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A. NEW TOOLS

A.1. LEAFLET ABOUT THE MANAGEMENT OF SPECIAL WASTE AT FSB

The main goal of this project has been the creation of a new leaflet, written in English and in French, which collect all the information corresponding to the correct way to manage special waste generated in the FSB laboratories. It does specify the best way to package and label each type of waste.

Below there is the English version of the leaflet:

SCHOOL OF BASIC SCIENCES
OCCUPATIONAL HEALTH AND SAFETY

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Collection « What should I know? »

Leaflet about the management of special waste at FSB

Do you know how to manage your waste safely ?

By: Helena Rigol Etter

ETSEIB

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INTRODUCTION

According to Swiss law, any company providing hazardous waste is considered as a *Remitting Company* and is subjected to well-defined rules.

This manual describes the rules to follow for a safe waste and material disposal while respecting the environment. According to its contents, waste is classified as:

- **chemical,**
- **biological and/ or**
- **radioactive waste**

This manual does not deal with human material elimination nor laboratory animal disposal.

The different steps for this waste management are:

Sorting → Packaging → Labelling → Storage → Transport → Elimination

Our **chemical** waste is assigned to companies specialized in treatment and recycling of special waste. Cridec SA from Eclépens takes care of most of them.

Our **biological** waste is usually neutralized (made harmless) on site and treated as conventional waste. Some categories of biological waste follow the same process as special wastes.

Our **radioactive** waste is either neutralized on site (short decay time) or handed out to the Paul Scherrer Institute (PSI) in Villigen, the Swiss center for retreatment of this kind of wastes.

Wastes containing chemical products or biological material are regulated by the Law on environment protection (LPE, ref. 814.01) and, more precisely, the Ordinance on the movement of wastes (OMoD, ref. 814.610). Every waste concerned by the OMoD is tagged with a six digits identification code listed in the DETEC Ordinance concerning lists of wastes' movements (LMoD ref. 814.610.1). Treatment of biological waste is described in the Ordinance on the contained use of organisms (OUC, ref. 814.912).

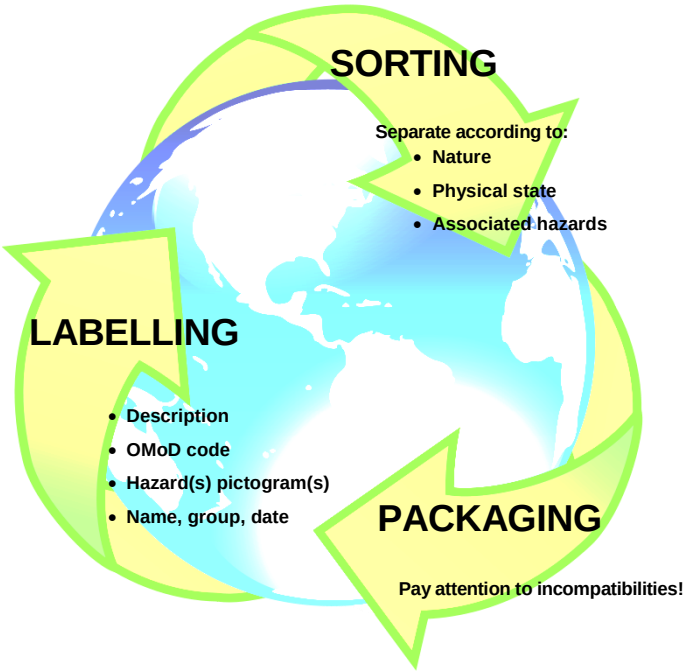
Wastes containing radioactive sources are regulated by the Law on Radiaological Protection (LRaP, ref. 814.50) and its ordinance (ORaP, ref. 814.501).

The principles to follow start with sorting out at the source so that the waste is assigned as early as possible. To the possible extent, substances have to be kept in their original packaging. The container must be adapted in terms of size and material to avoid incompatibilities. It is forbidden to use glass containers unless they are the original packaging or if there is an incompatibility issue. Waste must be properly and neatly labeled, and then brought to the respective storage areas. **Chemical incompatibilities must be respected**. **All biological wastes are deactivated** either by chemical deactivation or by autoclaving. These principles are developed below.

FSB RULES

In Switzerland, the producer is responsible for his wastes until the end of the recycling process or destruction. He is not authorized to dilute them before elimination unless for safety reasons. At the School of Basis Sciences (FSB), chemical **stores make available the required material for proper waste packaging**. For security reasons, auto-reactive or unstable waste must be neutralized, deactivated in the laboratory where they were produced. Only after that they can be brought to the stores. The latter collect the wastes and are the only ones authorized to hand them over to external companies.

The waste producer is responsible and avoids mixing different wastes. He sorts them out according to their physico-chemical properties and toxicity as described by OMoD. The chart « **Management of special wastes at the FSB** » can be helpful to classify the different categories of special wastes. Thanks to simple questions the user quickly finds the correct OMoD code and the description to report on the label. The latter will be illustrated in this leaflet. This chart is available at http://sb-sst.epfl.ch/waste-disposal/.



Each unit organizes its own disposal process according to safety rules concerning the substances. The user determines which categories of waste are expected and gets adapted containers from the chemical stores.

Every waste must be tagged with a label indicating:

- **the content**
- **the OMoD code***
- **the hazard(s) pictogram(s)**
- **the name of the producer**
- **the group to which it belongs**
- **the date of the waste's creation**

The safety delegate of the unit is responsible for checking that the rules are carefully respected. **Every special waste must be eliminated no later than 2 months after its production**. Material contaminated by either chemicals or biologics is also considered as special waste.

* Obtained from the chart « Management of special waste at the FSB »

1) Packaging :

To secure the packaging, this latter must comply with the following indications:

- In order to obtain the adapted conditioning a distinction has to be made between **special waste** (chemical, biological, radioactive) and **contaminated material waste**. Solids must also be distinguished from liquids.
- **Only waste containers provided by the stores will be accepted**.
- Containers must be made of **materials which are chemically and mechanically resistant** to the waste **and with size adapted to the disposal stream** (two months maximum).
- The following color code shall be respected:

Green bottles for special waste

White can for aqueous solutions or containing acetonitrile

Blue can for halogenated solvents

Yellow can for non-halogenated solvents

- These containers should be **filled up to 80% maximum** to avoid splashing, spilling and overpressure.
- **Reuse of used containers for waste is prohibited** except for organic solvents which will be poured into recovery containers.
- **Each unit's individual wastes will not be mixed**. They will remain in their original container.
- Unless specific recommendation, liquids must be poured into plastic containers which are sealed with a **secured cap** (that is to say, equipped with a pressure relief valve).

Security cap

<u>The use of glass containers in prohibited</u> unless the liquid waste to be removed is still in its original glass container, or if there is an incompatibility issue. This can be the case of strong acids such as nitric acid or sulfuric acid at high concentrations (> 60%).
<u>It is forbidden to use food packaging</u> whatever the substance, waste or not.

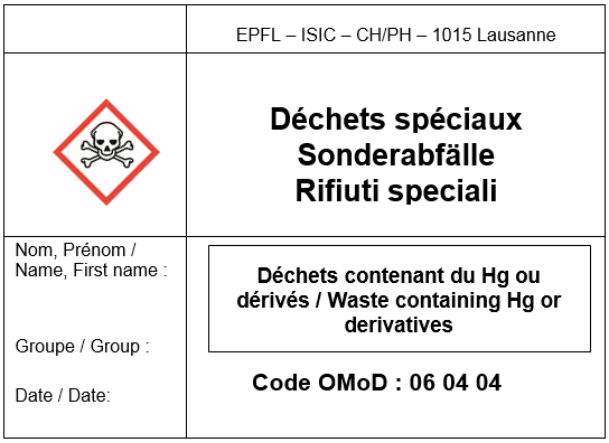
2) Labelling :

Each waste must be identified by the producer with a label indicating:

- **the content**
- **the OMoD code***
- **the hazard(s) pictogram(s)**
- **the name of the producer**
- **the group to which it belongs**
- **the date of the waste's creation**

Ideally, the appropriate container will be prepared in advance with its label. Blank or pre-filled labels are available at the stores. By default, **each label must contain at least one hazard pictogram**. The chart of waste management* gives the indications related to the description and the OMoD code to write on the label. To avoid misinterpretation, it is forbidden to write acronyms on labels. It is only after that that the container can be transported to the chemical store.

At the CH/ PH store labels are exposed in a display. At the BCH store, they are in folders.



	EPFL – ISIC – CH/PH – 1015 Lausanne
	Déchets spéciaux **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchets contenant du Hg ou dérivés / Waste containing Hg or derivatives** **Code OMoD : 06 04 04**

Labels available in CH/ PH store and pre-filled sample label

* Obtained from the chart « Management of special waste at the FSB »

3) Storage :

In the laboratories and in the stores, **cans with liquid waste must be stored in retention trays** (even if they are in fridges or freezers).

Closed cans in retention trays in a ventilated place

All organic solvents must be put in ventilated places and kept tightly closed to prevent evaporation of volatiles. In particular, flammable waste must be put in ventilated and fireproof cabinets, and toxic waste in ventilated and locked cabinets.

Ventilated and fireproof cabinet

Pending the collection of waste, it is essential to respect the safety requirements by identifying the containers, respecting the place where they have to be stored and assessing the potential risks. In all cases, you must **consider possible storage incompatibilities between products and ensure that the containers are compatible with the contents**. This is also essential for safe transportation of the waste until its final destruction step.

