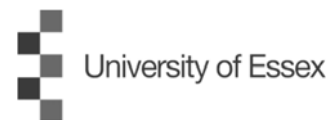


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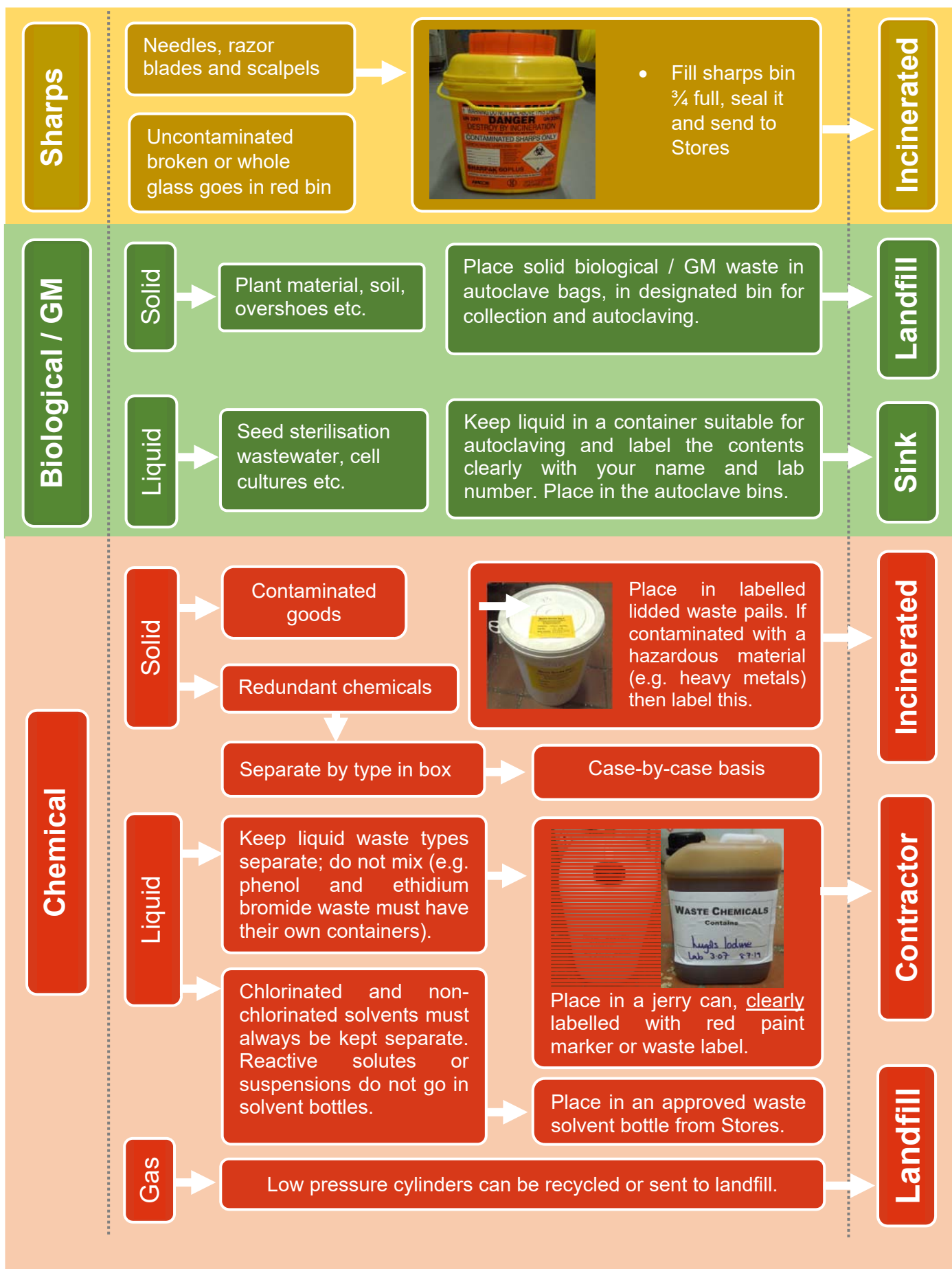


# Laboratory Waste Disposal Handbook

Version 4

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# Laboratory waste disposal summary



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# 1. Introduction

## 1.1 Legal and Regulatory Background

A large number of pieces of legislation cover the disposal of waste, hazardous or otherwise. These include:

- The Environmental Protection Act 1990, as amended (EPA)
- The Hazardous Waste (England and Wales) Regulations 2005, as amended
- Controlled Waste (England and Wales) Regulations 2012, as amended
- The Environmental Permitting (England & Wales) Regulations 2016 (EPR)
- The Waste (England and Wales) Regulations 2011, as amended
- The Waste Electrical & Electronic Equipment Regulations 2013, as amended (WEEE)
- The Health & Safety at Work Act 1974 (HSWA)
- The Management of Health & Safety at Work Regulations (MHSWR)
- Control of Substances Hazardous to Health Regulations 2002, as amended (COSHH)
- Carriage of Dangerous Good Regulations 2009, as amended (ADR)
- Water Industry Act 1991

This guidance is based on the above legislation and codes of practice available at time of writing, alongside the University's waste management policies. These are available to download on the links below:

### **Approved Code of Practice & guidance documents:**

[HTM 07-01 Management and disposal of healthcare waste](#)

[Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste](#)

### **University of Essex Waste Management Policy:**

<https://www.essex.ac.uk/-/media/documents/sustainability/waste-policy.pdf>

The University has a number of legal duties surrounding hazardous waste. The University must:

- Have an absolute knowledge of the contents of all waste streams, and classify its waste to identify if it is hazardous
- Separate and store hazardous waste safely and securely
- Ensure the safety of staff, students and others who may generate or handle any wastes
- Use authorised businesses to collect, recycle, treat or dispose of its hazardous waste
- Complete the relevant parts of the Consignment Note that applies to the University
- Keep accessible records for three years at the premises where the waste was produced or stored – these may be inspected at any time by the Environment Agency

## 1.2 Planning for the disposal of waste

Laboratories by their nature produce a very wide range of different types of waste and are also governed by many different sets of regulations relating to its disposal. It's therefore necessary that some planning goes into the way your waste will be handled.

Forward planning is essential. The correct route for waste must be selected, and in some cases, what sequence the waste must be treated. This should all be detailed within the risk assessments or scheme of work documents covering your work. This must all be done BEFORE you create any waste.

Accurate labelling and documentation are also essential. We have a legal duty to know the constituents of all waste we produce. Waste which is not identified cannot be disposed of without very costly or time-consuming chemical analysis. It's important, therefore, to label waste correctly at the time of production.

We are legally required to contain, package and transport waste safely. These means using the correct containers for packaging waste, correct pre-treatment where necessary, and correct methods for final disposal.

The intention of this handbook is to give you some general advice and guidance on the correct methods to use, but if in any doubt please contact a member of the Technical Services team, who will be able to advise you.

## 2. Domestic waste and recycling

### 2.1 General domestic waste

General Campus waste should be segregated at source. Within the lab, any uncontaminated, non-recyclable materials should be placed in the supplied bags or bins for disposal. This can include packaging materials, non-recyclable plastics, non-hazardous solid waste etc.

Think about the waste you are producing; is it recyclable (e.g. cardboard, plastic packaging)?

<https://www.essex.ac.uk/-/media/documents/sustainability/waste-policy.pdf>

<https://www.essex.ac.uk/staff/building-and-maintenance-services/waste>



### 2.2 Recycling

Recycling facilities are available for uncontaminated recyclables, such as cardboard and plastic packaging.

<https://www.essex.ac.uk/-/media/documents/sustainability/waste-policy.pdf>

<https://www.essex.ac.uk/staff/building-and-maintenance-services/waste>

In addition to this, we have recycling systems in place for:

- Some clean lab plastics, along with their packaging (e.g. pipette tip boxes and supports)
- Shipping pallets via Estates
- Equipment packaging (usually removed by the delivery company)
- Clean glass and plastic 'Winchesters'

We are looking at expanding the recycling systems available, and more details of new systems will be circulated as they come online.

## 3. Chemical waste

The below is intended to be a brief summary of these disposal routes. The precise disposal details for your waste will be included within your specific COSHH or other equivalent risk assessment.

### 3.1 Lightly contaminated items (e.g., PPE, paper towels, packaging)

Items that have been lightly contaminated with hazardous chemicals, such as gloves and paper towels, should be placed into the waste pails situated within the labs. The pails will be taken from the lab regularly and waste is incinerated, prior to the residue being sent to landfill.

