Chemical Waste

Policy

All chemical wastes generated by HKU are subject to the Waste Disposal (Chemical Waste) (General) Regulations made under the Waste Disposal Ordinance, which require control over the handling, collection, storage, transport, and disposal of such wastes.

Essentially, these regulations prohibit the tipping of chemical waste into water sources and prescribe for its proper treatment and disposal.

In general chemical waste is segregated at source and collected in a variety of containers provided by the chemical waste collector. The Dangerous Goods team of the Safety Office provides a service to collect and dispose of the waste appropriately.

Responsibilities

The Department Head must:

- appoint a chemical waste manager to ensure the requirements of the chemical waste guidance are followed.
- provide resources to procure chemical waste cabinets and spill trays.
- ensure that the checklist (Appendix IX) is completed regularly to monitor compliance.

The Departmental Chemical Waste Manager should:

- direct and co-ordinate the handling of chemical wastes.
- ensure each pail has an accompany log sheet that was filled.

The Safety Office will:

- apply for Waster Producer Licences from the Environmental Protection Department (EPD).
- provide a chemical waste programme incorporating supply of waste containers, labels, and collection of waste.
- arrange final disposal with contractors.
- ensure trip ticket administration is completed to EPD's satisfaction.
- provide spill trays for Departments.
- provide Chemical Waste Warning signs.
- monitor the effluents to comply with licence conditions

The Contractor will:

- provide containers of appropriate materials and construction for each type of waste.

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1. General Requirement

1.1 Classification of Laboratory Chemical Waste

Chemical wastes generated from the laboratories are generally of small quantity and relatively dilute in nature. However, a few common waste types are classifiable as chemical waste (as defined in Schedule 1 to the Regulations, also listed in Appendix I).

They include the following:

(a) strong acids and alkalis;

(b) spent organic solvents and

(c) surplus or expired chemicals.

1.2 Segregation

1.2.1 Given the varied nature of chemical wastes generated by laboratories, wastes should be segregated according to the following classification:

- Acids plus wastes compatible with acids (A);
- Alkalis plus wastes compatible with alkalis (B);
- Organic solvents (O); and
- wastes that requires special handling (S). These include such chemicals as ammonia, hydrogen peroxide, hypochlorite solutions and strong oxidising acids (e.g. nitric, perchloric). Chemical wastes falling into this category must be segregated for storage and should be individually packaged and labelled.

1.2.2 For laboratory chemical waste which also contains other very reactive substances or chemicals (including strong oxidizing and reducing agents, catalyst), the waste should be stabilized prior to storage in the same container of compatible waste type.

1.2.3 Surplus or expired chemicals should be segregated, individually packaged and labelled for storage, prior to collection.

1.3 Packaging

1.3.1 *Standard of Containers*

Chemical wastes should be poured into the appropriate containers provided by the Safety Office and supplied by Ecospace.

1.3.2 *Number and Capacity of Containers*

Workplaces should have sufficient chemical waste containers to ensure all the chemical waste that may be generated or produced at their premises between period of collection by Safety Office can be stored safely.

1.3.3 *Containers to be Securely Closed and with Clean External Surface*

Every chemical waste container should be properly closed and stored. The container should be kept clean.

1.3.4 *Containers to be in Good Condition*

While the Safety Office will endeavour to ensure waste containers are in good condition, the waste producers should check to ensure that the containers are in good condition before use.

1.3.5 *Separate Containers for Different Waste Categories*

Separate containers must be used for different waste categories. Inorganic wastes should be

separated from organic wastes and separate containers should also be provided for the storage of acid or alkali wastes.

1.3.6 *Incompatible Wastes*

Incompatible types of wastes should not be mixed in the same container. Chemical wastes that are incompatible generally include those that will react with each other:

- **violently; or**
- **with evolution of substantial heat; or**
- **with evolution of toxic or harmful gases; or**
- **to produce flammable products; or**
- **to produce toxic products.**

1.3.7 *Ullage (Airspace)*

When filling the container with liquid chemical wastes, sufficient ullage (air space) should be allowed for to ensure that neither leakage nor permanent distortion of the container occurs as a result of liquid expansion caused by changes in temperature or other physical conditions which are likely to occur under normal conditions of handling, storage and transport. Generally 10cm air space should be sufficient.

1.4 Labelling

1.4.1 Every container for chemical waste storage should be provided an appropriate label in both English and Chinese in the form specified in the Regulation.

1.4.2 The label should include the following particulars:

- the words and characters 'CHEMICAL WASTE';
- name, address and contact telephone number of the waste producer;
- chemical name(s), common name(s) or waste type(s); and
- appropriate hazard warning symbol.

The dimensions of the label should not be less than 90 mm x 100 mm.

1.4.3 The chemical waste producer should ensure that the information contained on the label is accurate and sufficient so as to enable proper and safe handling, storage and transport of the chemical waste.

1.4.4 The label should be securely attached to a suitable part of the container, which allows the information on the label to be easily read, be kept clean and free from obstruction.

1.5 Storage

1.5.1 Chemical wastes should be stored in a storage cupboard which is fitted with leakproof sill or spill catcher trays in its base to retain the capacity of the largest container or 20% by volume of the total storage capacity in that cupboard whichever is the greater in case of spillage or leakage from the containers.

1.5.2 The material used for the construction of the leakproof sill or spill catcher trays should be able to withstand the chemical action of the stored chemical waste. Examples of a stainless steel spill catcher tray to be used with containers or organic wastes, and a heavy-duty plastic spill catcher tray to be used with containers of

inorganic wastes (including strong acids and alkalis), are shown in Appendix II, Sketches B and C respectively.

1.5.3 Incompatible chemical wastes which when in contact with one another may produce dangerous consequences should either be stored separately or in a cabinet provided with compartments separated from each other by impermeable partitions.

1.5.4 The storage cupboard should be provided with adequate ventilation by means of openings to prevent the formation of any dangerous or harmful concentration of vapour. An example of such a cupboard, and illustrations of how it could be used to store chemical wastes are shown in Sketches A, D and E of Appendix II.

1.5.5 A site for Chemical Waste storage must not obstruct any means of escape.

2. Chemical Waste Handling

2.1 Service

2.1.1 The D.G. Team of the Safety Office will collect waste from departments/ laboratories etc. and accumulates it in appropriate stores to await collection by Ecospace.