4) Transport :

When transporting waste from the laboratory to the corresponding store, make sure to do so in a completely safe manner. In fact, the risks of carrying not well-sealed bottles, tripping or unexpected door openings are not negligible. That is why, **baskets, buckets or carts** available at the stores must be used for all transports. Those must be returned to their original location after used.

Forbidden transport

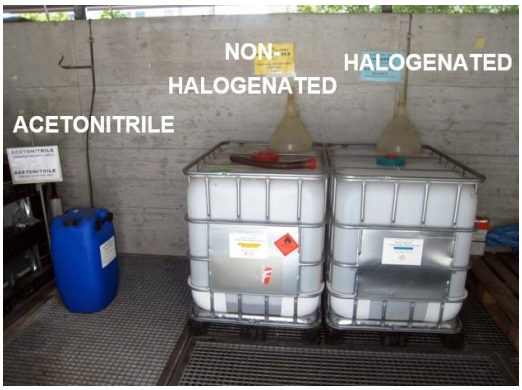
Correct transport

5) Elimination:

At the FSB, all **hazardous waste are managed by chemical stores** (except auto-reactive or unstable waste, which must be deactivated in the laboratory where they were produced) if correctly packaged. Only stores are authorized to deliver hazardous waste to external companies for destruction. CH/ PH buildings' store is in the local G0 CH 494 and Batochime's (BCH) store is in the room BCH 1218.

In laboratories, waste solvents are poured in special containers according to their nature. Once these 80% full, they are brought to the store. Green bottles and white cans are given to the persons in charge. Cans containing organic solvents are emptied in suitable recovery containers. Cans containing acetonitrile solutions with more than 20% of water can be emptied into a blue collection container at BCH 1241:

Collection containers at CH/ PH



Collection containers at BCH 1241 (outside)

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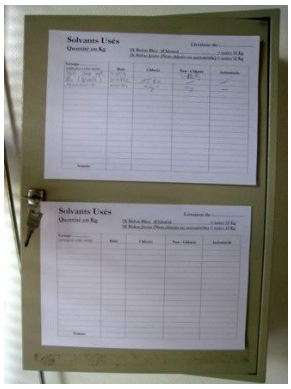
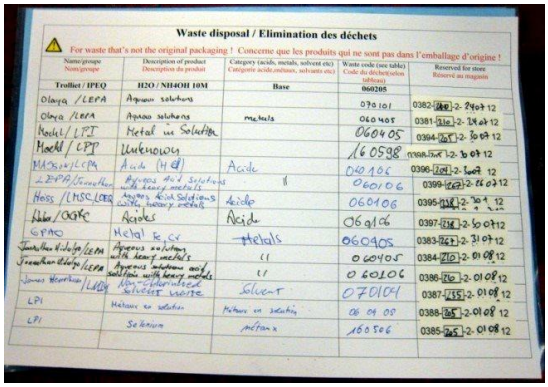
The nature and quantities of waste must be reported in the dedicated solvent sheet at the stores.

Used organic solvents dedicated sheets of the CH/ PH chemical store



Used organic solvents dedicated sheets of the BCH chemical store



Other chemical wastes' dedicated sheets of the CH/ PH store

Waste, other than solvents, being brought to the BCH's store has to be overhanded to the person in charge. The latter will fill the corresponding waste sheet.

It is recommended to bring your waste to the stores one day before its collection (agenda available at: http://sb-sst.epfl.ch/chemical-waste).

INCOMPATIBILITY BETWEEN CHEMICALS

Knowing and understanding incompatibilities between chemicals' hazards is essential for the proper management of chemical substances. This shall be applied for their storage, their use and the waste management.

*

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* Hazardous waste: DO NOT MIX

Storage must allow a secured conservation of the substances, that is to say, **ensuring the product's quality and the protection of the collaborators**. Substances must be stored in closed, ventilated cabinets in order to protect health; moreover, cabinets containing flammable substances must be fire resistant.

Substances must be stored separately according to the risk of reactivity resulting from a possible leak or spillage. Thus liquids are put in retention trays. The reaction between two substances can cause spontaneous combustion, even explosion, or may lead to the creation of new substances particularly hazardous to health.

It is therefore crucial to get as much information as possible before storing chemicals, initiating a chemical reaction or before producing chemical waste. The (material) **Safety Data Sheet (SDS)** is the reference source where this information can be obtained. The main chapters to consider are chapter 2 (hazards), chapter 4, 5, 6 (first aid and emergency measures), chapter 7 (handling and storage), chapter 8 (personal protection) and chapter 10 (stability and reactivity).

Rules for the separation of substances:

							acid	base	
	+	-	-	-	-	-	-	-	-
	-	+	-	-	-	-	-	-	-
	-	-	+	-	O	+	-	-	+
	-	-	-	+	-	-	O	O	O
	-	-	O	-	+	+	-	-	+
	-	-	+	-	+	+	-	-	+
acid	-	-	-	O	-	-	+	-	-
base	-	-	-	O	-	-	-	+	-
	-	-	+	O	+	+	-	-	+

+: can be stored together

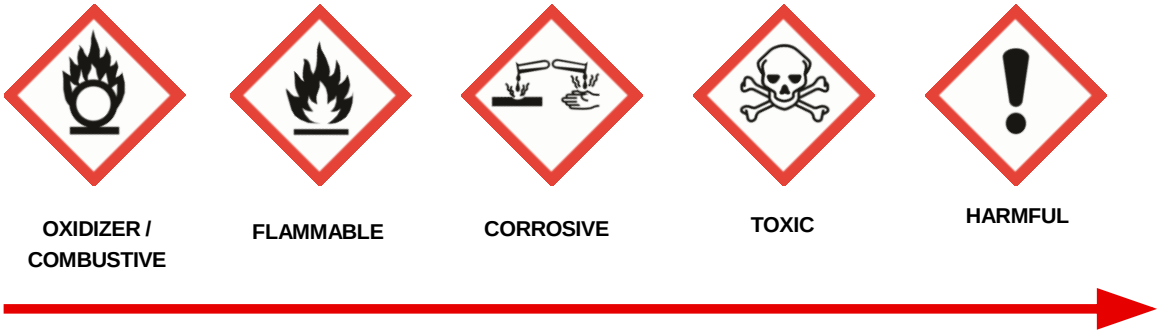
- : must be stored separately

O : can be stored together if certain dispositions are taken (put them in separated retention trays and in a fireproof cabinet)

EXPLANATION / REMARKS:

- ! **Acids and bases** have the same pictogram but **must be stored separately** because they react together (gas emissions, heat…)
- ! **Explosives must be stored apart**. Like that, in case of explosion, they won't spread other hazards.
- ! **Oxidizing or corrosive vapors can attack and weaken packaging**.
- ! Being two of the three elements of the fire triangle, **combustive and flammables must be stored separately** in order to avoid a possible combustion in presence of an ignition source.
- ! **Strong reducers (combustibles) and strong oxidizers (combustives) can react violently**, causing fire, sometimes explosion: two separate storage cupboards are required.
- ! **Do not store toxic products with flammable products** (worsening of the toxic effects in case of fire).
- ! In a shelf**, flasks containing SOLID chemicals are placed above flasks containing LIQUIDS**. In this way, when dropped, liquid flasks will not break and contaminate the solids below.

If a product has **multiple hazard pictograms**, it will be stored according to the following order of precedence:



That is to say, the combustive property of a chemical substance is more important that the flammable property. So if a substance involves both dangers (combustive and flammable) it will have to be stored with the combustive rather than with the flammables. Indeed, combustives facilitate the combustion of flammables.

It is also very important to respect the **compatibility between the packaging's material and the chemical waste** it will contain

CONDITIONING OF THE WASTE

Based on the chart « Management of special waste at FSB » (see chart attached at the end of the leaflet or at http://sb-sst.epfl.ch/safety-manual) packaging of each type of special waste is developed in this section.

First, unknown waste will be considered. Then, radioactive, unstable/ auto-reactive, biological and chemical waste.

UNKNOWN WASTE

In the case of having to manage an unknown waste, you will have to label it and contact as soon as possible the store. The waste will be treated by the store following the advice of the Occupational Health and Safety service (SB-SST).

LABEL:

	EPFL – ISIC – CH/PH - 1015 Lausanne
Ajouter si danger connu / Add if danger known	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchet INCONNU / UNKNOWN waste** - Quantité / Quantity - État visuel / Visual aspects - Donées connues / Known information **Code OMoD : 16 05 98**

Label for unknown waste

RADIOACTIVE WASTE

Radiological Protection Ordinance (ORaP) sets an activity threshold Exemption Limit (EL) for every radionuclide. If the radioactivity is lower than that level, the substance is no longer subjected to this law. Wastes are then treated according to their other characteristics. **The radioprotection expert is the only person authorized to determine if the waste can be eliminated as a non-radioactive substance, or if it should be conserved for a while before elimination, or handed over to the Paul Scherrer Institute (PSI)**.

If waste is in small vials, these ones must not be emptied but put directly into a special waste bucket type « UN » (3rd picture). The use of the original packaging is also permitted.




Examples of containers where to put radioactive waste: transparent can, green bottle, vials in a « UN » type bucket or original packaging

LABEL:

	EPFL – ISIC – CH/PH - 1015 Lausanne
Ajouter selon la dangerosité chimique / Add depending on the chemical hazard	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchet radioactif / Radioactif waste**

Label for radioactive waste

The label will have to be put either in the original container (without covering the original label), or in the new container.