If items have been contaminated with certain materials (such as heavy metals, phenol, pharmaceuticals, or pesticides), make sure this is clearly labelled on the bin as these must be segregated for disposal.

This disposal route is for chemically contaminated items ONLY. Other hazards must be dealt with first before using this waste stream.

**It is essential that any items being disposed of via the standard waste pails are not contained within autoclave bags or any other container that shows biohazard labelling. Presence of such hazard warnings will result in that waste pail being rejected until the contents have been repackaged.**



### 3.2 Solid chemical waste

Solid chemical waste includes redundant or expired chemicals (generically known as 'lab smalls'). These are time-consuming and expensive to dispose of, and so every effort should be made to avoid ordering duplicate chemicals or ordering in excessive quantities.

Separate incompatible classes of solid chemicals by type in red boxes (e.g. oxidising, flammable, toxic, corrosive) to avoid potentially dangerous reactions from any leaks or spills. These will then be collected and disposed of on a case-by-case basis. Red boxes will be supplied on request – please contact the Technical Services Managers with details of what requires disposal.



Please make sure that the box for collection includes an itemised list of contents (including, at minimum, the full chemical name (preferably IUPAC), CAS number and quantity for disposal). Any items in damaged packaging (e.g., cracked lids or bottles) must be placed in secondary packaging before being transferring to the red box.

### 3.3 Non-hazardous liquid chemical waste

Aqueous waste can be disposed of via the designated sink in each lab, so long as it is risk-assessed to be non-hazardous or has been produced at a quantity and concentration below any legal thresholds defining the waste as hazardous. **Please note that is now a specific offence to dilute more concentrated waste to take it below any such disposal thresholds.** See Section 3.4 below for disposal routes for such waste.

### 3.4 Hazardous liquid chemical waste

Solutions or suspensions of substances which are show hazard warnings as being toxic, oxidising, flammable, carcinogenic, mutagenic, teratogenic or environmentally damaging must not be disposed of in this way. There is a list of substances which cannot be disposed of via the drains under any circumstances (see below for more information).

Place in a clean UN-approved container, available from Stores, and clearly label with a paint marker or permanent waste label. Please DO NOT use standard 'permanent' markers for this – the labelling will wash off completely in the event of any external contamination of the container

Once filled to 75% full, these can be returned to Stores for disposal. Please do not overfill them as it makes handling difficult during downstream processing. Always keep liquid waste types in their own separated containers.

Never mix chlorinated and non-chlorinated solvents. Reactive solutes or suspensions must also never be poured into a general solvent waste bottle. Keep such materials separate and dispose of directly via Stores as above.

It is illegal to discard any of the chemicals listed below via the drains. There is no lower limit on disposals of these chemicals. They cannot be knowingly disposed of down the sink no matter how small the amount.

- Aldrin
- Atrazine
- Azinphos-methyl
- Cadmium and compounds



- Carbon tetrachloride
- 4,4'-(2,2,2-trichloroethane-1,1-diyl)bis(chlorobenzene) [Dichloro-Diphenyl-Trichloroethane; DDT]
- 1,2-Dichloroethane
- Dichlorvos
- Dieldrin
- Endosulfan
- Endrin
- Fenitrothion
- Hexachlorobenzene
- Hexachlorobutadiene
- Gamma-hexachlorocyclohexane
- Malathion
- Mercury and compounds
- Pentachlorophenol and its compounds
- Polychlorinated biphenyls (PCBs)
- Simazine
- Tributyltin compounds
- Trichlorobenzene
- Trifluralin
- Triphenyltin compounds

In addition, the following must not be put down the drains as they would violate other disposal agreements:

- Petroleum spirit and any other volatile or flammable organic solvents
- Heavy metals not listed above at more than 10mg/litre (e.g. antimony, arsenic, beryllium, chromium, copper, lead, nickel, selenium, silver, tin, vanadium or zinc). \*\*\* See note below
- Calcium carbide
- Cyanide salts
- Waste liable to form viscous or solid coatings or deposits on or in any part of the sewerage system through which the effluent is to pass
- Substances of a nature likely to give rise to fumes or odours injurious to persons working in the sewers through which the effluent is to pass
- Halogenated hydrocarbons
- Halogen substituted phenolic compounds
- Thiourea and its derivatives
- Known carcinogens, mutagens or teratogens - this includes Ethidium Bromide

**\*\*\* Please note that is now a specific offence to dilute more concentrated waste to take it below any legally imposed disposal thresholds.**

### 3.5 Gaseous chemical waste

Containers that once held low pressure gas can often be recycled by suppliers. Check with the supplier prior to purchasing. If not, these can sometimes be sent via Stores for disposal.

