source:** Soldering process



Figure 8s

- **Code:** SW303
- **Description:** Adhesive or glue waste containing organic solvents excluding solid polymeric materials
- **Example of Waste:** Spent solvent based glue/adhesive
- **Typical source:** Assembly activities such as furniture assembly



Figure 8t

- **Code:** SW305
- **Description:** Spent lubricating oil
- **Example of Waste:** Spent lubricating oil
- **Typical source:** Motor vehicles and compressor machines



Figure 8u

- **Code:** SW306
- **Description:** Spent hydraulic oil
- **Example of Waste:** Spent hydraulic oil
- **Typical source:** Hydraulic equipment and machines



Figure 8v

- **Code:** SW307
- **Description:** Spent mineral oil-water emulsion
- **Example of Waste:** Spent coolant or cutting fluids
- **Typical source:** Metals cutting/shaping process



Figure 8w

- **Code:** SW308
- **Description:** Oil tanker sludges
- **Example of Waste:** Tank bottom sludge from crude oil tanker
- **Typical source:** Crude oil tanker



Figure 8x

- **Code:** SW309
- **Description:** Oil-water mixture such as ballast water
- **Example of Waste:** Ballast water
- **Typical source:** Ballast tank of ship



Figure 8y

- **Code:** SW310
- **Description:** Sludge from mineral oil storage tank
- **Example of Waste:** Oil sludge
- **Typical source:** Crude oil tank in petroleum refinery



Figure 8z

- **Code:** SW311
- **Description:** Waste of oil or oily sludge
- **Example of Waste:** Oily sludge
- **Typical source:** Maintenance or cleaning activities of oily wastes



Figure 8aa

- **Code:** SW312
- **Description:** Oily residue from automotive workshop, service station oil or grease interceptor
- **Example of Waste:** Oily sludge
- **Typical source:** Automotive workshops, petrol service stations, etc...



Figure 8ab

- **Code:** SW313
- **Description:** Oil contaminated earth from re-refining of used lubricating oil
- **Example of Waste:** Oily sludge
- **Typical source:** Used lubricating oil re-refining activities



Figure 8ac

- **Code:** SW314
- **Description:** Oil or sludge from oil refinery plant maintenance operation
- **Example of Waste:** Oil or sludge
- **Typical source:** Oil refining maintenance activities



Figure 8ad

- **Code:** SW315
- **Description:** Tar or tarry residues from oil refinery or petrochemical plant
- **Example of Waste:** Tar residues
- **Typical source:** Oil refinery and petrochemical plants



Figure 8af

- **Code:** SW317
- **Description:** Spent organometallic compounds including tetraethyl lead, tetramethyl lead and organotin compounds
- **Example of Waste:** Spent organometallic compounds including tetraethyl lead, tetramethyl lead and organotin compounds
- **Typical source:** Production of polyethylene



Figure 8ag

- **Code:** SW318
- **Description:** Waste, substances and articles containing or contaminated with polychlorinated biphenyls (PCB) or polychlorinated triphenyls (PCT)
- **Example of Waste:** Spent coolants and insulating fluids
- **Typical source:** Transformers and capacitors



Figure 8ah

- **Code:** SW319
- **Description:** Waste of phenols or phenol compounds including chlorophenol in the form of liquids or sludges
- **Example of Waste:** Spent disinfection containing pentachlorophenol
- **Typical source:** Agriculture activities



- **Code:** SW320
- **Description:** Waste containing formaldehyde
- **Example of Waste:** Spent formaldehyde resins
- **Typical source:** Particle board and plywood manufacturing.