For any question contact first the radioprotection expert of your group. If you need more information, contact Mrs. Valeria Granata.

UNSTABLE / AUTO-REACTIVE WASTE

Any unstable / auto-reactive composition must be deactivated (made inert) in the local of use.

If the composition remains unstable (towards air humidity, atmospheric oxygen and/ or at room temperature) it must be put under an inert atmosphere (argon or nitrogen, eventually in inert oil) and away from light. If the composition is stable at room temperature, it will have to be put into a « UN » type container, filled with general absorbent granules, sealed and labelled. If the composition is not stable at room temperature it must be put in a rigid overpack filled with general absorbent, sealed, labelled and stored in an EX refrigerator or freezer.

Contact the SB-SST for further process of elimination.


White container « UN » type or yellow container « UN » type

LABEL:

	EPFL – ISIC – CH/PH - 1015 Lausanne
Ajouter selon la dangerosité chimique / Add depending on the chemical hazard	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Nom de la substance ou du mélange désactivé / Name of the substance or mixture deactivated** - Quantité / Quantity - État visuel / Visual condition - Dangers conus / Known hazards **Code OMoD : 16 05 06**

Label for deactivated unstable waste

BIOLOGICAL WASTE

The Ordinance on Handling Organisms in Contained Systems (OUC) indicates that the management of biological wastes is organized by the BioSafety Officer (BSO) as part of its program of biological safety. It ensures that the measures are respected, especially for:

-Inactivation and decontamination methods
-Collection and elimination of liquids and solid wastes

At the FSB, Biosafety Level 1 (BSL1) wastes and Biosafety Level 2 (BSL2) wastes are treated and eliminated the same way. If any doubt contact the BSO (Kirstin Friedrich) in order to discuss adapted inactivation and decontamination procedures.

In order to select correct packaging and labelling, **a distinction is made between biological wastes that contain chemical substances, those which do not and the ones containing solids**. In fact, you will have to perform differently in each case:

1) LIQUID BIOLOGICAL WASTE

1-a) DOES NOT CONTAIN CHEMICAL SUBSTANCES

Collect in a plastic container or leave it in the original packaging if it is compatible with the substance. Contact the BSO (depending on the domain of activity and the volume produced: possibility to autoclave or deactivate chemically).

AUTOCLAVING

Collect your solution in a Duran Schott bottle and do not tightly close the bottle during autoclaving. Follow exactly the procedure indicated by the manufacturer. After autoclaving your solution is no longer considered as waste.

Duran Schott bottle for autoclaving

! Never autoclave a biological solution which contains toxic or dangerous chemicals, solvents or bleach (hypochlorite). This could lead to a risk of intoxication, even explosion.

CHEMICAL DEACTIVATION

Collect in a plastic container or leave it in the original packaging if it is compatible with the substance and the solution used to deactivate it.



Examples of containers: nalgene bottle, green bottle or transparent can

Deactivation with a hypochlorite solution (bleach) at 10% maximum (pay attention to incompatibilities).

Depending on the microorganism, you may need a specific deactivation solution. In this case, refer to the document « SV guidelines, management of biomedical waste* ».

After having deactivated it, the waste becomes a chemical waste with the **OMoD code 18 01 02** and must be brought to the chemistry store.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
!	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchet biologique désactivé à l'eau de Javel MAX 10% / Biological waste desactivated with bleach MAX 10%** **Code OMoD : 18 01 02** Indication si cyanures, métaux lourds et/ou autres / Indication if cyanide, heavy metals and/or other.

Label for deactivated biological waste

The label will have to be put either on the original container (without covering the original label), or on the new container.

* See References (page 41)

1-b) CONTAINS CHEMICAL SUBSTANCES

Collect in a plastic container or leave it in the original packaging if it is compatible with the substance and the solution used to deactivate it.

Examples of containers: nalgene bottle, green bottle or transparent can

Deactivation with a hypochlorite solution (bleach) at 10% maximum (attention to incompatibilities). If chemical substances contained in the waste are incompatible with hypochlorite (as it happens with the acids), contact the BSO Kirstin Friedrich.
Depending on the microorganism you use, you may need a specific deactivation solution. In this case, refer to the document « SV guidelines, management of biomedical waste*».

If it contains nanoparticles, waste will be put in a sealed double pack. It can be a heat-sensitive bag or one with a plastic zip lock.

After having deactivated it, it becomes a chemical waste with the **OMoD code 18 01 02** and must be brought to the chemistry store.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
!	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchet biologique désactivé à l'eau de Javel MAX 10% / Biological waste desactivated with bleach MAX 10%** **Code OMoD : 18 01 02** Indication si cyanures, métaux lourds et/ou autres / Indication if cyanide, heavy metals and/or other.

Label for deactivated biological waste

The label will have to be put either on the original container (without covering the original label), or on the new container.

* See References (page 41)

2) SOLID BIOLOGICAL WASTE

Collect in a transparent plastic bag (with indication « biohazard »), close it and autoclave it. Put the autoclaved bag in a second transparent bag to prevent leakage. Finally, put everything in a white bag with red stripes, close it tightly, label and bring it to the CH B0 93.4 local. Once a week (on Fridays) the container is emptied.

If it contains nanoparticles, the initial waste container will be put in a sealed double pack. It can be a heat-sensitive bag or one with a plastic zip lock.


Transparent « biohazard » bag and white with red stripes bag closed hermetically

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
!	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchet biologique solide autoclavé / Autoclaved solid biological waste**

Label for autoclaved solid biological waste

CHEMICAL WASTE

Each unit organizes its own disposal process according to the safety rules of the chemical substances. The user determines which categories of waste are expected and gets suitable recovery containers from the chemical stores. Every waste must be identified by the producer with a label describing the content, its OMoD code (according to the chart « Management of chemical wastes at FSB ») and the associated hazard pictograms. This label must appear duly completed on the container before carrying it to the chemical store.

The safety delegate (CoSec) of the unit is responsible for checking that the rules are carefully respected. **Every special waste must be eliminated no later than 2 months after its production. Material contaminated by chemicals is also considered as special waste**. Its management is described in the second part of the chart entitled « Management of contaminated material ».

1) GAS CHEMICAL WASTE

Bring gas cylinders, sprays or cartridges to the stores.

2) LIQUID CHEMICAL WASTE

2-a) CONTAINS NANOPARTICLES

While respecting incompatibilities, these liquid wastes are placed in bottles for special waste (leave in the original packaging if it is compatible with the waste). The bottle is labelled and sealed with a heat-sensitive plastic double pack. Plastic bags with zip lock can also be used as double pack. The tightly sealed double pack is then labelled.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
Ajouter selon la dangerosité chimique / Add depending on the chemical hazard	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Nanoparticules : déchets liquides / Nanoparticles: liquid waste** **Code OMoD : 16 05 06** Indiquer le nom de la substance ou du mélange et le nom du/des solvants / Enter the name of the substance or mixture and the name of the solvent/s

Label for nanoparticles liquid waste

Green bottle for special waste overpacked tightly and labelled

2-b) CONTAINS CYANIDES >50 mg/kg

If the liquid waste contains more than 50 mg/kg of cyanides it has to be basified in order to obtain a pH>8 solution. Once the solution is stable, it can be poured into a green bottle for special waste.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchets de cyanures basiques / Basic cyanide waste** **Code OMoD : 06 03 11**

Label for basic cyanide waste

Green bottle for special waste

2-c) CONTAINS MERCURY OR MERCURY DERIVATIVES

If the waste contains mercury or mercury derivatives, pour it into a green bottle for special waste.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchets contenant du Hg ou dérivés / Waste containing Hg or derivatives** **Code OMoD : 06 04 04**

Label for waste containing Hg or derivatives

Green bottle for special waste

2-d) CONTAINS > 20% OF WATER

2-d-i) Aqueous solution (without organic solvents)

- **Very acid solution (pH ≤ 3)**

Pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

Keep away from bases and solvents.

White can

LABEL (solution WITHOUT heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Acides pH ≤ 3 / Acids pH ≤ 3** **Code OMoD : 06 01 06** Conserver à l'écart des bases et des solvants / Keep away from bases and solvents

Label for very acid aqueous solutions without heavy metals

LABEL (solution WITH heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Acides pH ≤ 3 avec métaux /** **Acids pH ≤ 3 with metals** **Code OMoD : 06 01 06** Liste des métaux lourds en solution (PAS DE MERCURE) / List of the heavy metals in solution (NO MERCURY) Conserver à l'écart des bases et des solvants / Keep away from bases and solvents

Label for very acid aqueous solutions with heavy metals

- **Very basic solution (pH ≥ 10)**

Pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

Keep away from acids and solvents.