2.1.2 Ecospace will eventually collect and dispose of:

(i) Surplus chemicals,
(ii) Expired chemicals, and
(iii) Spent chemical mixtures resulting from experiments, provided that such chemicals can meet the regulatory definition of 'chemical waste', and can be accepted by the CWTC for treatment.

2.1.3 The Regulations target specific substances in forms or concentrations that pose significant threat to health and the environment. The following examples are what, according to the Regulation and EPD's guidelines, are not chemical wastes:

(a) Neutralised salts that do not contain compounds listed in Append IX.
(b) Apparatus rinse water and wiping tissue with low chemical contents.
(c) Elemental heavy metals in stable form (e.g. lead, copper, chromium, nickel)
(d) Household chemicals used in laboratories for cleaning (e.g. soap, detergents).
(e) Dilute acids and alkalis with concentration below those stipulated in Appendix I.

2.1.4 A list of waste streams and respective containers are shown in Appendix III.

2.1.5 Ecospace does not provide service for the following substances as they are not accepted at the CWTC:
asbestos,
Radioactive materials,
explosives,
gaseous materials.

This list includes mixtures of spent chemicals that pose an explosion hazard. Please consult the Safety Office for proper procedures of such materials.

A list of explosive substances is attached for your reference (Appendix IV)

2.1.6 Ecospace provides properly Iabelled 20 litre pails for collection of spent chemical mixtures.

2.2 Chemical Waste Manager

2.2.1 Each department should appoint a Chemical Waste Manager (CWM) to direct and co-ordinate the handling of chemical wastes. This person should be either a laboratory superintendent or an experienced laboratory technician.

2.2.2 An acting CWM should also be appointed in case the CWM is not on duty. The names of the CWM should be supplied to Safety Office as the primary and secondary contact person.

2.3 Handling of Spent Chemical Mixtures

2.3.1 For each department, Ecospace will provide a number of 20 litre pails. These are for storage of spent organics, acids and alkalis respectively.

2.3.2 These pails are delivered with completed chemical waste labels and colour dot labels. The colour dot label is a useful aid for easy identification of wastes. Waste names and dot colours correspond as follows:

Waste Name	*Colour Dot Label*
Mixed Spent Halogenated Solvents Violet	Violet 5
Mixed Spent Non-halogenated Solvents	Burgundy 5
Mixed Spent Acids	White 11
Mixed Spent Alkalis	White 3
Lubricating Oil	Burgundy

Waste from medical and dental laboratories are assigned a different category:

Waste Name	*Colour Dot*
Non-Halogenated Solvents	RED x 1
Halogenated Solvents	RED x 1
Acid	RED x 3
Alkali	RED x 4

2.3.3 The CWM is required to initiate a Waste Log Sheet for each pail. Every waste entering the pail must be properly logged. The filled log sheet must accompany the pail at time of collection by Safety Office. Ecospace and Safety Office will refuse to collect pails that do not carry a legible log sheet.

N.B.: For waste lubricating oil, a log sheet is not required.

2.3.4 Spent chemicals containing the following should never be mixed with other chemical waste, and should be stored separately in smaller bottles:

(i) highly reactive compounds;

(ii) water reactive compounds;

(iii) concentrated strong oxidizing agents; or

(iv) concentrated strong reducing agents.

A list of water reactive substances is attached for reference. (Appendix V) These bottles should bear an individual log sheet, be labeled and stored as described per Sections 2.4.2 and 2.4.3.

2.3.5 Mixtures of organics and inorganics should, upon passing the compatibility test as outlined in Section 2.5, be stored according to following guidelines:

Mixture	*Pall to Use*
Halogenated Organics	Halogenated Organics
Non-halogenated Organics	Non-halogenated Organics
Heavy Metal Salts & Precipitates	Alkali
Solvent after cleaning oily parts	Non-halogenated Organics

For mixtures with two distinctive liquid phases, the phases should be separated for storage in respective appropriate containers. In general, non-acidic substances that are not hydrophobic should be mixed into the alkali pail, as an alkali medium is usually a chemically less reactive environment. Hydrophobic material should be mixed into the organics pail. Solid precipitates can be mixed into the proper container for the co-existing liquid.

2.3.6 At the end of each experimental session, spent chemicals should be collected using 3 beakers of appropriate size, for organics, acids and alkalis respectively. Mixtures of these should be collected according to the guidelines given in Section 2.3.5 above.

2.3.7 The beakers must be placed in a fume hood with the sash in the working position. Spent chemicals should be added slowly, and in small portions, into the beakers. Stop if excess heat or gas bubbles are generated during the process. Store un-added portion separately in a bottle, compile separate log sheet for the bottle. Follow labelling and storage procedures per Section 2.4.2 and 2.4.3.

2.3.8 After all spent chemicals are collected in the beakers, perform compatibility test between contents of the beakers and respective chemical waste pails. Procedures of the compatibility test are described in Section 2.5. As a safety precaution, check the pail log sheet against the beaker content before each compatibility test.

2.3.9 Add beaker content into the corresponding pail if the individual compatibility test result is satisfactory. Otherwise store separately. Follow procedures per section 2.4.2 and 2.4.3 for storage of incompatible waste.

2.3.10 If it passes the compatibility test, the new waste can be added to the pail outside the fume hood. Always check the liquid level of the waste pail before adding new waste each time. Use a funnel and a catch tray for spill prevention and control. Enter new waste information onto the log

sheet. Ensure that all fields of an entry are carefully completed and are legible.

2.3.11 Irrespective of the compatibility test, if a superintendent or a technician is reluctant for any reason to mix a new waste into a pail, then the waste should be stored separately. Follow procedures per Section 2.4.2 and 2.4.3 for storage of incompatible waste.

2.3.12 Chemical waste pails should always be stored in stainless steel (organics) or plastic (inorganics) catch trays, and be placed inside the storage cabinet. The storage cabinet should be kept in a cool area.

2.4 Handling of Surplus or Expired Chemicals

2.4.1 Leave chemical in original packing and label. If the original packing is not in good condition and presents a risk of leakage, wrap and seal the bottle in a PE plastic bag, or other overpack of compatible nature.

2.4.2 On each bottle, attach a second label listing the following information: (i) name of department, (ii) name and contact telephone number of laboratory person-in-charge, (iii) chemical name, (iv) quantities, (v) particular risks and safety precautions. Ecospace does not collect any item without this label.

2.4.3 Store these chemicals in stainless steel (organics) or plastic (inorganics) catch trays in chemical waste storage cabinet.

2.5 Compatibility Test Procedures

2.5.1 The test should be performed by a competent laboratory technician, in a fume hood with the sash at working position.