Figure 8ai



Figure 8aj

- **Code:** SW321
- **Description:** Rubber or latex wastes or sludges containing organic solvents or heavy metals
- **Example of Waste:** Rubber sludge
- **Typical source:** Rubber product manufacturing



Figure 8ak

- **Code:** SW322
- **Description:** Waste of non-halogenated organic solvents
- **Example of Waste:** Spent benzene
- **Typical source:** Production of styrene



Figure 8al

- **Code:** SW323
- **Description:** Waste of halogenated organic solvents
- **Example of Waste:** Spent chloroform
- **Typical source:** Extraction of plant materials

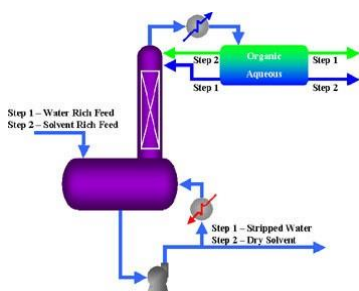


Figure 8am

- **Code:** SW324
- **Description:** Waste of halogenated or unhalogenated non-aqueous distillation residues arising from organic solvents recovery process
- **Example of Waste:** Sludges containing organic solvents such as trichloroethylene.
- **Typical source:** Solvent recovery processes.



Figure 8an

- **Code:** SW325
- **Description:** Uncured resin waste containing organic solvents or heavy metals including epoxy resin and phenolic resin
- **Example of Waste:** Off-specification or defect resin materials
- **Typical source:** Printed circuit board assembly



Figure 8ao

- **Code:** SW326
- **Description:** Waste of organic phosphorus compound
- **Example of Waste:** Discarded fertilizer containing phosphorus
- **Typical source:** Agriculture activities



Figure 8ap

Figure 8ap:

- **Code:** SW327
- **Description:** Waste of thermal fluids (heat transfer) such as ethylene glycol
- **Example of Waste:** Spent ethylene glycol
- **Typical source:** Waste of thermal fluids

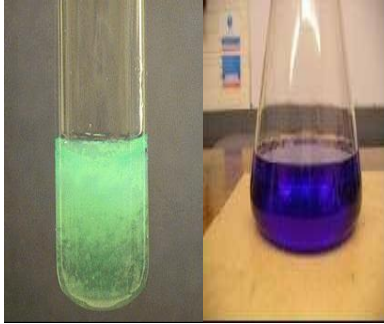


Figure 8aq

- **Code:** SW401
- **Description:** Spent alkalis containing heavy metals
- **Example of Waste:** Spent paint alkali based paint stripper
- **Typical source:** Metal stripping



Figure 8ar

- **Code:** SW402
- **Description:** Spent alkalis with pH more or equal to 11.5 which are corrosive or hazardous
- **Example of Waste:** Spent concentrated caustic soda
- **Typical source:** Pulping and bleaching process



Figure 8as

- **Code:** SW403
- **Description:** Discarded drugs containing psychotropic substances or containing substances that are toxic, harmful, carcinogenic, mutagenic or teratogenic
- **Example of Waste:** Expired anti-depressants, stimulants and pain killers
- **Typical source:** Pharmacies, hospitals and clinics



Figure 8at

- **Code:** SW404
- **Description:** Pathogenic wastes, clinical wastes or quarantined materials
- **Example of Waste:** Used syringes, swabs and human tissues
- **Typical source:** Hospitals and clinics



Figure 8au

- **Code:** SW405
- **Description:** Waste arising from the preparation and production of pharmaceutical product
- **Example of Waste:** Wastewater treatment plant sludge.
- **Typical source:** Pharmaceutical product manufacturing



Figure 8av

- **Code:** SW406
- **Description:** Clinker, slag and ashes from scheduled wastes incinerator
- **Example of Waste:** Incinerator ashes
- **Typical source:** Scheduled waste incinerators



Figure 8aw

- **Code:** SW407
- **Description:** Waste containing dioxins or furans
- **Example of Waste:** Fly ash from incinerator
- **Typical source:** Incineration plants



Figure 8ax

- **Code:** SW408
- **Description:** Contaminated soil, debris or matter resulting from cleaning-up of a spill of chemical, mineral oil or scheduled wastes
- **Example of Waste:** Contaminated soils
- **Typical source:** Cleaning-up of a spill of scheduled wastes



Figure 8ay

- **Code:** SW409
- **Description:** Disposed containers, bags or equipment contaminated with chemicals, pesticides, mineral oil or scheduled wastes
- **Example of Waste:** Empty paint containers
- **Typical source:** Painting shop in vehicle manufacturing plants



Figure 8az

- **Code:** SW410
- **Description:** Rags, plastics, papers or filters contaminated with scheduled wastes
- **Example of Waste:** Used latex gloves
- **Typical source:** Factory production line, laboratory, etc..