White can

LABEL (solution WITHOUT heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Bases pH ≥ 10 / Bases pH ≥ 10** **Code OMoD : 06 02 05** Conserver à l'écart des acides et des solvants / Keep away from acids and solvents

Label for very basic aqueous solutions without heavy metals

LABEL (solution WITH heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Bases pH ≥ 10 avec métaux/** **Bases pH ≥ 10 with metals** **Code OMoD : 06 02 05** Liste des métaux lourds en solution (PAS DE MERCURE) / List of the heavy metals in solution (NO MERCURY) Conserver à l'écart des acides et des solvants / Keep away from acids and solvents

Label for very basic aqueous solutions containing heavy metals

- **3<pH<10 solution**

Pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

White can

LABEL (solution WITHOUT heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
⚠	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchet aqueux avec ion particulier / Aqueous waste with particular ion** **Code OMoD : 07 01 01**

Label for aqueous waste with a particular ion

LABEL (solution WITH heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
⚠	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Métaux lourds en solution aqueuse / Heavy metals in aqueous solution** **Code OMoD : 06 04 05** Liste des métaux lourds en solution (PAS DE MERCURE) / List of the heavy metals in solution (NO MERCURY)

Label for heavy metals in aqueous solution

2-d-ii) Water + solvents

- **Only water + organics**

Pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**COV aqueux (% teneur en solvant) / Aqueous COV (% solvent content)** **Code OMoD : 07 01 04** Liste des métaux lourds en solution (PAS DE MERCURE) / List of the heavy metals in solution (NO MERCURY)

Label for aqueous COV

- **Very acid solution (pH ≤ 3)**

Pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

Keep away from bases and solvents.

White can

LABEL (solution WITHOUT heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Acides pH ≤ 3 + organique / Acids pH ≤ 3 + organic** **Code OMoD : 06 01 06** Conserver à l'écart des bases et des solvants / Keep away from bases and solvents

Label for very acid aqueous solutions with organics and without heavy metals

LABEL (solution WITH heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Acides pH ≤ 3 + organique + métaux / Acids pH ≤ 3 + organic + metals** **Code OMoD : 06 01 06** Liste des métaux lourds en solution (PAS DE MERCURE) / List of the heavy metals in solution (NO MERCURY) Conserver à l'écart des bases et des solvants / Keep away from bases and solvents

Label for very acid aqueous solutions containing organics and containing heavy metals

- **Very basic solution (pH ≥ 10)**

Pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

Keep away from acids and solvents.

White can

LABEL (solution WITHOUT heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Bases pH ≥ 10 + organique /** **Bases pH ≥ 10 + organic** **Code OMoD : 06 02 05** Conserver à l'écart des acides et des solvants / Keep away from acids and solvents

Label for very basic aqueous solutions with organics but without heavy metals

LABEL (solution WITH heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Bases pH ≥ 10 + organique + métaux** **/ Bases pH ≥ 10 + organic + metals** **Code OMoD : 06 02 05** Liste des métaux lourds en solution (PAS DE MERCURE) / List of the heavy metals in solution (NO MERCURY) Conserver à l'écart des acides et des solvants / Keep away from acids and solvents

Label for very basic aqueous solutions containing organics and containing heavy metals

- **3<pH<10 solution**

Pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

White can

LABEL (solution WITHOUT heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	Déchets spéciaux **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Eau avec ion particulier + organique / Water with particular ion + organic** **Code OMoD : 07 01 04**

Label for water with particular ion and organics

LABEL (solution WITH heavy metals):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	Déchets spéciaux **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchet aqueux de métaux lourds + organique / Aqueous waste with heavy metals + organic** **Code OMoD : 06 04 05** Liste des métaux lourds en solution (PAS DE MERCURE) / List of the heavy metals in solution (NO MERCURY)

Label for aqueous waste with heavy metals and organics

2-e) CONTAINS ≤ 20% OF WATER

2-e-i) Used oil waste

Pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

White can

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Huiles de vidange / Oil waste** **Code OMoD : 13 02 08**

Label of oil waste

2-e-ii) VOC waste of halogenated solvents

Pour it in a blue can and keep under ventilated atmosphere.

The label must indicate if it contains polychlorinated polyaromatics (PCB).

Blue can for waste of halogenated solvents

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Solvants halogénés / Halogenated solvents** **Code OMoD : 07 01 03** Indiquer si contient des PCB / Indicate whether containing PCBs Conserver sous atmosphère bien ventilée / Keep under ventilated atmosphere

Label for halogenated solvents

2-e-iii) VOC waste with non-halogenated solvents

Pour it in a yellow can and keep under ventilated atmosphere.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Solvants non-halogénés / Non-halogenated solvents** **Code OMoD : 07 01 04** Conserver sous atmosphère bien ventilée / Keep under ventilated atmosphere

Label for non-halogenated solvents

Yellow can for waste of non-halogenated solvents

2-f) PAINT WASTE

If the waste is still in its original packaging with its lid, it can be left in it. If it is not, pour it in a white can or another compatible container and adapted to the volume of waste (reminder: elimination at least every 2 months).

Keep under ventilated atmosphere.

White can

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchets de peinture / Paint waste** **Code OMoD : 08 01 11** Conserver sous atmosphère bien ventilée / Keep under ventilated atmosphere

Label for paint waste

The label will have to be put either in the original container (without covering the original label), or in the new container.

3) SOLID CHEMICAL WASTE

It is important to distinguish sharp and/ or peaked items from the others. Indeed, they must be put into rigid containers to avoid piercing plastic bags.

3-a) CONTAINS NANOPARTICLES

In order to avoid their inhalation, it is strongly recommended to generate suspensions of waste nanoparticles.

If this isn't possible, put in a bottle or in a bucket adapted to the volume of waste (leave it in the original packaging if it is compatible with the waste), label the bottle and seal it with a heat-sensitive plastic double pack. Plastic bags with zip lock are also accepted. Label as well the sealed plastic packaging as described for the liquid nanoparticles (see paragraph 2-a).

Bottles and « UN » type white bucket for solid waste

LABEL (for solid waste):

	EPFL – ISIC – CH/PH – 1015 Lausanne
Ajouter selon la dangerosité chimique / Add depending on the chemical hazard	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Nanoparticules : déchets solides / Nanoparticles: solid waste** **Code OMoD : 16 05 06** Indiquer le nom de la substance ou du mélange / Enter the name of the substance or mixture

Label for nanoparticles solid waste

LABEL (for contaminated material):

	EPFL – ISIC – CH/PH – 1015 Lausanne
Ajouter selon la dangerosité chimique / Add depending on the chemical hazard	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Matériel contaminé avec des nanoparticules / Material contaminated with nanoparticles** **Code OMoD : 15 01 10**

Label for material contaminated with nanoparticles

3-b) CONTAINS MERCURY OR MERCURY DERIVATIVES

Put in a bottle or in a bucket adapted to the volume of waste (leave it in the original packaging if it is compatible with the waste). In the case of contaminated material, sharp/ peaked items shall be put into rigid containers.

LABEL (for solid waste):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchets contenant du Hg ou dérivés / Waste containing Hg or derivatives** **Code OMoD : 06 04 04**

Label for solid waste containing Hg or derivatives

LABEL (for contaminated material):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Materiel contaminé avec Hg ou dérivés / Material contaminated with Hg or derivatives** **Code OMoD : 06 04 04**

Label for material contaminated with Hg or derivatives

If the original container is used, the new label must be placed next to the original label without cover it.

3-c) USED SILICA

Put the powder and/ or Thin Layer Chromatography (TLC) plates in a bottle or a bucket adapted to the volume of waste.

Keep under ventilated atmosphere.

Bottles and « UN » type white bucket for solid waste

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Silice usagée / Silica waste** **Code OMoD : 16 03 03** Conserver sous atmosphère bien ventilée / Keep under ventilated atmosphere

Label for used silica waste

3-d) SOLID SUBSTANCE INSIDE A CARTRIDGE

Put in a rigid container while respecting the incompatibilities.

The label will specify the content and the **OMoD code 16 05 06**.

3-e) PAINT WASTE

The waste can be put into a plastic bag if there is no risk to break it. Otherwise, put it in a rigid container.

Keep under ventilated atmosphere.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchets de peinture / Paint waste** **Code OMoD : 08 01 11** Conserver sous atmosphère bien ventilée / Keep under ventilated atmosphere

Labelling of paint waste

If the original container is used, the new label must be placed next to the original label without cover it.

3-f) NON-CONTAMINATED GLASSWARE

Glass flasks which contained solvents are recycled as clean glassware by throwing them in containers for glass recycling after:

- Being totally emptied
- Rinsed with water
- Tagged as « Washed glassware » with a label that hides the original one. This label is available at the stores

Washed and labelled glassware put into ordinary container for glass recycling

LABEL:

	EPFL – ISIC – 1015 Lausanne
	VERRE USAGÉ lavé et nettoyé / Washed and cleaned GLASSWARE
	Pour recyclage / For recycling

Label for non-contaminated glassware

When the above treatment can not be easily applied, the bottle is eliminated following the process for the soiled (contaminated) glassware:

3-g) CONTAMINATED GLASSWARE

Glassware soiled with chemicals must be collected in a « UN » type yellow bucket. This one must be taken to the store labelled and sealed.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux Sonderabfälle Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**VERRE souillé uniquement / Soiled GLASS only** **Code OMoD : 15 01 10**

Label for contaminated glassware

« UN » type yellow bucket

3-h) USED SYRINGE AND NEEDLE

It is forbidden to recap the needles. Needles and syringes should be placed in the buckets for needles and syringes. They are available at the stores.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	Déchets spéciaux **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Seringues et aiguilles souillées /** **Used syringes and needles** **Code OMoD : 18 01 01**

Label for used syringes and needles

Buckets for needles and syringes

3-i) CONTAMINATED ABSORBENT

Once the absorption is finished, put the soiled granules, wipes, gloves or other soiled objects in a « UN » type white bucket, seal it, label it, and bring it to the store.