2.5.2 Using a pipet, draw a 50 ml sample of the content from the target waste pail and move to a beaker. Insert a thermometer into the beaker.

2.5.3 Slowly, mix in a portion of the new chemical waste that is to be added to the pail. The volumetric ratio of the test reagents should be similar to that between the original pail content and the new waste.

2.5.4 If bubbling, fuming or a sharp temperature rise of 10°C or more occurs during mixing or within 5 minutes, stop further mixing. Store new waste separately in a bottle, compile separate log sheet. Follow Section 2.4.2 and 2.4.3 for storage and labelling procedures.

2.5.5 If no adverse reaction occurs in 5 minutes, the new waste can be added to the corresponding pail.

2.5.6 Please make reference to Appendix VI Hazardous Waste Compatibility Chart.

2.6 Personal Protective Equipment

Chemical goggles and laboratory, coats should be used at all times when handling or mixing chemical wastes, irrespective of whether the operation is performed in a fume hood.

2.7 Collection Service

2.7.1 The CWM should advise the Safety Office, in the form of a telefaxed waste log sheet (Appendix VII) which contains the name, nature and volume of each pail.

2.7.2 For surplus or expired chemicals, please fill in the Labpack Form (Appendix VIII) and fax to Safety Office.

2.7.3 Safety Office will collect the waste. The time of collection will be arranged between Safety Office and CWM.

2.7.4 Department should allocate storage space for empty pails that is enough for two weeks' use and place in containment tray when the full waste pails are collected by Safety Office staff.

2.7.5 Safety Office will liaise with Ecospace for collection of the waste and further supply of empty pails.

3. Liquid Effluents

3.1 Introduction

Hong Kong has been divided into a number of Water Buffer Control Zones for the purposes of water pollution control. The list below shows the relevant zones for the University's buildings.

Water Control Zone	*Buildings*
(A) Western Buffer (i):	U. Pathology Building University Hall Restaurant No. 6 Sassoon Road Residence Restaurant Estates Office Building Laboratory Animal Unit – Dexter Man Building Faculty of Medicine Building Flora Ho Sports Centre HKJCB for Interdisciplinary Research
(B) Western Buffer (ii):	Stanley Ho Sports Centre
(C) Southern	Swire Institute of Marine Science
(D) Tolo Harbour	Kadoorie Agricultural Research Centre
(E) Victoria Harbour	Main Campus

All liquid effluents from buildings in lists A, B & E enter the government sewers while List C and D Buildings discharge into coastal waters. The legal conditions that govern liquid effluents discharged into drainage and sewerage systems, and inland and coastal waters of Hong Kong are given in the Hong Kong Water Pollution Control Ordinance Cap. 358. Details of the Ordinance are summarized in the Technical Memorandum on Effluent Standards issued by the Secretary for Planning, Environment and Lands under Section 21(1) of the Water Pollution Control (Amendment) Ordinance 1990.

3.2 Practice at HKU

Because of the legal conditions governing the waste water stream, students, technicians and researchers must be careful to avoid putting any solid or liquid chemical waste into the sinks. Please refer to Guidelines for chemical waste management. In principle, only acids and alkalis that have been neutralized to the pH range 6-10 and non-toxic salts can be disposed into the sewer system.

3.3 Standards for Effluents Discharged to Foul Sewers

3.3.1 *Hong Kong Regulations*

3.3.1.1 Standards for Effluents Discharged to Foul Sewers

The current standards for effluents leading to Governments sewage treatment plants are listed below:

Parameter	**Unit**	**Uper Limit**
pH	pH units	6-10
5 day Biochemical Oxygen Demand	mg/l	1200
Chemical Oxygen Demand	mg/l	3000
Suspended Solids	mg/l	1200
Total Toxic Metals	mg/l	10
Phenols	mg/l	1
Total Nitrogen	mg/l	200
Total Phosphorous	mg/l	50
Surfactants	mg/l	200
Oil & Grease	mg/l	100
Barium	mg/l	8
Boron	mg/l	8
Cadmium	mg/l	0.2
Chromium	mg/l	2
Copper	mg/l	4
Iron	mg/l	30
Mercury	mg/l	0.2
Nickel	mg/l	4
Silver	mg/l	4
Zinc	mg/l	5
Other toxic metals, individual Cyanide	mg/l	2.5
Sulphide	mg/l	10
Sulphate	mg/l	100

The current list of 'toxic metals' provided by the EPD for sewer effluents includes antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium and vanadium.

The following substances must **not** be discharged into foul sewers:

- polychlorinated biphenyls (PCB)
- polyaromatic hydrocarbon (PAH)
- fumigant, pesticide or toxicant
- radioactive substances
- chlorinated hydrocarbons
- flammable or toxic solvents
- petroleum oil or tar
- calcium carbide
- waste liable to form scum, deposits

Any substance of a nature or quantity likely to damage the sewer or to interfere with any of the treatment processes.

The Authority will **not** allow dilution as a means of meeting effluent standards. Dilution lowers the concentration of waste by increasing the volume, but the total mass of waste, and thus the loading on the receiving waters and their biota, does not change. This does not necessarily prohibit mixing different effluent streams within the premises.

3.3.1.2 Standards for Effluents Discharged to Coastal Waters

Parameter	Unit	Upper Limit
pH	pH unit	6-9
Colour	Lovibond Unit (25mm cell length)	1
Suspended Solids	mg/l	50
Biochemical Oxygen Demand	mg/l	50
Chemical Oxygen Demand	mg/l	100
Oil & Grease	mg/l	30
Barium	mg/l	5
Boron	mg/l	5
Cadmium	mg/l	0.1
Iron	mg/l	15
Other Toxic Metals (individually)	mg/l	1
Total Toxic Metals	mg/l	2
Cyanide	mg/l	0.2
Phenols	mg/l	0.5
Sulphide	mg/l	5
Total Nitrogen	mg/l	100
Total Phosphorous	mg/l	10
Surfactants (total)	mg/l	20
E. Coli	Count/100 mg/l	1000

Prohibited substances for effluents to coastal wasters are:

- polychlorinated biphenyls (PCB)
- polyaromatic hydrocarbon (PAH)
- fumigant, pesticide or toxicant
- radioactive substances
- chlorinated hydrocarbons
- flammable or toxic solvents
- petroleum oil or tar
- calcium carbide
- wastes liable to form scum, deposits or discolouration
- sludge, floatable substances or solids larger than 10 mm

As with waste water, the Authority will not allow dilution as a means of meeting effluent standards. That would cause excessive loading on the receiving waters and their biological systems.