Figure 8ba

- **Code:** SW411
- **Description:** Spent activated carbon excluding carbon from the treatment of potable water and processes of the food industry and vitamin production
- **Example of Waste:** Spent activated carbon
- **Typical source:** Wastewater treatment plant



Figure 8bb

- **Code:** SW412
- **Description:** Sludges containing cyanide
- **Example of Waste:** Cyanide plating sludge
- **Typical source:** Metal plating



Figure 8bc

- **Code:** SW413
- **Description:** Spent salt containing cyanide
- **Example of Waste:** Spent insecticide containing cyanide salts
- **Typical source:** Metal casting and heat treating industry



Figure 8bd

- **Code:** SW414
- **Description:** Spent aqueous alkaline solution containing cyanide
- **Example of Waste:** Alkaline solution containing cyanide
- **Typical source:** Alkaline degreasing



Figure 8be

- **Code:** SW415
- **Description:** Spent quenching oils containing cyanides
- **Example of Waste:** Quenching bath residues from oil baths containing cyanide
- **Typical source:** Metal heat treatment operations



Figure 8bf

- **Code:** SW416
- **Description:** Sludges of inks, paints, pigments, lacquer, dye or varnish
- **Example of Waste:** Paint sludge
- **Typical source:** Paint removal activities



Figure 8bg

- **Code:** SW417
- **Description:** Waste of inks, paints, pigments, lacquer, dye or varnish
- **Example of Waste:** Paint residue
- **Typical source:** Painting shop in vehicle assembly plant



Figure 8bh

- **Code:** SW418
- **Description:** Discarded or off-specification inks, paints, pigments, lacquer, dye or varnish products containing organic solvent
- **Example of Waste:** Off-specification solvent based paints
- **Typical source:** Painting shop or paint manufacturing plants



Figure 8bi

- **Code:** SW419
- **Description:** Spent di-isocyanates and residues of isocyanate compounds excluding solid polymeric material from foam manufacturing process
- **Example of Waste:** Spent insecticide containing methyl isocyanate
- **Typical source:** Agriculture activities



Figure 8bj

- **Code:** SW420
- **Description:** Leachate from scheduled waste landfill
- **Example of Waste:** Leachate
- **Typical source:** Secure landfill facilities



Figure 8bk

- **Code:** SW421
- **Description:** A mixture of scheduled wastes
- **Example of Waste:** A mixture of spent lube oil and hydraulic oil
- **Typical source:** Workshop facilities



Figure 8bl

- **Code:** SW422
- **Description:** A mixture of scheduled and non-scheduled wastes
- **Example of Waste:** A mixture of rags contaminated with mineral oil
- **Typical source:** Workshop facilities

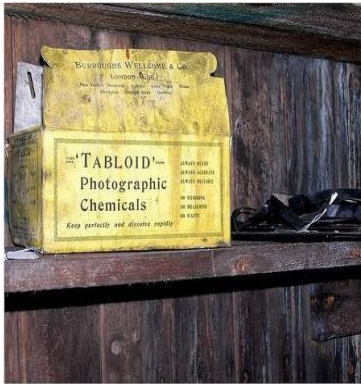


Figure 8bm

- **Code:** SW423
- **Description:** Spent processing solution, discarded photographic chemicals or discarded photographic Wastes
- **Example of Waste:** Discarded photographic chemicals
- **Typical source:** Photography processing or printing



Figure 8bn

- **Code:** SW424
- **Description:** Spent oxidizing agent
- **Example of Waste:** Spent sodium hypochlorite
- **Typical source:** Bleaching activities



Figure 8bo

- **Code:** SW
- **Description:** Wastes from the production, formulation, trade or use of pesticides, herbicides or biocides
- **Example of Waste:** Wastewater treatment sludge
- **Typical source:** Pesticides, herbicides or biocides manufacturing



Figure 8bp

- **Code:** SW426
- **Description:** Off-specification products from the production, formulation, trade or use of pesticides, herbicides or biocides
- **Example of Waste:** Off-specification pesticide products
- **Typical source:** Pesticide manufacturing plants