LABEL:

	EPFL – ISIC – CH/PH – 1015 Lausanne
	Déchets spéciaux **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Absorbant contaminé avec « nom du produit absorbé » /** **Contaminated absorbent with « name of the absorbed product »** **Code OMoD : 15 02 02** Conserver sous atmosphère bien ventilée / Keep under ventilated atmosphere

Label for waste absorbent

« UN » type white bucket

3-j) MATERIAL CONTAMINATED WITH ACUTE TOXICS AND/ OR CMR/ STOT

This includes materials contaminated with substances that are highly toxic or carcinogenic, mutagenic and/ or toxic for reproduction (CMR) and/ or having a specific toxicity for target organs (STOT) such as osmium tetroxide, benzene and carcinogenic metals, amongst others.

If they are not sharp nor peaked, put all contaminated materials (gloves, paper and/ or clothes) in a grey plastic bag. Once full, the bag is sealed, labeled and brought to the stores. If it is a sharp/ peaked item, throw it in a rigid container and label it.

Grey bag and bin for contaminated waste

« UN » type bucket for sharp contaminated material

LABEL (material contaminated with acute toxics):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Matériel contaminé avec « nom de la substance » / Material contaminated with « name of the substance »** **Code OMoD : 15 01 10**

Label for material contaminated with acute toxics

LABEL (material contaminated with CMR/ STOT):

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Matériel contaminé avec « nom de la substance » / Material contaminated with « name of the substance »** **Code OMoD : 15 01 10**

Label for material contaminated with CMR/ STOT

CONCLUSION

Special attention and a regular monitoring must be given to the packaging of special waste. One has to ensure the compatibility of waste, the compliance of storage containers (compatible material, adapted volume…). Regardless the colour of the container it is important to clearly identify with labels, visible, readable and explicit markings specifying the different contents and associated hazards.

What should I know?

- ! **Chemical stores will consider of all special waste if they are stable and properly packaged**
- ! **Auto-reactive or unstable waste must be** neutralized (deactivated) or made inert in the local where they were produced
- ! Material contaminated by substances is also considered as special waste
- ! Only waste containers provided by the stores will be accepted
- ! Containers must be made of materials which are chemically and mechanically resistant to the waste and adapted to the volume of waste:
- ! **Every special waste must be eliminated no later than 2 MONTHS after its production**
- ! **Reuse** of used containers is **prohibited** unless for the solvents
- ! Liquids must be placed in plastic cans / flasks that are sealed with a security cap
- ! The use of **glass** containers is **prohibited** unless it is the original container or there is an incompatibility issue
- ! It is also forbidden to use food packaging
- ! The label is mandatory and must precise:
    - the description of the content
    - the OMoD code
    - the hazard(s) pictogram(s)
    - the name of the producer
    - the group to which it belongs
    - the date of the waste's creation
- ! **Cans with liquid waste must be stored in retention trays**
- ! Substances must be stored separately according to the risk of reactivity resulting from a possible leak or spillage

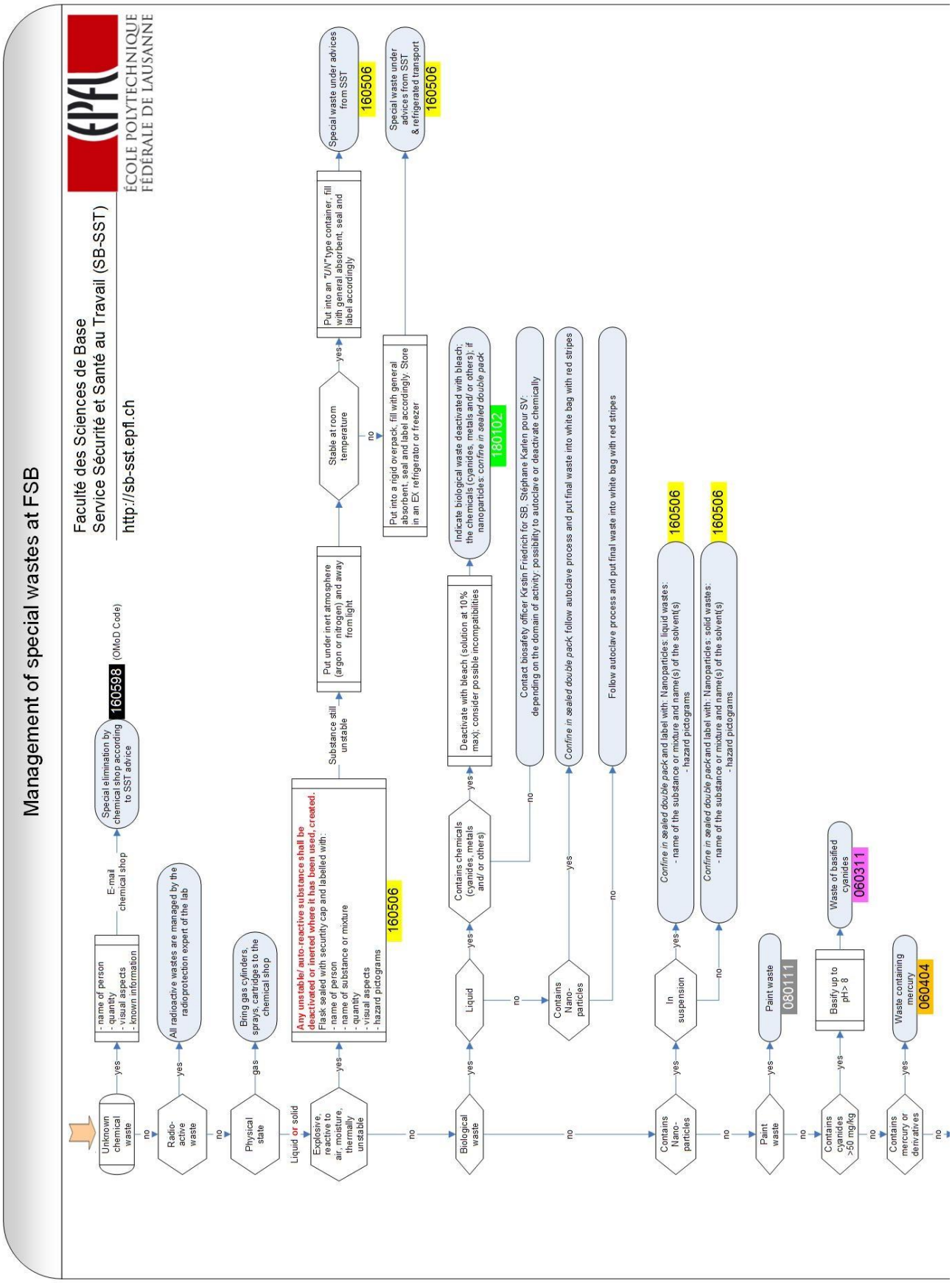
Following these rules will protect yourself, your premises and all persons involved in the disposal process of your waste

REFERENCES ET INDEX

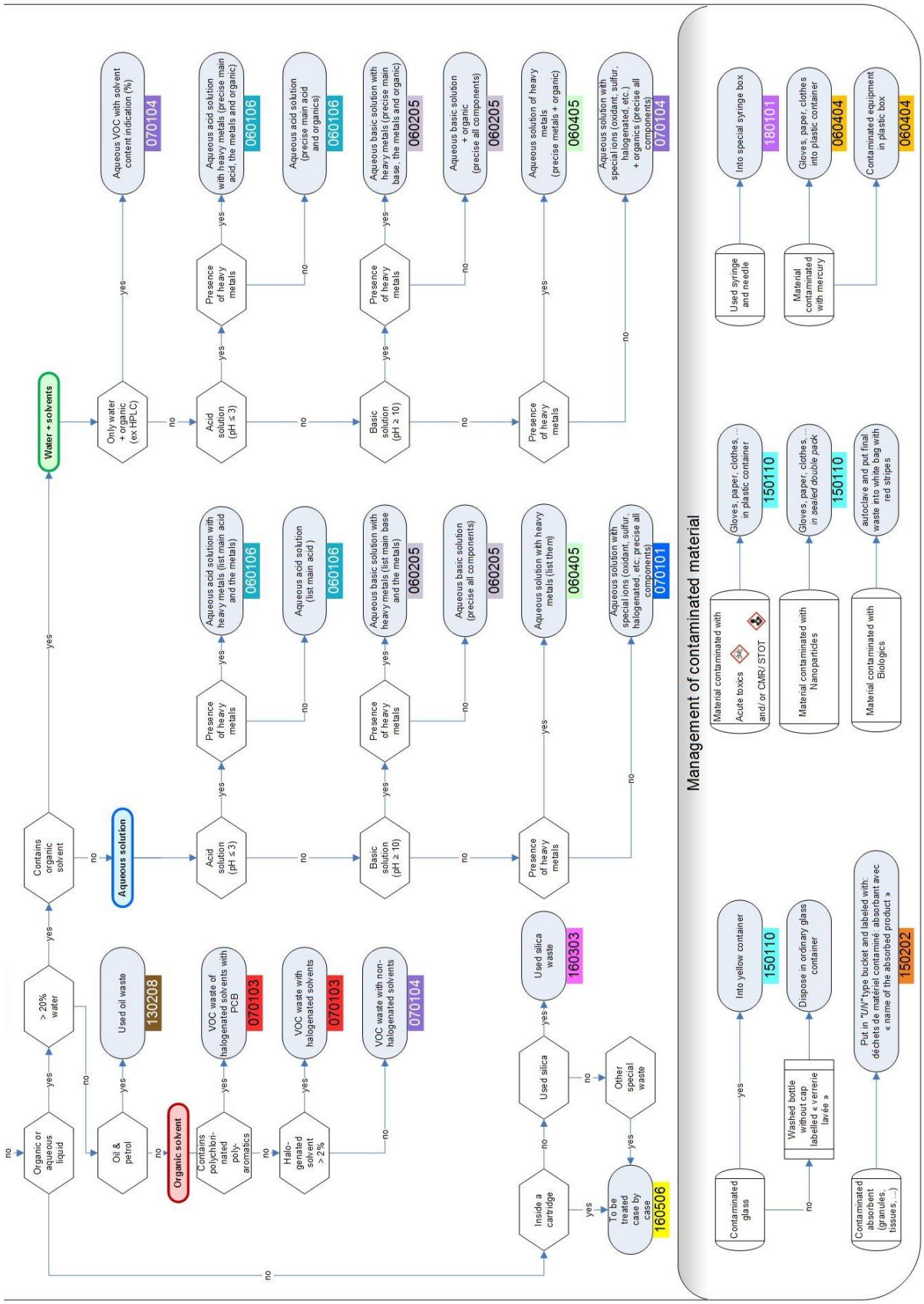
- Safety manual of the SB-SST with FSB rules (http://sb-sst.epfl.ch/safety-manual)
- SV guidelines, management of biomedical waste (http://sv-safety.epfl.ch/)
- Ordinance on the movement of wastes (OMoD) 814.610 (http://www.admin.ch/)