High pressure cylinders, such as those used by BOC to supply gases, or those containing LPG or similar gas cylinders (usually propane/butane) remain the property of the gas supplier. Empties will be collected by them when they are finished with (usually, but not always, free of charge). Follow the instructions on the label attached to each cylinder for arranging collection. If the cylinder has no label attached, please contact a Technical Services Manager for assistance with determining the original supplier.



## 4. Waste containing biological agents and/or waste from genetic modification (GM) projects

Due to legal limitations imposed by the University's wastewater handling company, we are not permitted to release any viable biological agents or GM material to the sewers. Since no commercial disinfectant supplier will certify their products to give 100% kill, we are therefore required to inactivate all such waste by autoclaving rather than disinfection before its safe disposal.

The below is intended to be a brief summary of these disposal routes. The precise disposal details for your waste will be included within your Biological Agents Scheme of Work or your GM Risk Assessment.

### 4.1 Solid biological waste

Solid biological waste includes items such as used PPE, wipes, agar plates, pipettes etc.

Use an autoclave bag within the supplied boxes. Fill the bag within the disposal boxes to 75% full, then fold over the top of the bag, replace the lid and hold it on with a small piece of autoclave tape. Label it with your lab details and place it in the marked collection area for your lab. After autoclaving, this waste will be sent to our standard municipal disposal route.

### 4.2 Solid GM waste

Solid GM waste includes items such as used plant material, PPE, wipes, agar plates, pipettes etc.

Use an autoclave bag within the supplied boxes. Fill the bag within the disposal boxes to 75% full, then fold over the top of the bag, replace the lid and hold it on with a small piece of autoclave tape. Label it with your lab details and place it in the marked collection area for your lab.

After autoclaving, disposal is defined by the Activity Class of the project being undertaken:

- Class I GM waste will be sent for disposal via municipal waste streams unless it's GM Risk Assessment specifies otherwise
- Class II GM waste will be sent for incineration once it has been autoclaved

### 4.3 Liquid biological waste

Liquid biological waste includes items such as used culture media, waste cultures, etc.

Store the liquid in a container suitable for autoclaving, such as a glass Duran bottle. Ensure that it is clearly labelled with your name, label number and its contents. Place it in the marked waste boxes. After autoclaving, the liquid will be safe to be emptied down the drain unless it has been marked as having some secondary contamination present that would require its handling as hazardous waste.

Please DO NOT pre-treat any liquid waste for autoclaving with disinfectant, as these release vapour within the autoclave and can pose a significant hazard to the operators, as well as damaging the inner lining of the autoclave.

### 4.4 Liquid GM waste

Liquid biological waste includes items such as used culture media, waste cultures, etc.

Store the liquid in a container suitable for autoclaving, such as a glass Duran bottle. Ensure that it is clearly labelled with your name, label number and its contents. Place it in the marked waste boxes. After autoclaving, the liquid will be safe to be emptied down the drain unless it has been marked as having some secondary contamination present that would require its handling as hazardous waste.

After autoclaving, disposal is defined by the Activity Class of the project being undertaken:

- Class I GM waste will be disposed of to general drainage unless it's GM Risk Assessment specifies otherwise
- Class II GM waste will be sent for incineration once it has been autoclaved

## 6. Sharps and glass waste

### 6.1 Needles, razor blades, scalpels etc.

Sharps, such as needles, razor blades and scalpels, should be placed in the yellow sharps bin. Once this bin is filled to the marked line (approximately 75% full), seal it and send it to Stores for incineration. Do not overfill it or the container may not be accepted for disposal.

There is a strict coding system in place for the lid colour of these bins (see below). Please also note that bins with white lids are now obsolete and should be disposed of if you have any remaining. Our normal stocks of bins are yellow/orange, so if any other type might be needed, please contact a Technical Services Manager.



#### **SHARPS WASTE Partially Discharged** (For INCINERATION)

Partially discharged and empty sharps including those contaminated with medicines other than those that are cytotoxic and cytostatic.