Figure 8bq

- **Code:** SW427
- **Description:** Mineral sludges including calcium hydroxide sludges, phosphating sludges, calcium sulphite sludges and carbonates sludges
- **Example of Waste:** Calcium hydroxide wastes
- **Typical source:** Production of acetylene gas from calcium carbide



Figure 8br

- **Code:** SW428
- **Description:** Wastes from wood preserving operation using inorganic salts containing copper, chromium or arsenic or fluoride compounds or using compound containing chlorinated phenol or creosote
- **Example of Waste:** Residues of wood preservative chemicals
- **Typical source:** Wood preservation activities



Figure 8bs

- **Code:** SW429
- **Description:** Chemicals that are discarded or off-specification
- **Example of Waste:** Off-specification chemicals
- **Typical source:** Chemical manufacturing plants



Figure 8bt

- **Code:** SW430
- **Description:** Obsolete laboratory chemicals
- **Example of Waste:** Obsolete chemicals from laboratory
- **Typical source:** Chemical laboratories



Figure 8bu

- **Code:** SW431
- **Description:** Waste from manufacturing or processing or use of explosives
- **Example of Waste:** Empty bullet cartridges
- **Typical source:** Ammunition and explosive manufacturing plants.



Figure 8bv



Figure 8bv

- **Code:** SW432
- **Description:** Waste containing, consisting of or contaminated with peroxides
- **Example of Waste:** Spent hydrogen peroxide
- **Typical source:** Pulp and paper bleaching

- **Code:** SW501
- **Description:** Any residues from treatment or recovery of scheduled wastes
- **Example of Waste:** Residues
- **Typical source:** Treatment or recovery of scheduled wastes

9. Selection Of Containers Storing Scheduled Wastes



- 9.1. An appropriate container should be selected according to the characteristics of the scheduled wastes.
- 9.2. The characteristic of scheduled wastes shall be compatible with the type of material used for the container to prevent any reaction which will deteriorate the container.
- 9.3. In normal practice, scheduled wastes are stored in the following containers:
 - Bung hole drum (steel/plastic)
 - Open top drum (steel/plastic) with cover and clamp
 - Intermediate bulk container;
 - Corrugated box / carton box;
 - Flexible Intermediate Bulk Containers (FIBCs) / Jumbo Bags / Bulk Bags / Polypropylene Big Bags
- 9.4. The quantity of the wastes should be taken into consideration to estimate the appropriate size and strength of container to avoid over spilling or container breakage.
- 9.5. The container used should be in good condition (free from any damage such as tear or hole).

- 9.6. Assigning specific containers for specific wastes will allow the containers to be reused without further washing/cleaning.
- 9.7. Containers containing residues of chemicals or scheduled wastes which are not compatible to the waste to be stored should be properly rinsed prior to usage. The solution generated from the rinsing activity should be contained and characterized prior to treatment or disposal at sites approved by the Department of Environment.
- 9.8. Suggested packaging according to waste types and characteristics are as shown in **Table 3** below.

Table 3: Suggested packaging according to waste types and characteristics

Type Of Containers	Type Of Scheduled Wastes	Packaging Requirement
<p>Bunghole drum (steel/plastic)</p>  <p>The image shows two blue bunghole drums. The top one is a steel drum with a red bung and a white label. The bottom one is a plastic drum with a white label. Both are cylindrical with three horizontal bands.</p>	<ul style="list-style-type: none"> ● Inorganic or organic liquid waste ● Steel drums should not be used for corrosive wastes such as acids or alkalis ● Plastic drums compatible with most solvents. Solvents that are not compatible with plastic such as Diethyl Ether and Chloroform should be stored in steel drums 	<p>No hole, no bulge, and free of dent and corrosion</p>

Type Of Containers	Type Of Scheduled Wastes	Packaging Requirement
<p data-bbox="238 331 499 427">Open top drum with cover and clamp (steel/plastic)</p> 	<ul data-bbox="572 339 781 959" style="list-style-type: none"> • Scheduled wastes in solid form • Steel drums should not be used for acidic or alkaline waste • Example: sludge, e-waste, pharmaceutical waste, laboratory waste, contaminated gloves etc. 	<p data-bbox="835 339 1009 512">No hole, no bulge, and free of dent and corrosion</p>