This does not necessarily prohibit mixing different effluent streams within the premises.

Reference

- 🕮 A Guide to the Chemical Waste Control Scheme – EPD.
- 🕮 Code of Practice on the Packaging. Labelling and Storage of Chemical Wastes – EPD.
- 🕮 Safety in Science Laboratories – Education Department.
- 🕮 Technical memorandum. Standards for Effluents discharged into Drainage and Sewerage Systems. Inland and Coastal Waters – EPD.

Appendix I

SCHEDULE OF SUBSTANCES AND CHEMICALS CLASSIFIED AS CHEMICAL WASTE

Part A	Code
Any substance to which the Antibiotics Ordinance (Cap. 137) applies	30
Asbestos	09
Dangerous drugs [as defined in the Dangerous Drugs Ordinance (Cap. 134)]	10
Dangerous goods, category 2, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	02
Dangerous goods, category 6, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	04
Dangerous goods, category 9, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	14
Dibenzofurans	19
Dioxins	19
Pesticides [as defined in the Register referred to in Section 4(b) of the Pesticides Ordinance (Cap. 133)	06
Poisons (Part I) [as defined in the Pharmacy and Poisons Ordinance (Cap. 138)]	20
Polychlorinated biphenyls	29
Part B	**Code**
Antimony and its compounds	66
Arsenic compounds	66
Barium compounds	66
Berylium and its compounds	66
Boron compounds	66
Cadmium and its compounds	66
Chromium bearing solid tannery waste	66
Chromium and its compounds, NES	66
Cobalt and its compounds	66
Copper compounds/copper etchant	66/76
Cyanides	96
Dangerous goods, category 3, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	38
Dangerous goods, category 4, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	36
Dangerous goods, category 5, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	33
Dangerous goods, category 7, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	35
Dangerous goods, category 8, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	34
Dangerous goods, category 10, NES [as defined in the Dangerous Goods Ordinance (Cap. 295)]	39
Halogenated organic solvents and compounds	49
Lead and its compounds	66
Manganese and its compounds	66
Mercury and its compounds	66
Mineral oils employed for engine lubrication	73
Mineral oils, NES	63
Part B	**Code**
Nickel and its compounds	66

Non-halogenated organic solvents and compounds	43
Organo lead compounds	86
Organo mercury compounds	86
Organo tin compounds	86
Paints	53
Pesticides [as defined in the Register referred to in Section 4(a) of the Pesticides Ordinance (Cap. 133)]	46
Pharmaceutical products and medicines, NES	40
Phosphorus compounds excluding phosphates	68
Selenium compounds	66
Silver compounds	66
Sulphides	98
Thallium and its compounds	66
Tin compounds	66
Vanadium compounds	66
Zinc compounds	66
Acids, alkalis and corrosive compounds	
Acetic acid above 10% acetic acid by weight	48
Acids or acidic solutions, NES with acidity equivalent to above 5% nitric acid by weight	48
Ammonia solution above 10% ammonia by weight	58
Bases or alkaline solutions, NES, with alkalinity equivalent to above 1% sodium hydroxide by weight	58
Chromic acid above 1% chromic acid by weight	78
Fluoroboric acid above 5% fluorobonc acid by weight	48
Formic acid above 10% formic acid by weight	48
Hydrochloric acid above 5% hydrochloric acid by weight	48
Hydrofluoric acid above 0.1% hydrofluoric acid by weight	48
Hydrogen peroxide solution above 8% hydrogen peroxide by weight	55
Nitric acid above 5% nitric acid by weight	48
Perchloric acid above 5% perchloric acid by weight	48
Phosphoric acid above 5% phosphoric acid by weight	48
Potassium hydroxide solution above 1% potassium hydroxide by weight	58
Potassium hypochlorite solution above 5% active chlorine	88
Sodium hydroxide solution above 1% sodium hydroxide by weight	58
Sodium hypochlorite solution above 5% active chlorine	88
Sulphuric acid above 5% sulphuric acid by weight	48
NES = Not elsewhere specified	

Appendix II

Sketch A – Chemical Waste Storage Cupboard

Sketch B – Stainless Steel Spill Catcher Tray

Sketch C – Heavy-Duty Plastic Spill Catcher Tray

Sketch D – Storage of Organic Chemical Wastes

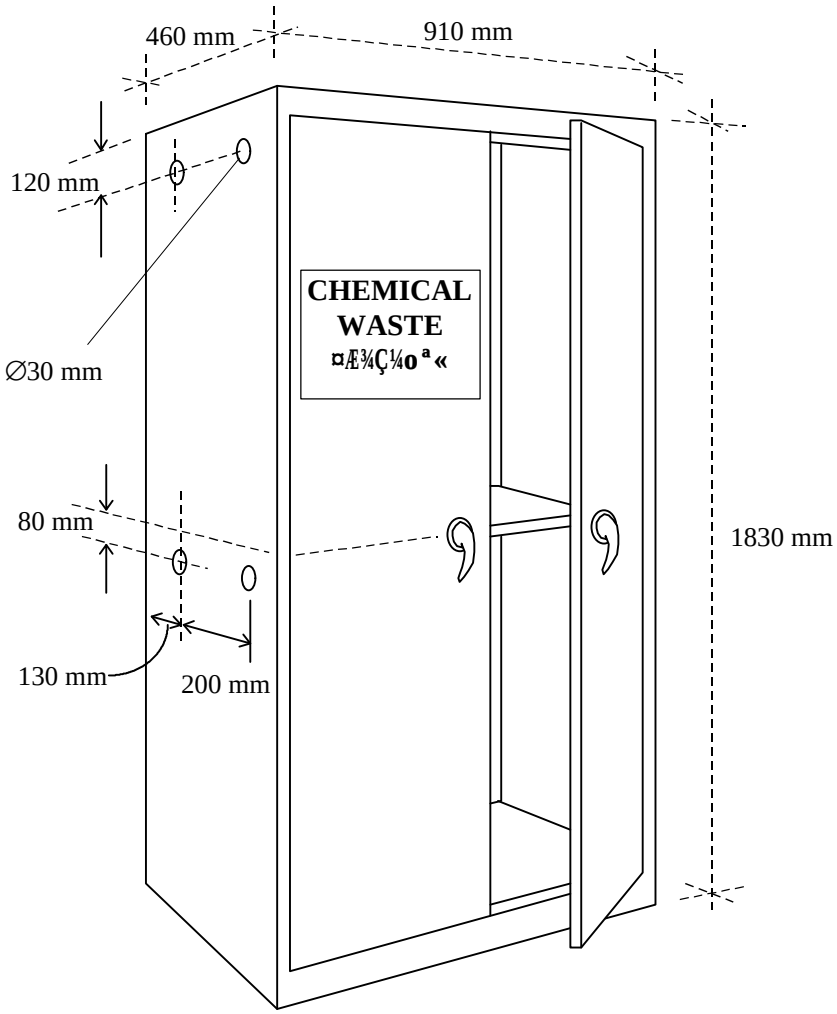
Sketch E – Storage of Inorganic Chemical Wastes