#### **SHARPS WASTE Non-Pharmaceutically Contaminated Sharps** (For INCINERATION or ALTERNATIVE TREATMENT)

Non-pharmaceutically contaminated: sharps not contaminated with medicines including cytotoxic and cytostatic medicines.



#### **CYTO SHARPS WASTE** (For INCINERATION)

Sharps including those contaminated with cytotoxic and cytostatic medicines, or with carcinogenic substances.



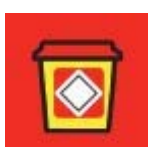
#### **SOLID PHARMA WASTE** (For INCINERATION)

Solid pharmaceutical waste including medicinal waste in original packaging.



#### **CLINICAL WASTE (For INCINERATION)**

Clinical waste, surgical instruments and other infected clinical wastes not suitable for disposal in sharps containers or plastic bags.



#### **ANATOMICAL WASTE** (For INCINERATION)

Identifiable Anatomical Waste and some prepared tissue samples including some prepared microscope slides of human tissue

<https://www.sharpsafe.co.uk/about/faqs/>

## 6.2 Uncontaminated broken or whole glass

Uncontaminated broken glass should be placed in the red bins located in each lab. This can usually be sent for recycling.



Empty and uncontaminated "Winchester" solvent bottles from Fisher Scientific or VWR/Avantor should, after cleaning, be returned to Stores. The company will collect these for possible recycling. Please note that Winchesters or glass bottles from other suppliers cannot be recycled through this system.



# 7. Clinical waste

## 7.1 'Clinical' waste and similar

Anyone who intends to work with human body tissues, fluids and human blood products must first refer to the University's policy and the School's Local Rules on this subject.

<https://www.essex.ac.uk/staff/working-with-substances/biological-hazards-and-genetic-modification>

You must pay particular care to how you designate the waste (i.e. what category of waste it is). This designation can fundamentally change the required disposal route(s) for your waste, either by disinfection, sterilisation, or incineration (or more likely a combination of these).

The three classifications of waste are:

'Offensive' waste: This is often referred to colloquially as 'tiger' waste, due to the bags sometimes used for packaging it (which are yellow and black striped). Please note that we do not normally use these striped bags, and package this class of waste in the more normal yellow 'clinical' waste bags, and note this accordingly on the waste transfer notes.

'Clinical' waste: This is often packaged in the familiar yellow waste bags or rigid yellow containers, although other options are available (see below). Clinical waste is further categorised as being Class A (high infection risk), Class B (everything else with any hazard present) and Class C (exempt animal/human specimens - these can be non-hazardous items only).

'Clinical' waste (suitable for alternative treatment): This is primarily the same as the above, but allows for the usage of disposal technologies other than incineration to be used. This waste would usually be packaged in orange waste bags. The University does not normally consign waste in this classification, so if you need to do this then please contact a Technical Services Manager before any waste is created.

The primary type of waste produced by the School falls under the classification of 'offensive' waste rather than 'clinical' waste. Please note that the University has no permanent contract for the disposal of clinical waste, so if you are likely to produce a significant volume of such waste you need to make plans for its removal BEFORE starting work.



## 8. Radioisotope sources

### 8.1 Radioisotopes

This is detailed within the University's Local rules for use of ionising radiation which must be strictly adhered to. These are downloadable from <https://www.essex.ac.uk/staff/working-with-physical-agents/ionising-radiation-safety>

Section 7.2 of these Local Rules summarises disposals:

"All radioactive waste must be disposed of according to the approved procedures for that particular Scheme of Work.

An accurate record of the disposal of radioactive waste must be kept in each department. See Local Rules Section 6.1: Record Keeping.

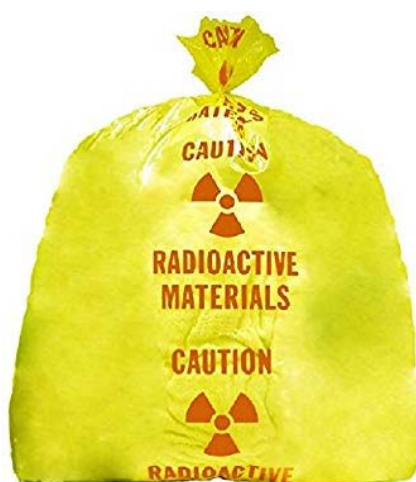
On no account should radioactive waste be allowed to accumulate in the laboratory for more than one day.