For further information please contact the Occupational Health and Safety service of the School of Basic Sciences (SB-SST http://sb-sst.epfl.ch/).

Waste						OMoD code	Page
UNKNOWN						16 05 98	14
RADIOACTIVE							15
UNSTABLE / AUTO-REACTIVE						16 05 06	16
BIOLOGICAL	LIQUID	without chemical products					17
		with chemical products				18 01 02	19
	SOLID						20
CHEMICAL	GAZ						21
	LIQUID	contains nanoparticles				16 05 06	21
		contains cyanides > 50 mg/kg				06 03 11	22
		contains mercury or mercury derivatives				06 04 04	22
		contains > 20% of water	aqueous solution (without solvents)	very acid solution (pH ≤ 3)	without heavy metals	06 01 06	23
					with heavy metals	06 01 06	23
				very basic solution (pH ≥ 10)	without heavy metals	06 02 05	24
					with heavy metals	06 02 05	24
				3 < pH < 10 solution	without heavy metals	07 01 01	25
					with heavy metals	06 04 05	25
			water + solvents	only water + organics (ex. HPLC)		07 01 04	26
				very basic solution (pH ≤ 3)	without heavy metals	06 01 06	26
					with heavy metals	06 01 06	26
				very basic solution (pH ≥ 10)	without heavy metals	06 02 05	28
					with heavy metals	06 02 05	28
				3 < pH < 10 solution	without heavy metals	07 01 04	29
					with heavy metals	06 04 05	29
		contains ≤ 20% of water	used oil waste			13 02 08	30
			VOC waste of halogenated solvents			07 01 03	31
			VOC waste of non-halogenated solvents			07 01 04	31
		paint waste				08 01 11	32
	SOLID	contains nanoparticles	special waste			16 05 06	33
			contaminated material			15 01 10	33
		contains mercury or mercury derivatives	special waste			06 04 04	34
			contaminated material			06 04 04	34
		used silica				16 03 03	35
		solid substance inside a cartridge				16 05 06	35
		paint waste				08 01 11	36
		non-contaminated glassware					36
		contaminated glassware				15 01 10	37
		used syringe and needle				18 01 01	38
		contaminated absorbent				15 02 02	38
		material contaminated with acute toxics and/ or CMR/ STOT				15 01 10	39


Management of special wastes at FSB
Faculté des Sciences de Base
Service Sécurité et Santé au Travail (SB-SST)
http://sb-sst.epfl.ch
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
Unknown chemical waste
yes
- name of person
- quantity
- visual aspects
- known information
E-mail chemical shop
Special elimination by chemical shop according to SST advice
160598
(OMoD Code)
no
Radio-active waste
yes
All radioactive wastes are managed by the radioprotection expert of the lab
no
Physical state
gas
Bring gas cylinders, sprays, cartridges to the chemical shop
Liquid or solid
Explosive, reactive to air, moisture, thermally unstable
yes
Any unstable/ auto-reactive substance shall be deactivated or inerted where it has been used, created.
Flask sealed with security cap and labelled with:
- name of person
- name of substance or mixture
- quantity
- visual aspects
- hazard pictograms
160506
Substance still unstable
Put under inert atmosphere (argon or nitrogen) and away from light
Stable at room temperature
yes
Put into an "UN" type container, fill with general absorbent, seal and label accordingly
Special waste under advices from SST
160506
no
Put into a rigid overpack, fill with general absorbent, seal and label accordingly. Store in an EX refrigerator or freezer
Special waste under advices from SST & refrigerated transport
160506
no
Biological waste
yes
Liquid
yes
Contains chemicals (cyanides, metals and/ or others)
yes
Deactivate with bleach (solution at 10% max); consider possible incompatibilities
Indicate biological waste deactivated with bleach; the chemicals (cyanides, metals and/ or others); if nanoparticles: *confine in sealed double pack*
180102
no
Contact biosafety officer Kirstin Friedrich for SB, Stéphane Karlen pour SV; depending on the domain of activity: possibility to autoclave or deactivate chemically
no
Contains Nano-particles
yes
Confine in sealed double pack, follow autoclave process and put final waste into white bag with red stripes
no
Follow autoclave process and put final waste into white bag with red stripes
no
Contains Nano-particles
yes
In suspension
yes
Confine in sealed double pack and label with: Nanoparticles: liquid wastes:
- name of the substance or mixture and name(s) of the solvent(s)
- hazard pictograms
160506
no
Confine in sealed double pack and label with: Nanoparticles: solid wastes:
- name of the substance or mixture and name(s) of the solvent(s)
- hazard pictograms
160506
no
Paint waste
yes
Paint waste
080111
no
Contains cyanides >50 mg/kg
yes
Basify up to pH> 8
Waste of basified cyanides
060311
no
Contains mercury or derivatives
yes
Waste containing mercury
060404
no

ETSEIB


Organic or aqueous liquid
> 20% water
Contains organic solvent
Water + solvents
Aqueous solution
Organic solvent
Oil & petrol
Used oil waste
130208
Contains polychlori-nated poly-aromatics
VOC waste of halogenated solvents with PCB
070103
Halo-genated solvent > 2%
VOC waste with halogenated solvents
070103
VOC waste with non-halogenated solvents
070104
Only water + organic (ex HPLC)
Aqueous VOC with solvent content indication (%)
070104
Acid solution (pH ≤ 3)
Presence of heavy metals
Aqueous acid solution with heavy metals (precise main acid, the metals and organic)
060106
Aqueous acid solution (precise main acid and organics)
060106
Aqueous acid solution with heavy metals (list main acid and the metals)
060106
Aqueous acid solution (list main acid)
060106
Basic solution (pH ≥ 10)
Aqueous basic solution with heavy metals (precise main base , the metals and organic)
060205
Aqueous basic solution + organic (precise all components)
060205
Aqueous basic solution with heavy metals (list main base and the metals)
060205
Aqueous basic solution (precise all components)
060205
Presence of heavy metals
Aqueous solution of heavy metals (precise metals + organic)
060405
Aqueous solution with heavy metals (list them)
060405
Aqueous solution with special ions (oxidant, sulfur, halogenated, etc.) + organics (precise all components)
070104
Aqueous solution with special ions (oxidant, sulfur, halogenated, etc. precise all components)
070101
Used silica
Used silica waste
160303
Inside a cartridge
Other special waste
To be treated case by case
160506
yes
no
Management of contaminated material
Material contaminated with Acute toxics and/ or CMR/ STOT
Material contaminated with Nanoparticles
Material contaminated with Biologics
Gloves, paper, clothes, ... in plastic container
150110
Gloves, paper, clothes, ... in sealed double pack
150110
autoclave and put final waste into white bag with red stripes
Contaminated glass
Into yellow container
150110
Washed bottle without cap labelled « verrerie lavée »
Dispose in ordinary glass container
Contaminated absorbent (granules, tissues, ...)
Put in "UN" type bucket and labeled with: déchets de matériel contaminé: absorbant avec « name of the absorbed product »
150202
Used syringe and needle
Into special syringe box
180101
Material contaminated with mercury
Gloves, paper, clothes into plastic container
060404
Contaminated equipment in plastic box
060404
Sharp/ peaked items shall be put into rigid containers | Containers shall be sealed and labeled when brought to the stores
Respect incompatibilities: a same code does not mean that wastes can be mixed
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Now you do !

A.2. COMPUTER PROGRAM ABOUT THE MANAGEMENT OF SPECIAL WASTE AT FSB

This program has been designed in order to guide the collaborator that has generated waste, through a series of simple questions that are answered with a yes or a no, to all the information relevant to its packaging, labelling and storage. These questions follow the order of the "Management of special wastes at FSB" chart.

The computer program has been designed but is no yet available. However, below there are two examples to illustrate how it works and to show which is the information that can be obtained from it:

EXAMPLE Nº 1: LIQUID BIOLOGICAL WASTE THAT CONTAINS CHEMICAL SUBSTANCES

To start with, the computer program asks some questions in order to determine which type of waste has been generated.