Sketch A
¹Ï A

APPENDIX II

Chemical Waste Storage Cupboard
¤Æ¾Ç¼o ª« ¶J ¦ sÂd

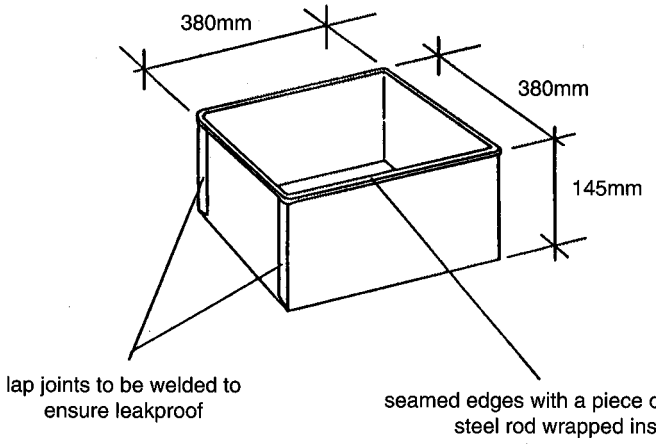
Cupboard, steel, double-door, fitted with 3 point locking espagnolette bolt, controlled by 6-lever lock with one adjustable shelf.



External Dimension	:	910mm wide x 1830mm high x 460mm deep
Doors and Sides	:	1.2mm (minimum) thickness of steel
Ventilation Holes	:	4 holes of diameter 30mm on each side as shown
Marking	:	Words "CHEMICAL WASTE ¤Æ¾Ç¼o ª «" should be printed clearly and boldly in red on a white background with letters/characters of not less than 60 mm in height.
Adjustable Shelf and Bottom	:	1.2 mm (minimum) thickness of steel, strengthened with two U-shape ribs welded along the width underneath the adjustable shelf and bottom of the cupboard, stiff and strong enough to stand the weight of at least 70 kilograms
Top and Back	:	0.7 - 0.8mm thickness of steel
Lock	:	Union or Yale
Finish	:	Rust proof with "FOSCOTE" or equivalent preparation and sprayed with three coats of cellulose lacquer
Colour	:	Olive brown

Sketch B

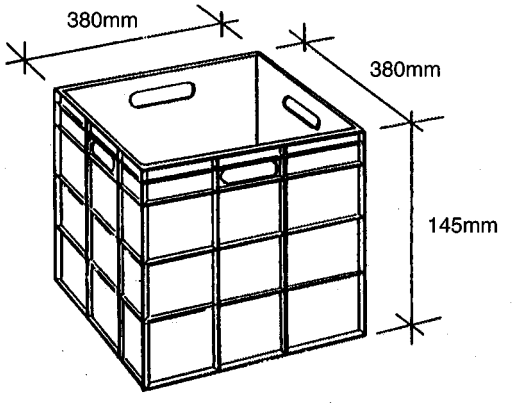
Stainless Steel Spill Catcher Tray



Overall dimension 380mm x 380mm x 145mm, to be made of a SWG 24 stainless steel (type 316) sheet. All edges should be seamed with a piece of stainless steel rod (dia. 5mm) to stiffen and avoid sharp edges. The lap joints should be welded to ensure that the whole tray is leakproof.

Sketch C

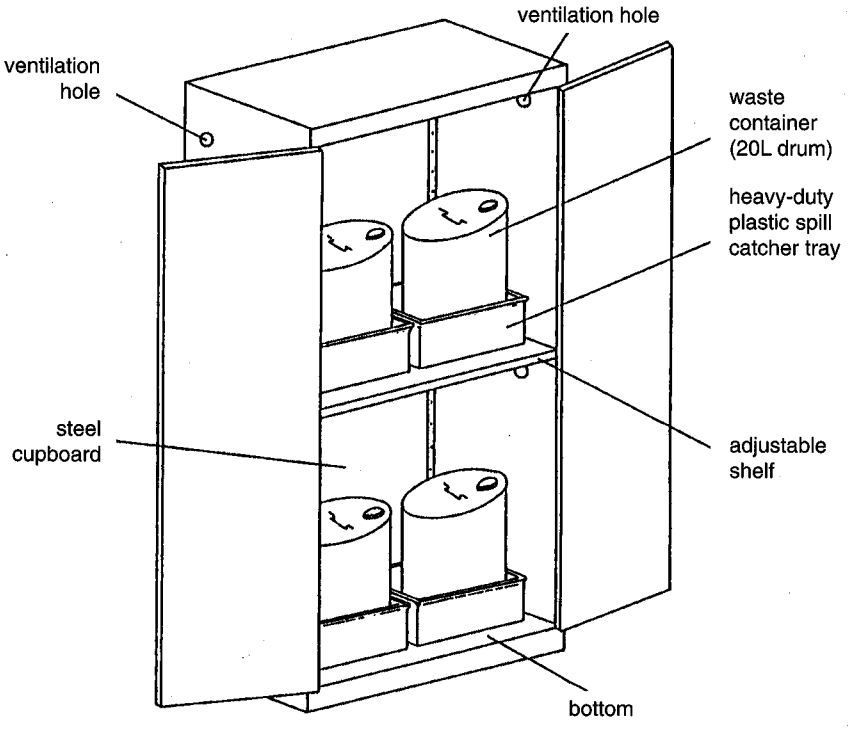
Heavy-Duty Plastic Spill Catcher Tray



Overall dimension	:	380mm x 380mm x 362mm
Material dimension	: Top	360mm x 360mm x 355mm
	Bottom	351mm x 351mm x 355mm