(i) SOLID: All solid waste should be treated as contaminated. All combustible solid waste should be put into plastic bags and sealed ready for incineration. A unique numbered tag must be attached to the bag (Section 6.1.2). All non-combustible solid waste must be decontaminated and disposed of in normal waste bins. If in doubt consult the DIRPS or UIRPO.

(ii) AQUEOUS LIQUID: All aqueous waste must be disposed of via the designated sink in room 3SW.3.02 ensuring that the liquid is poured directly into the plughole and flushed copiously with water. Entrained solids, gases or non-aqueous liquids must not be disposed of with aqueous waste, if in doubt consult the DIRPS or UIRPO (for example, it might be necessary to filter the aqueous waste).

(iii) ORGANIC LIQUID: Vials containing liquid organic waste must be put into plastic bags and stored for incineration. A unique numbered tag must be attached to the bag (Section 6.1.2).

(iv) GASEOUS: All procedures that may result in the production of gaseous waste must be carried out in the designated fume cupboard in room 3SW.3.02. All gaseous disposals will be made through stack 9."



### 8.2 Alpha-emitting radioisotopes

The University currently has no cost-effective disposal route for materials or chemicals that emit alpha particles (e.g. uranium salts). Please think very carefully if you plan any work with these materials, as post-



project disposal will likely involve a specialist contractor, will be very expensive and needs to be planned a long way in advance. Contact the Technical Services Managers for more information.

### **8.3 Disposal of sealed radioisotope sources**

Disposal or relocation of a sealed radioisotope source cannot be arranged without the express written consent of the University Ionising Radiation Protection Officer (UIRPO).

Arranging a disposal of sealed radioisotope sources is an expensive and complicated task, as there are very few companies authorised to handle and dispose of such items.

Please consult the Technical Services Manager if such a disposal has been authorised.

## 9. Mercury

Mercury vapour, and most compounds of mercury, are toxic to the human nervous system and act as cumulative poisons. The developing brains of fetuses and infants are especially sensitive to mercury's toxic effects. Because mercury vapours are readily absorbed through the lungs into the bloodstream, they are particularly hazardous. Exposure to mercury vapours can occur when mercury containing products (such as thermometers, sphygmomanometers and fluorescent lamps) are broken.

Ensure that all waste containers which hold mercury are stored in a ventilated cupboard whilst in use. Mercury-containing waste must always be segregated from other chemical waste streams.

### Broken thermometers and similar

In the event of a broken thermometer, or other mercury-containing item, you must take suitable precautions. Mercury spill kits and collectors are available from many suppliers.

- The room should be vacated and ventilated for at least 15 minutes.
- Wear a face fit tested half mask respirator with mercury filters, disposable coverall and nitrile gloves.
- Do not use a vacuum cleaner, but rather clean up using light strokes with a brush aiming to avoid creating and inhaling airborne dust. Disposable gloves should be worn and all particles, the brush and glass fragments placed in a suitable container.
- Wipe the area with a damp cloth, then add that to the container, as well as the disposable coverall and seal it.
- Only remove the half mask respirator once container is sealed.
- Mercury is hazardous waste therefore the container should not be disposed of in the general waste bin.

Always ensure the waste container is clearly labelled as containing mercury waste.



# 10. Electrical waste

## 10.1 Electrical waste

If you wish to dispose of any equipment, whether functional or not, please first contact a Technical Services Manager so that the equipment may be disposed of correctly. The department is obliged to keep a written record of all equipment disposals.

<https://www.essex.ac.uk/staff/equipment-safety/electrical-safety>

You must dispose of surplus electrical equipment in an environmentally friendly manner and in accordance with consumer protection requirements.

A flowchart provides an overview of how to dispose of University owned, surplus electrical equipment.

Under the Waste Electrical and Electronic Equipment (WEEE) Regulations 2006, electrical and electronic waste must be disposed of responsibly and recycled where possible. This means that electrical or electronic equipment which cannot be repaired, is uneconomical to repair or is no longer wanted must not be put into landfill via normal waste bins. Equipment covered by these regulations will show a symbol, as shown on the right.

The means of disposal will depend on whether the item was purchased before or after 13 August 2005. See the University's Waste and Recycling Policy for details. The Government provide information on environmental management waste regulations and retailer and distributor responsibilities.