The first question of the program is if the generated waste is a material or not. In this case, the user would answer that it is not:

Then, and following the order of the "Management of special wastes at FSB" chart, the next question that appears is if it is an unknown waste. The answers would be again that it is not:

The program continues asking questions until it determines which the nature of the special waste is:


Radioactive waste ?
YES
NO
Radioactive waste ?
YES
NO
Gas state ?
YES
NO
Gas state ?
YES
NO
Explosive, reactive to air, moisture, thermally unstable ?
YES
NO
Explosive, reactive to air, moisture, thermally unstable ?
YES
NO
Biological waste ?
YES
NO
Biological waste ?
YES
NO
Liquid ?
YES
NO
Liquid ?
YES
NO
Contains chemicals (cyanides, metals and/ or others) ?
YES
NO
Contains chemicals (cyanides, metals and/ or others) ?
YES
NO

Once the nature of the special waste has been identified (in this case, liquid biological waste containing chemical substances) the computer program shows all the information that the collaborator could need to sort and package its waste:

SORTING AND PACKAGING

Collect in a plastic container or leave it in the original packagins if it is compatible with the substance and the solution used to deactivate it.

Deactivation with a hypochlorite solution (bleach) at 10% maximum (attention to incompatibilities). If chemical substances contained in the waste are incompatible with hypochlorite (as it happens with the acids), contact the BSO Kirstin Friedrich. Depending on the microorganism you use, you may need a specific deactivation solution. In this case, refer to the document "SV guidelines, management of biomedical waste".

If it contains nanoparticles, waste will be put in a sealed double pack. It can be a heat-sensitive bag or one with a plastic zip lock.

Examples of containers: nalgene bottle, green bottle or transparent can

Attention !

1. Only waste containers provided by the stores will be accepted
2. Containers must be made of materials which are chemically and mechanically resistant to the waste and adapted to the volume fo waste:
3. Every special waste must be eliminated no later that 2 MONTHS after its production
4. The use of glass containers is prohibited unless it is the original container or there is an incompatibility issue (as it is the case of strong acids such as nitric or sulfuric acid at high concentrartions (>60%))
5. It is also forbiden to use food packaging
6. Liquids must be placed in plastic cans/ flasks that are sealed with a security cap

NEXT

Then, it shows which label has to be used to identify it:

LABELLING

	EPFL – ISIC – CH/PH – 1015 Lausanne
	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Déchet biologique désactivé à l'eau de Javel MAX 10% / Biological waste desactivated with bleach MAX 10%** **Code OMoD : 18 01 02** Indication si cyanures, métaux lourds et/ou autres / Indication if cyanide, heavy metals and/or other.

After having deactivated it, it becomes a chemical waste with the OMoD code 18 01 02 and must be brought to the chemistry store.

The label will have to be put either on the original container (without covering the original label), or on the new container.

NEXT

The next screen gives information about the best way to store it and reminds how important is to take into account the incompatibilities that the waste has before storing it:

STORAGE

Knowing and understanding incompatibilities between chemicals' hazards is essential for the proper management of chemical substances. This shall be applied for their storage, their use and the waste management.

Storage must allow a secured conservation of the substances, that is to say, **ensuring the product's quality and the protection of the collaborators**. Substances must be stored in closed, ventilated cabinets in order to protect health; moreover, cabinets containing flammable substances must be fire resistant.

Substances must be stored separately according to the risk of reactivity resulting from a possible leak or spillage. Thus liquids are put in retention trays. The reaction between two substances can cause spontaneous combustion, even explosion, or may lead to the creation of new substances particularly hazardous to health.

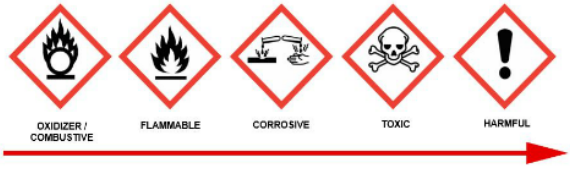
Rules for the separation of substances:

							acid	base	
	+	-	-	-	-	-	-	-	-
	-	+	-	-	-	-	-	-	-
	-	-	+	-	O	+	-	-	+
	-	-	-	+	-	-	O	O	O
	-	-	O	-	+	+	-	-	+
	-	-	+	-	+	+	-	-	+
acid	-	-	-	O	-	-	+	-	-
base	-	-	-	O	-	-	-	+	-
	-	-	+	O	+	+	-	-	+

EXPLANATION/ REMARKS:

! **Acids and bases** have the same pictogram but **must be stored separately** because they react together (gas emissions, heat...).
! **Explosives must be stored apart**. Like that, in case of explosion, they won't spread other hazards.
! **Oxidizing or corrosive vopors can attack and weaken packaging**.
! Being two of the three elements of the fire triangle, **combustive and flammables must be stored separately** in order to avoid a possible combustion in presence of an ignition source.
! **Strong reducers (combustibles) and strong oxidizers (combustives) can react violently**, causing fire, sometimes explosion: two separate storage cupboards are required.
! **Do not store toxic products with flammable products** (worsening of the toxic effects in case of fire).
! In a shelf, **flasks containing SOLID chemicals are placed above flasks containing LIQUIDS**. In this way, when dropped, liquids flasks will not break and contaminate the solids below.

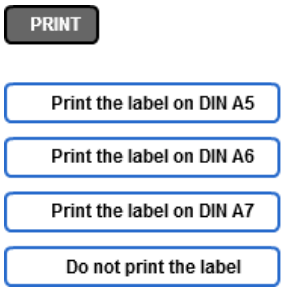
If a product has multiple hazards pictograms, it will be stored according to the following order of precedence:



It is also very important to respect the **compatibility between the packaging's material and the chemical waste** it will contain

NEXT

Finally, the user can print the label in the most suitable size according to the container that has been used to package it:

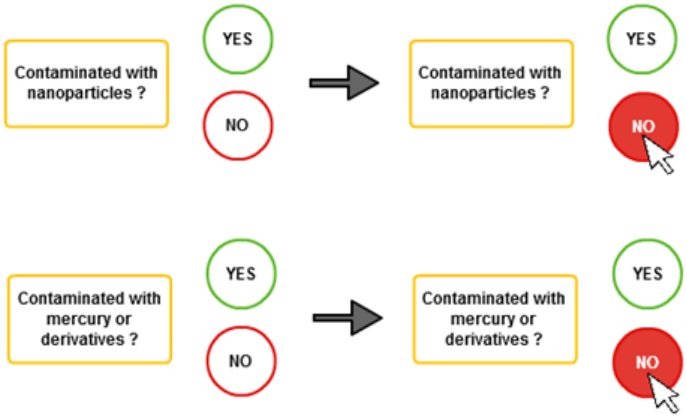


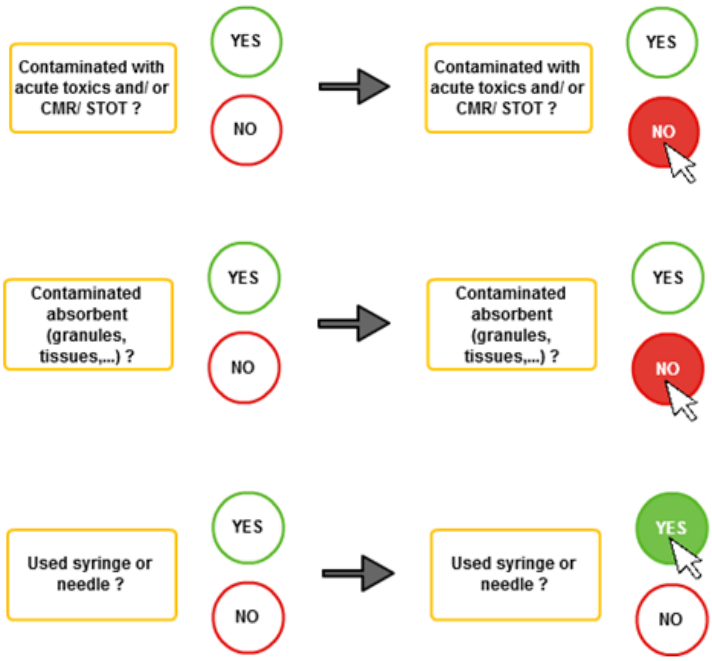
EXAMPLE Nº 2: USED SYRINGE

As explained above, the computer program starts by asking a series of simple questions that are answered with a yes or a no in order to determine which type of waste has been generated.