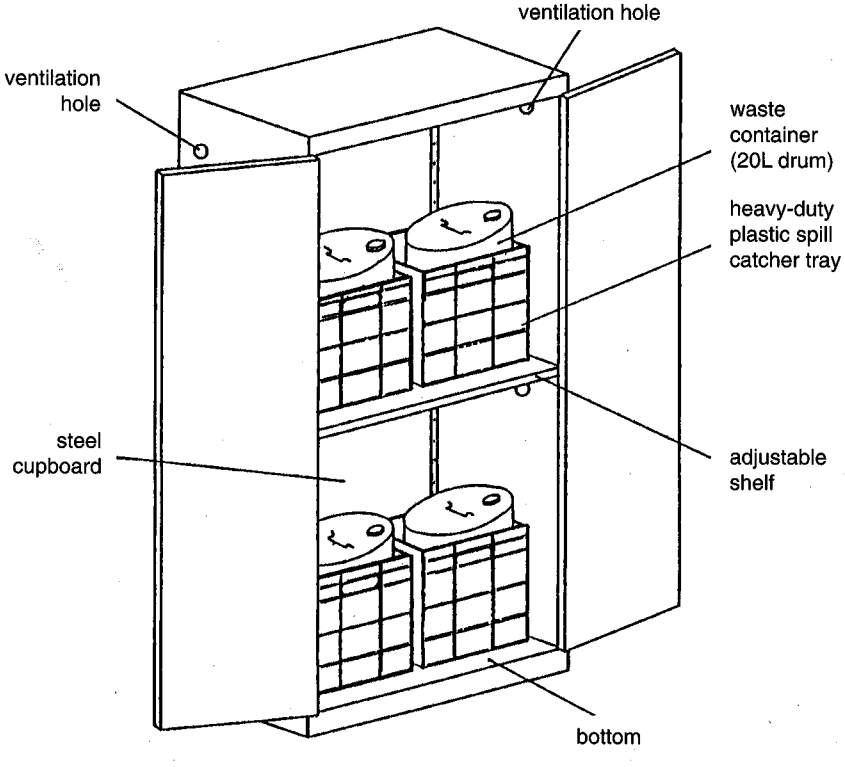
Sketch D

Storage of Organic Chemical Wastes



Sketch E

Storage of Inorganic Chemical Wastes



Appendix III

List of Waste Streams and Containers

CWTF ID	Containers Type	Color Dot	Waste Name	
10036613	A	Red x 3	SPENT	ACID, MEDICAL LAB
10036615	A	Red x 4	SPENT	ALKALI, MEDICAL LAB
10036614	A	Red x 5	SPENT	CHROMIC ACID, MEDICAL LAB
10036617	Q	Red x 1	SPENT	HALO SOLVENT, MEDICAL LAB
10149182	A	Red x 7	SPENT	NITRIC ACID, MEDICAL LAB
10036616	Q	Red x 1	SPENT	NON-HALO SOLVENT, MEDICAL LAB
10036606	A	White 11	SPENT	ACID, LAB
10036607	A	White 3	SPENT	ALKALI, LAB
10036609	A	White 3	SPENT	AMMONIA, LAB
10166855	A	Black	SPENT	CYANIDE SOLUTION, LAB
10036610	Q	Burg 5	SPENT	FOUNTAIN SOLUTION, LAB
10036605	Q	Violet 5	SPENT	HALO SOLVENT, LAB
10166854	A	Orange	SPENT	NITRIC ACID, LAB
10036603	Q	Burg 5	SPENT	NON-HALO SOLVENT, LAB
10036611	Q	Burg 5	SPENT	ORGANIC ACID, LAB
10036618	I	Burg	SPENT	ORGANIC GEL, LAB
10152410	I	White	SPENT	SILICA GEL, LAB
10036617	A	Burg 10	SPENT	ALKALI, FIXER & DEVELOPER
10036608	A	Yellow	SPENT	FECL3, ETCHANT
10036612	Q	Violet 5	SPENT	HALO-SOLVENT W/WATER
10036602	B	Burg 8	SPENT	LUBE OIL

Key for Container Type

A = Plastic Closed Top
B = Carbon Steel
Q = Composite
I = Plastic Open Top

Appendix IV

List of Explosive Substances

Acetyl azide	Acetyl nitrate
Ammonium azide	Ammonium chlorate
Ammonium hexanitrocobaltate	Ammonium nitrate
Ammonium nitrite	Ammonium periodate
Ammonium permanganace	Ammonium picrate
Ammonium tetraperoxychromate	Azidocarbonyl guanidine
Barium azide	Benzene diazonium chloride
Benzotriazole	Benzoyl peroxide
Bismuth nitride	Boron triazide
Bromine azide	Butanetriol trinitrate
t-Butyl hypochiorite	Cadmium azide
Cadmium hexamine chlorate	Cadmium hexamine perchlorate
Cadmium nitrate	Cadmium nitride
Cadmium trihydrazine chlorate	Calcium nitrate
Cesium azide	Chlorine azide
Chlorine dioxide	Chlorine fluoroxide
Chlorine trioxide	Chloroacetylene
Choropicrin	Copper acetylide
Cyanuric triazide	Diazidoethane
Diazodinitrophenol	Diethylene glycol dinitrate
Dipentaerithritol hexanitrate	Dipicryl amine
Disulfur dinitride	Ethyl nitrate
Ethyl nitrite	Fluorine azide
Glycol dinitrate	Glycol monolactate trinitrate
Gold fulminate	Guanyl nitrosaminoguanylidene hydrazine
HMX	Hydrazine azide
Hydrazoic acid	Lead azide
Lead dinitroresorcinate	Lead monoitroresorcinate
Lead styphnate	Mannitol hexanitrate
Mercuric oxycyanide	Mercury fulminate
Nitrocarbonitrate	Nitrocellulose
Nitroglycerin	Nitrosoguanidine
Nitrostarch	Pentaerythritol tetranitrate
Picamide	Picric acid
Polyvinyl nitrate	Potassium dinitrobenzfuroxan
Potassium nitrate	RDX
Silver acetylide	Silver azide
Silver nitride	Silver styphnate
Silver tetrazene	Smokeless powder
Sodium picamate	Tetranitromethane
Tetraselenium tetranitride	Tetrasulfur tetranitride
Tetrazene	Thallium nitride
Trilead dinitride	Trimercury dinitride
Trinitrobenzene	Trinitrobenzoic acid
Trinitronaphthalene	Trinitroresorcinol
Trinitrotoluene	Urea nitrate
Vinyl azide	Zinc peroxide