Electrical equipment which is no longer wanted but may be of value to others is subject to strict laws relating to the safety of goods under health and safety, consumer protection and product liability, as well as trading standards.

Electrical equipment, in a safe or defective condition, owned by the University must not be sold or given away free of charge. Printed, verbal or online advertisements for University equipment which is no longer wanted are also not permitted. This is because it is not possible to exclude liability under the Consumer Protection Act 1987 by means of any contract term or other provision. This in turn means the seller could be sued if a consumer or other person were injured as a result of defective equipment. Examples include unwanted computer or audio visual equipment, kitchen or workshop equipment.

Electrical equipment must either be responsibly disposed of according to WEEE Regulations or formally donated by the University to a registered charity. That organisation would then be legally responsible for the re-sale or use of donated equipment.



## 11. Mixed Waste

'Mixed' waste is defined as a form of waste that falls into two different waste streams. Examples include microbiological cultures with chemical contaminants, GM material with radioisotope contamination etc. Another type of 'mixed' waste is where the waste covers two or more different packing groups for chemical waste (see Appendix 3).

These wastes are especially troublesome to dispose of as they don't fit the pre-defined waste categories. Therefore, if you have any plans to produce such waste it's essential to plan the disposal route BEFORE you create the waste. Please bear in mind that it is entirely possible to create waste that we cannot dispose of through normal routes, so disposal would incur a large expense.

## Appendix 1:

These are the current list of hazardous chemical waste streams. This is a useful guide as to whether you should be storing wastes separately (see Section 11) and whether you are producing 'mixed' waste or not.

CODE	DESCRIPTION
A	SOLVENTS (incl. Vials in small quantities)
A1	SOLVENT VIALS/SMALL <25ML (large quantities)
B	INORGANIC ACIDIC LIQUIDS - NOT CONCENTRATED
C	INORGANIC ALKALI LIQUIDS
D	INORGANIC TOXIC, CORROSIVE SOLIDS
E	ORGANIC TOXIC, CORROSIVE SOLIDS (incl. Pesticides, POMs, etc)
F	MERCURY/RELATED ITEMS
G	PROBLEM ITEMS (iodine solvents, conc. acids, stench etc.)
H1	AEROSOLS
H2	FOAM AEROSOLS
I	AMMONIA SOLUTION
K	ORGANIC ACIDS
L	ORGANIC ALKALIS
N	INORGANIC CYANIDES
P	OXIDISING CORROSIVE SOLIDS
R	OXIDISING CORROSIVE LIQUIDS
RB	OXIDISING CORROSIVE LIQUIDS
T	INORGANIC ALKALI SOLIDS
X	MINERAL OILS
Y	HYPOCHLORITE SOLUTION
Z	PAINT/INKS IN TINS
AA	LOW HAZ DRY CELL BATTERIES
AB2	NI-CAD BATTERIES WET
AD	LEAD ACID BATTERIES
AF	LITHIUM BATTERIES
AI	WATER REACTIVE METALLIC SUBSTANCES
AJ	INORGANIC FLAMMABLE SOLIDS
AK	ORGANIC FLAMMABLE SOLIDS
AM	PICRIC ACID
AN	ORGANOMETALLIC, PYROPHORIC, WATER-REACTIVE
AP	SODIUM DITHIONITE
AR	INORGANIC PEROXIDES
AS	LIQUID ORGANIC PEROXIDES
AT	SOLID ORGANIC PEROXIDES
AU	COD VIALS
AV	PHOSPHORUS - WHITE/YELLOW
AW	NITRIC ACID
AZ	HYDROFLUORIC ACID

BA	COMPRESSED GAS, FLAMMABLE (small cartridges, lecture bottles etc.)
BB	COMPRESSED GAS (small cartridges, lecture bottles, etc.)
BC	COMPRESSED GAS, TOXIC (small cartridges, lecture bottles, etc.)
BH	SOLID PESTICIDES
BI	RESINS/ADHESIVES (INCLUDING ISOCYANATES)
BJ	EMPTY CONTAINERS
BK	AMMONIUM POLYSULPHIDE
BM	MEDICINES
BMC	CONTROLLED DRUGS
BP	WATER-BASED PAINTS
BR	ASBESTOS
BT	DICHLOROISOCYANURATES