Type Of Containers	Type Of Scheduled Wastes	Packaging Requirement
<p>Intermediate bulk container</p> 	<p>Used for a broad range of waste streams such as oils, solvents and acids</p>	<p>No hole or crack</p>
<p>Jerrican / carboy</p> 	<p>Inorganic or organic liquid waste such as chemical wastes, solvents, etc</p>	<p>No hole or crack</p>

10. Labelling Of Scheduled Wastes Containers

- 10.1. For identification and warning purposes, containers of scheduled wastes shall be clearly labelled in accordance with the Third Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005 and marked with the scheduled wastes code as specified in the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005.
- 10.2. The characteristics labels as in the Third Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005 are shown in **Appendix 3**.
- 10.3. The characteristic label shall be a square set at an angle of 45 degrees and the dimension shall not be less than 10 cm by 10 cm except where the size of the container or package warrants for a label of smaller size. Examples of waste characteristic labels are as shown in **Figure 9 below**.

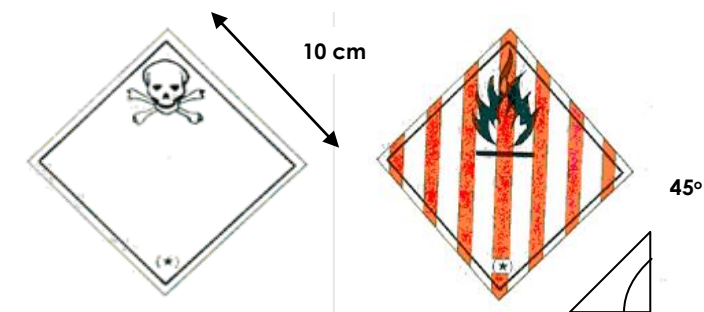


Figure 9: Examples of waste characteristic labels

10.4. The colours used on the labels 1 to 11 shall be in accordance with British Standard BS 381 C, "colours for specific purposes".

Colour	Reference No.
French blue	166
Canary yellow	309
Signal red	537
Light orange	557

10.5. The labels shall be divided into halves, the upper half of the label shall be reserved for the pictorial symbol (characteristic label) and the lower half for text printed in block capitals containing information.

10.6. The text shall be printed in black on all labels except when the background of the label is black, red or blue, the text shall be in white.

10.7. The labels may be of the following types:

- stick on;
- metal plates;
- stencilled on the container; or
- printed on the container.

10.8. Information to be included in the label for scheduled wastes containers:

- The date when the scheduled wastes are first generated; and
- The name, address and telephone number of the scheduled waste generator.

10.9. All labels should be able to withstand open weather exposure without a substantial reduction in effectiveness.

10.10. Label should be placed on a background of contrasting colour.

10.11. In the case of waste capable of causing two or more hazards, all the hazards must be clearly identified and the waste shall be labelled accordingly.

10.12. **Figure 10** is an example of label for the scheduled wastes containers.

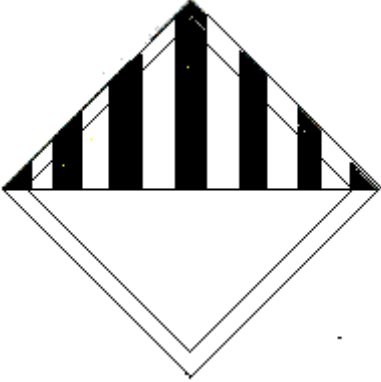
	
MIXTURE OF MISCELLANEOUS DANGEROUS SUBSTANCES (WASTE)	
Waste code	:
Waste name	:
Date generated	:
Name of waste generator	:
Address and telephone number	:

Figure 10: Example of label for scheduled wastes container

11. Placing/Filling/Packing of Incompatible Scheduled Wastes In Containers

11.1. Incompatible scheduled wastes shall be placed/ filled/ packed in separate containers. Incompatible scheduled wastes when mixed will produce hazardous situations. The indication of some of the hazards that can be expected if mixing of incompatible wastes took place is as shown in Fourth Schedule, Regulation 2 of the Environmental Quality (Scheduled Wastes) Regulations 2005 as in **Appendix 4**.