Appendix V

List of Water Reactive Substances

Acetic anhyride	Acetyl bromide
Acetyl chloride	Alkyl aluminum chloride
Allyl trichlorosilane	Aluminum aminoborohydride
Aluminum borohydride	Aluminum bromide
Aluminum chloride	Aluminum fluoride
Aluminum hypophosphide	Aluminum phosphide
Aluminum tetrahydroborate	Amyl trichlorosilane
Anisoyl chloride	Antimony tribromide
Antimony trichloride	Antimony trifluoride
Antimony triiodide	Antimony trivinyl
Arsenic tribromide	Arsenic trichloride
Arsenic triiodide	Barium
Barium carbide	Barium oxide
Barium sulfide	Benzene phosphorus dichloride
Benzoyl chloride	Benzyl silane
Benzyl sodium	Beryllium hydride
Beryllium tetrahydroborate	Bismuth pentaflouride
Borane	Boron bromodiiodide
Boron dibromoiodide	Boron phosphide
Boron tribromide	Boron trichloride
Boron triiodide	Bromine monofluroride
Bromine pentafluoride	Bromine trifluoride
Bromo diethylaluminum	n-Butyl lithium
n-Butyl trichlorosilane	Cadmium acetylide
Cadmium amide	Calcium
Calcium carbide	Calcium hydride
Calcium oxide	Calaium phosophide
Cesium amide	Cesium hydide
Cesium phosphide	Chlorine dioxide
Chlorine monofluoride	Chlorine pentafluoride
Chlorine trifluoride	Chloroacetyl chloride
Chlorodiisobutyle aluminum	Chlorophenyl isocyanate
Chromyl chloride	Copper acetylide
Cyclohexenyl trichlorosilane	Cyclohexyl trichlorosilane
Decaborane	Diborane
Diethyl aluminum chloride	Diethyl dichlorosilane
Diethyl zinc	Diisopropyl beryllium
Dimethyl dichlorosilane	Dimethylmethane diisocyanate
Disulfuryl chloride	Didecyl trichlorosilane
Ethyl dichloroarsine	Ethyl dichlorosilane
Ethyl trichlorosilane	Fluorine

Fluorine monoxide	Fluorosulfonic acid
Gold acetylide	Hexadecyl trichlorosilane
Hexyl trichlorosilane	Hydrobromic acid
Iodine monochloride	Lithium
Lithium aluminum hydride	Lithium amide
Lithium ferrosilicon	Lithium hydride
Lithium peroxide	Lithium silicon
Methyl aluminum sasquibromide	Methyl aluminum sesqichloride
Methyl dichlorosilane	Methylene diisocyanate
Methyl isocyanate	Methyl trichlorosilane
Methyl magnesium bromide	Methyl magnesium chloride
Methyl magnesium iodide	Nickel antimonide
Nonyl trichlorosilane	Octadecyl trichlorosilane
Octyl trichlorosilane	Pehenyl trichlorosilane
Phosphonium iodide	Phosophoric anhydride
Phosophorus oxychloride	Phosphorum pentasulfide
Phosophorus trisulfide	Phosphorus (amorphous red)
Phosophorus oxybromide	Phosphorus oxychloridePhosphorus pentachloride
Phosphorus pentachloride	Phosphorus sesquisulfide
Phosphorus trimbromide	Phosphorus trichloride
Polyphenyl polymethyl isocyanate	Potassium
Potassium hydride	Potassium oxide
Potassium peroxide	Propyl trichloride
Pyrosulfuryl chloride	Silicon tetrachloride
Silver acetylide	Sodium
Sodium aluminum hydride	Sodium amide
Sodium hydride	Sodium methylate
Sodium oxide	Sodium peroxide
Sodium-potassium alloy	Stannic chloride
Sulfonyl fluoride	Sulfuric acid (>70%)
Sulfur chloride	Sulfur pentafluoride
Sulfur trioxide	Sulfuryl chloride
Thiocarbonyl chloride	Thionyl chloride
Thiophosphoryl chloride	Titanium tetrachloride
Toluene diisocyanate	Trichlorosilane
Triethyl aluminum	Trisobutyl aluminum
Trimethyl aluminum	Tri-n-butyl aluminum
Tri-n-butyl borane	Tricotyl aluminum
Trichloroborane	Triethyl arsine
Triethyl stibine	Trimethyl arsine
Trimethyl stibine	Tripropyl stibine
Trisilyl arsine	Trivinyl stibine
Vanadium trichloride	Vinyl trichlorosilane
Zinc acetylide	Zinc phosphide
Zinc perioxide	