12. Other Documents

12.1. This guidebook is to be read together with the following documents:-

- Environmental Quality (Scheduled Wastes) Regulations, 2005.
- Guideline for Non-Rigid Scheduled Wastes Containers, Department of Environment, 2011.
- Guidelines for Packaging, Labelling And Storage Of Scheduled Wastes In Malaysia, Department Of Environment, 2014.
- Other relevant guidelines.

Appendix 1

Table 1. Maximum Concentration of Contaminants for the Toxicity Characteristic Leaching Procedure (TCLP)			
DOE CW No. ¹	Contaminant	CAS No. ²	Maximum Level (mg/L)
C004	Arsenic	7440-38-2	5.0
C005	Barium	7440-39-3	100.0
C018	Benzene	71-43-2	0.5
C006	Cadmium	7440-43-9	1.0
C019	Carbon tetrachloride	56-23-5	0.5
C020	Chlordane	57-74-9	0.03
C021	Chlorobenzene	108-90-7	100.0
C022	Chloroform	67-66-3	6.0
C007	Chromium	7440-47-3	5.0
C023	o-Cresol	95-48-7	200.0 ³
C024	m-Cresol	108-39-4	200.0 ³
C025	p-Cresol	106-44-5	200.0 ³
C026	Cresol		200.0 ³
C016	2,4-D	94-75-7	10.0
C027	1,4-Dichlorobenzene	106-46-7	7.5
C028	1,2-Dichloroethane	107-06-2	0.5
C029	1,1-Dichloroethylene	75-35-4	0.7
C030	2,4-Dinitrotoluene	121-14-2	0.13
C012	Endrin	72-20-8	0.02
C031	Heptachlor (and its epoxide)	76-44-8	0.008
C032	Hexachlorobenzene	118-74-1	0.13

Appendix 1

Table 1. Maximum Concentration of Contaminants for the Toxicity Characteristic Leaching Procedure (TCLP)			
DOE CW No. ¹	Contaminant	CAS No. ²	Maximum Level (mg/L)
C033	Hexachlorobutadiene	87-68-3	0.5
C034	Hexachloroethane	67-72-1	3.0
C008	Lead	7439-92-1	5.0
C013	Lindane	58-89-9	0.4
C009	Mercury	7439-97-6	0.2
C014	Methoxychlor	72-43-5	10.0
C035	Methyl ethyl ketone	78-93-3	200.0
C036	Nitrobenzene	98-95-3	2.0
C037	Pentachlorophenol	87-86-5	100.0
C038	Pyridine	110-86-1	5.0
C010	Selenium	7782-49-2	1.0
C011	Silver	7440-22-4	5.0
C039	Tetrachloroethylene	127-18-4	0.7
C015	Toxaphene	8001-35-2	0.5
C040	Trichloroethylene	79-01-6	0.5
C041	2,4,5-Trichlorophenol	95-95-4	400.0
C042	2,4,6-Trichlorophenol	88-06-2	2.0
C017	2,4,5-TP (Silvex)	93-72-1	1.0
C043	Vinyl chloride	75-01-4	0.2

FOOTNOTE:

1. Characteristic waste number.
2. Chemical abstracts service number.
3. If *o*-, *m*-, and *p*-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/l.

Appendix 2

Table 2. Compositional Analysis (Dry Basis)		
	Total Threshold Limit Concentration (TLC) mg/kg	Soluble Threshold Limit Concentration (STLC) mg/L
Metals		
Antimony (Sb)	500	15
Arsenic (As)	500	5
Barium (Ba)	10000	100
Beryllium (Be)	75	0.75
Cadmium (Cd)	100	1
Chromium (Cr)	2500	5
Chromium-VI (CrVI) 500	5	
Cobalt (Co)	8000	80
Copper (Cu)	2500	25
Lead (Pb)	1000	5
Mercury (Hg)	20	0.2
Molybdenum (Mo) 3500	350	
Nickel (Ni)	2000	20
Selenium (Se)	100	1
Silver (Ag)	500	5
Thallium (Tl)	700	7
Vanadium (V)	2400	24
Zinc (Zn)	5000	250

Table 2. Compositional Analysis (Dry Basis)		
	Total Threshold Limit Concentration (TLC) mg/kg	Soluble Threshold Limit Concentration (STLC) mg/L
Semivolatile Organics		
Pentachloro-phenol	17	1.7
Herbicides		
2,4-Dichlorophenoxy acetic acid	100	10
2,4,5-Trichlorophenoxy-propionic acid (Silvex)	10	1
Volatile Organics		
Trichloroethylene	2040	204
Pesticides and PCBs		
Aldrin	1.4	0.14
Chlordane	2.5	0.25
DDT, DDE, DDD	1	0.1
Dieldrin	8	0.8
Endrin	0.2	0.02
Heptachlor	4.7	0.47
Kepone	21	2.1
Lindane	4	0.4
Methoxychlor	100	10
Mirex	21	2.1
PCBs	50	5
Toxaphene	5	0.5

Appendix 2

Table 2. Compositional Analysis (Dry Basis)		
	Total Threshold Limit Concentration (TLC) mg/kg	Soluble Threshold Limit Concentration (STLC) mg/L
Miscellaneous		
Asbestos	1%	
Dioxin (2,3,7,8-TCDD)	0.1	0.1
Fluran (2,3,7,8-TCDF)	0.1	0.1
Fluoride salts	18000	180
Organic Lead	13	

THIRD SCHEDULE

LABELLING REQUIREMENT FOR SCHEDULED WASTES



EXPLOSIVE SUBSTANCES (WASTE)

Symbol (exploding bomb): black; Background: light orange

Label 1



INFLAMMABLE LIQUIDS (WASTE)

Symbol (flame): black or white; Background: red

Label 2



INFLAMMABLE SOLIDS (WASTE)

**Symbol (flame): black; Background: white with vertical red stripes
Label 3**



SOLID: SPONTANEOUSLY COMBUSTIBLE (WASTE)

**Substance liable to spontaneous combustion Symbol
(flame): black;
Background: upper half white, lower half red
Label 4**



SOLID: DANGEROUS WHEN WET (WASTE)
Substances which, if in contact with water, emit
inflammable gases Symbol (flame): black or white;
Background: blue
Label 5



OXIDIZING SUBSTANCES (WASTE)
Symbol (flame over circle): black; Background: yellow
Label 6



ORGANIC PEROXIDES (WASTE)

Symbol (flame over circle): black; Background: yellow
Label 7



TOXIC SUBSTANCES (WASTE)

Poisonous (toxic) substances

Symbol (skull over crossbones): black; Background:
white
Label 8



INFECTIOUS SUBSTANCES (WASTE)

Symbol (three crescents superimposed on a circle):

black; Background: white

Label 9

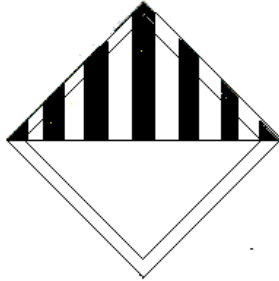


CORROSIVE SUBSTANCES (WASTE)

Symbol (liquids spilling from two glass vessels and attacking a hand and a metal): black; Background:

upper half white, lower half black

Label 10



**MIXTURE OF MISCELLANEOUS DANGEROUS SUBSTANCES
(WASTE)**

**Symbol (nil); Background: white with upper half vertical
black stripes
Label 11**

Appendix 4

SCHEDULED WASTES OF POTENTIAL INCOMPATIBILITY

The mixing of a waste in Group A with a waste in Group B may have the following potential consequences:

Group 1-A	Group 1-B
<ul style="list-style-type: none"> • Alkaline caustic liquids • Alkaline cleaner • Alkaline corrosive liquid • Caustic wastewater • Lime sludge and other corrosive alkalis 	<ul style="list-style-type: none"> • Acid sludge • Chemical cleaners • Electrolyte, acid • Etching acid, liquid or solvent • Pickling liquor and other corrosive acid • Spent acid • Spent mixed acid
<p>Potential consequences: Heat generation, violent reaction</p>	