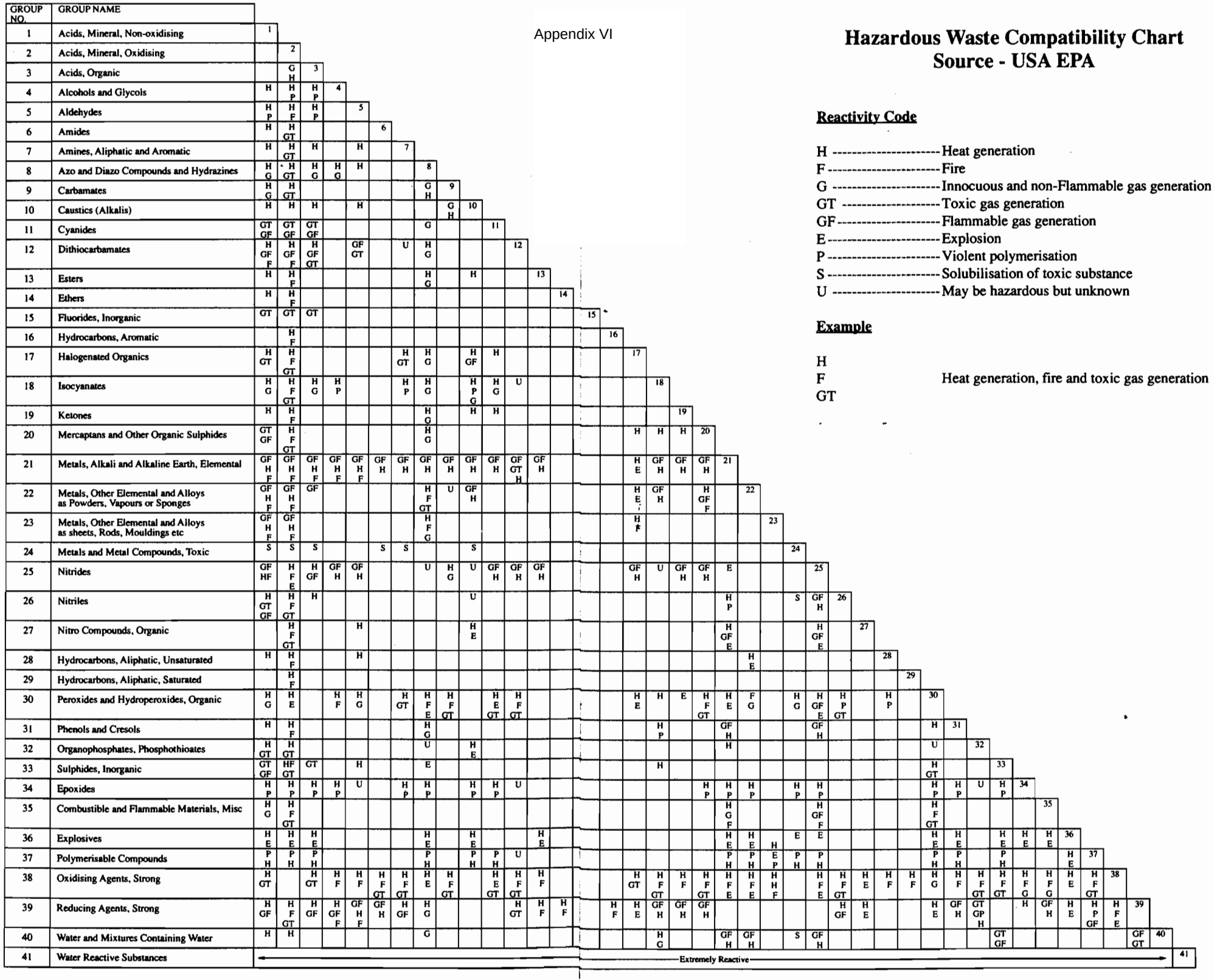
Appendix VI

Hazardous Waste Compatibility Chart

Appendix VI

Hazardous Waste Compatibility Chart
Source - USA EPA

GROUP NO.	GROUP NAME
1	Acids, Mineral, Non-oxidising
2	Acids, Mineral, Oxidising
3	Acids, Organic
4	Alcohols and Glycols
5	Aldehydes
6	Amides
7	Amines, Aliphatic and Aromatic
8	Azo and Diazo Compounds and Hydrazines
9	Carbamates
10	Caustics (Alkalis)
11	Cyanides
12	Dithiocarbamates
13	Esters
14	Ethers
15	Fluorides, Inorganic
16	Hydrocarbons, Aromatic
17	Halogenated Organics
18	Isocyanates
19	Ketones
20	Mercaptans and Other Organic Sulphides
21	Metals, Alkali and Alkaline Earth, Elemental
22	Metals, Other Elemental and Alloys as Powders, Vapours or Sponges
23	Metals, Other Elemental and Alloys as sheets, Rods, Mouldings etc
24	Metals and Metal Compounds, Toxic
25	Nitrides
26	Nitriles
27	Nitro Compounds, Organic
28	Hydrocarbons, Aliphatic, Unsaturated
29	Hydrocarbons, Aliphatic, Saturated
30	Peroxides and Hydroperoxides, Organic
31	Phenols and Cresols
32	Organophosphates, Phosphothioates
33	Sulphides, Inorganic
34	Epoxides
35	Combustible and Flammable Materials, Misc
36	Explosives
37	Polymerisable Compounds
38	Oxidising Agents, Strong
39	Reducing Agents, Strong
40	Water and Mixtures Containing Water
41	Water Reactive Substances



Reactivity Code

H ---------- Heat generation
F ---------- Fire
G ---------- Innocuous and non-Flammable gas generation
GT ---------- Toxic gas generation
GF ---------- Flammable gas generation
E ---------- Explosion
P ---------- Violent polymerisation
S ---------- Solubilisation of toxic substance
U ---------- May be hazardous but unknown

Example

H
F
GT

Heat generation, fire and toxic gas generation

Appendix VII

(a) Waste Log Sheet (please click to download)

(b) Waste Log Sheet from Medical Sources (please click to download)

Appendix VIII

Labpack Form

Appendix VIII

The University of Hong Kong

Labpack (Surplus/Expired Chemical) Form

Name of waste producer: _____ Tel: _____ E-mail: _____

Waste location: _____

Date: _____

Item No.	Chemical Name	Chemical Formula	Physical State (S/M/L)	Container Size (ml)	Container Type (G/P/M)	Type of Lid (P/G/M)	Quantity (# of Containers)	Chemical Weight/ Volume (Kg/Litre)	Remarks

S = Solid M = Sludge L = Liquid; G = Glass P = Plastic M = Metallic

Appendix IX

Checklist for Chemical Waste Management

		Y/N/NA
1.	A standard chemical waste container is used.	
2.	The labels on the container are clear, intact and adhere firmly to the container.	
3.	The waste container is in good condition and the caps are kept tightly closed.	
4.	The Chemical Waste Log Sheet is filled out properly.	
5.	The chemical waste containers do not obstruct the fire exit route.	
6.	The storage area is dry and clean.	
7.	Be conversant with the compatibility of the chemical waste e.g. solvent is incompatible with strong acid or with oxidizing agents.	
8.	The total volume of wastes stored is less than 300 L.	
	For chemical wastes stored at a workplace with volume < 50 L:	
9.	The location for waste storage or the spill tray bears a standard Chemical Waste Warning Sign which is displayed prominently.	
10.	The standard liquid chemical waste container is put inside a spill tray or a spill retention structure is available.	
11.	The spill tray or cabinet is free of other substances except the waste container(s).	
12.	Incompatible wastes are prevented from mixing in case of a spill.	
	For chemical wastes stored at a workplace with volume > 50 L but < 300 L:	
13.	The waste containers are enclosed by at least a 3-sided structure, e.g. a cabinet.	
14.	The storage structure is only for the storage of chemical wastes.	
15.	A standard chemical waste warning sign is displayed prominently at the storage structure.	
16.	The storage structure of liquid chemical wastes has a retention capacity for 20% of the total wastes stored or the volume of the biggest container, whichever is the greater.	
17.	The enclosed storage structure has vent holes or ventilation facility.	
18.	Incompatible chemical wastes are separated by barriers to prevent mixing in case of a spill.	
19.	The storage structure has no connection to the sewer or surface water drain.	

Remedial action is necessary if the answer to any one item is "No".