Group 2-A	Group 2-B
<ul style="list-style-type: none"> • Asbestos • Beryllium • Unrinsed pesticide containers • Pesticides 	<ul style="list-style-type: none"> • Solvents • Explosives • Petroleum • Oil and other flammable wastes
<p>Potential consequences: Release of toxic substances in case of fire or explosion</p>	

Appendix 4

Group 3-A	Group 3-B
<ul style="list-style-type: none"> • Aluminium • Beryllium • Calcium • Lithium • Magnesium • Potassium • Sodium • Zinc powder and other reactive metals and metal hydrides 	<ul style="list-style-type: none"> • Any waste in Group 1-A or 1-B
<p>Potential consequences: Fire or explosion; generation of flammable hydrogen gas</p>	

Group 4-A	Group 4-B
<ul style="list-style-type: none"> • Alcohols 	<ul style="list-style-type: none"> • Any concentrated waste in Group 1-A or 1-B Calcium • Lithium • Metal hydrides Potassium Sodium • Water reactive wastes
<p>Potential consequences: Fire, explosion or heat generation; generation of flammable toxic gases</p>	

Appendix 4

Group 5-A	Group 5-B
<ul style="list-style-type: none">• Alcohols• Aldehydes• Halogenated hydrocarbons• Nitrated hydrocarbons and other reactive organic compounds and solvents• Unsaturated hydrocarbons	<ul style="list-style-type: none">• Concentrated Group 1-A or 1-B wastes• Group 3-A wastes
Potential consequences: Fire, explosion or violent reaction	

Group 6-A	Group 6-B
<ul style="list-style-type: none">• Spent cyanide and sulphide solution	<ul style="list-style-type: none">• Group 1-B wastes
Potential consequences: Generation of toxic hydrogen cyanide or hydrogen sulphide gas	

Appendix 4

Group 7-A	Group 7-B
<ul style="list-style-type: none">• Chlorates and other strong oxidizers• Chlorites• Chromic acid• Hypochlorites• Nitrates• Nitric acid• Perchlorates• Permanganates• Peroxides	<ul style="list-style-type: none">• Organic acids• Group 2-B wastes• Group 3-B wastes• Group 5-A wastes and other flammable and combustible wastes
Potential consequences: Fire, explosion or violent reaction	

REFERENCES

1. Environmental Quality (Scheduled Wastes) Regulations, 2005.
2. Guideline for Non-Rigid Scheduled Wastes Containers, Department of Environment, 2011.
3. Guidelines for Packaging, Labelling And Storage Of Scheduled Wastes In Malaysia, Department Of Environment, 2014.
4. Environmental Institute of Malaysia (EiMAS)'s training material for Certification Course for Scheduled Wastes Managers.

LIST OF DEPARTMENT OF ENVIRONMENT (DOE) OFFICES

- 1.** DEPARTMENT OF ENVIRONMENT (HEADQUARTERS)
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LEVEL 1-4, PODIUM 3, WISMA SUMBER ASLI
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- 2.** JOHOR STATE DEPARTMENT OF ENVIRONMENT
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- 3.** KEDAH STATE DEPARTMENT OF ENVIRONMENT
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- 4.** KELANTAN STATE DEPARTMENT OF ENVIRONMENT
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JALAN SRI CEMERLANG
15300 KOTA BHARU
- 5.** MELAKA STATE DEPARTMENT OF ENVIRONMENT
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JALAN PASAR
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8. PERAK STATE DEPARTMENT OF ENVIRONMENT
TINGKAT 7 & 9, BANGUNAN SERI KINTA
JALAN SULTAN IDRIS SHAH
30000 IPOH
9. PERLIS STATE DEPARTMENT OF ENVIRONMENT
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JALAN BUKIT LAGI
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15. FEDERAL TERRITORY OF KUALA LUMPUR
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57100 KUALA LUMPUR

16. FEDERAL TERRITORY OF LABUAN DEPARTMENT OF
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