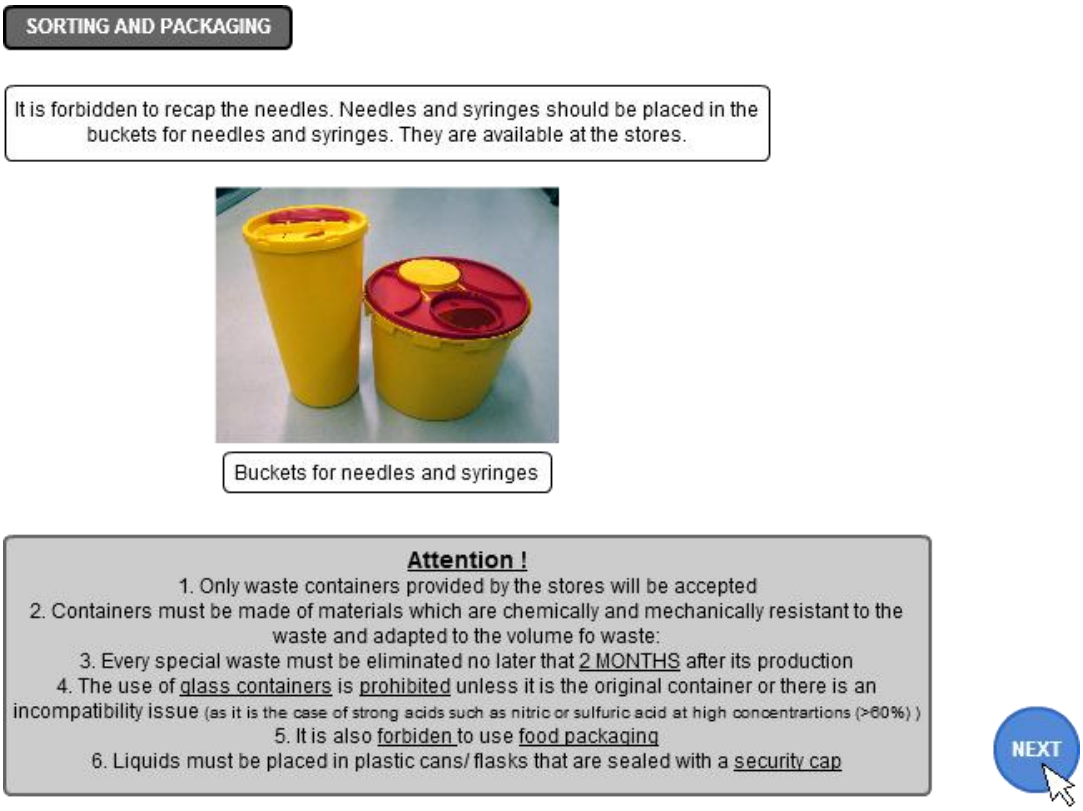
The first question is if the generated waste is a material or not. In this case the user would answer that yes, it is a material, as it is a used syringe.

Then the program continues asking questions until it determines which type of contaminated material has been generated:





As well as it happens in the previous example, once the nature of the special waste has been identified (in this case, a used syringe) the computer program shows all the information that the collaborator could need to sort and package it:



Then, it shows which label has to be used to identify it:

LABELLING

	EPFL – ISIC – CH/PH – 1015 Lausanne
!	**Déchets spéciaux** **Sonderabfälle** **Rifiuti speciali**
Nom, Prénom / Name, First name : Groupe / Group : Date / Date:	**Seringues et aiguilles souillées /** **Used syringes and needles** **Code OMoD : 18 01 01**

NEXT

The next screen gives information about the best way to store it and reminds how important is to take into account the incompatibilities that the waste has before storing it:

STORAGE

Knowing and understanding incompatibilities between chemicals' hazards is essential for the proper management of chemical substances. This shall be applied for their storage, their use and the waste management.

Storage must allow a secured conservation of the substances, that is to say, **ensuring the product's quality and the protection of the collaborators**. Substances must be stored in closed, ventilated cabinets in order to protect health; moreover, cabinets containing flammable substances must be fire resistant.

Substances must be stored separately according to the risk of reactivity resulting from a possible leak or spillage. Thus liquids are put in retention trays. The reaction between two substances can cause spontaneous combustion, even explosion, or may lead to the creation of new substances particularly hazardous to health.

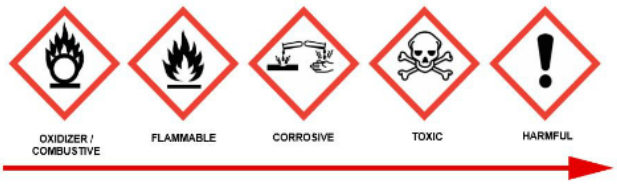
Rules for the separation of substances:

							acid	base	
	+	-	-	-	-	-	-	-	-
	-	+	-	-	-	-	-	-	-
	-	-	+	-	O	+	-	-	+
	-	-	-	+	-	-	O	O	O
	-	-	O	-	+	+	-	-	+
	-	-	+	-	+	+	-	-	+
acid	-	-	-	O	-	-	+	-	-
base	-	-	-	O	-	-	-	+	-
	-	-	+	O	+	+	-	-	+

EXPLANATION/ REMARKS:

! **Acids and bases** have the same pictogram but **must be stored separately** because they react together (gas emissions, heat...).
! **Explosives must be stored apart**. Like that, in case of explosion, they won't spread other hazards.
! **Oxidizing or corrosive vopors can attack and weaken packaging**.
! Being two of the three elements of the fire triangle, **combustive and flammables must be stored separately** in order to avoid a possible combustion in presence of an ignition source.
! **Strong reducers (combustibles) and strong oxidizers (combustives) can react violently**, causing fire, sometimes explosion: two separate storage cupboards are required.
! **Do not store toxic products with flammable products** (worsening of the toxic effects in case of fire).
! In a shelf, **flasks containing SOLID chemicals are placed above flasks containing LIQUIDS**. In this way, when dropped, liquids flasks will not break and contaminate the solids below.

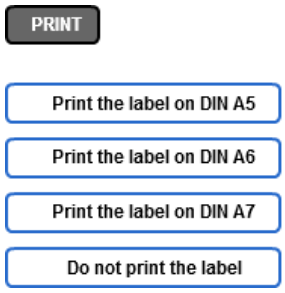
If a product has multiple hazards pictograms, it will be stored according to the following order of precedence:



It is also very important to respect the **compatibility between the packaging's material and the chemical waste** it will contain

NEXT

Finally, the user can print the label in the most suitable size according to the container that has been used:



A.3. DATA CONCERNING THE NATURE AND THE AMOUNT OF SPECIAL WASTE GENERATED AT THE FSB

A.3.1. INFORMATION OBTAINED FROM THE TRACKING DOCUMENTS

Using the tracking documents for the movements of special wastes in Switzerland from the CH/ PH chemical store and the ones from the BCH store, tables representing the amount of each type of waste depending on the different month of the year have been created (Table A.1 and A.2):

Table A.1. Amount of generated waste in CH/ PH laboratories during the year 2012 every month (quantities in kg)

CH/ PH TRACKING DOCUMENTS:		2012												
OMoD code	**Description**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**Median**
60106	Acids	100	100	200		100	200	100	100	100	100	100	40	103,3
60205	Bases	15		50		50	100				50	50	60	31,3
60311	Solid salts and solutions containing cyanides													0,0
60404	Wastes containing mercury													0,0
60405	Wastes containing other heavy metals	10	10	10		10	20		10	10	10	10	20	10,0
70101	Wash water and aqueous mother liquors													0,0
70103	Halogenated organic solvents, wash liquids and mother liquors (chlorine content> 2%)		30			30				30	30		70	15,8
70104	Other organic solvents, wash liquids and mother liquors	200	400	200		200	400		200	200	200	200	200	200,0
80111	Paint and varnish waste containing organic solvents or other hazardous substances													0,0
130208	Other engine, gearbox and lubricating oils (including mixtures of mineral oils)			80			20							8,3
150110	Packaging containing residues of substances or of special waste with particularly dangerous properties or contaminated with such substances or special waste	100	100	200		100	100		100	100	100	100	100	91,7
150202	Absorbent soiled by hazardous substances													0,0
160303	Mineral waste containing dangerous substances (ex. silica)			1							1		1	0,3
160598	Chemical waste whose composition in not known							1	1				1	0,3
160506	Laboratory chemicals consisting of or containing dangerous substances, including mixtures of laboratory chemicals (ex. unstable waste, waste containing nanoparticles)	20	40	200		100	200	20	20	20	20	20	50	59,2

180101	Waste presenting a risk of injury (sharp or peaked items)						40				40			6,7
180102	Waste presenting a risk of contamination (for example tissue waste, waste containing blood, secretions or excretions, bags of blood and blood supply) (biological waste)	50							50					8,3

Table A.2. Amount of generated waste in BCH laboratories during the year 2013 every month (quantities in kg)

CH/ PH TRACKING DOCUMENTS:		2013												
OMoD code	**Description**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**Median**
60106	Acids	40	50		50	50	50		50	50	100	30	30	41,7
60205	Bases	60			50	50		50		40		40	40	27,5
60311	Solid salts and solutions containing cyanides	60								60				10,0
60404	Wastes containing mercury													0,0
60405	Wastes containing other heavy metals	20	30		30	30	30	30	30	30	60	30	30	29,2
70101	Wash water and aqueous mother liquors									1				0,1
70103	Halogenated organic solvents, wash liquids and mother liquors (chlorine content> 2%)				60	60		60	60	60	60	60	60	40,0
70104	Other organic solvents, wash liquids and mother liquors		210			210	210	210	210	210	210		210	140,0
80111	Paint and varnish waste containing organic solvents or other hazardous substances											1		0,1
130208	Other engine, gearbox and lubricating oils (including mixtures of mineral oils)				20	20		20						5,0
150110	Packaging containing residues of substances or of special waste with particularly dangerous properties or contaminated with such substances or special waste	100	100		100	100	100	100		200	200		100	91,7
150202	Absorbent soiled by hazardous substances													0,0
160303	Mineral waste containing dangerous substances (ex. silica)						1		20				20	3,4
160598	Chemical waste whose composition in not known													0,0
160506	Laboratory chemicals consisting of or containing dangerous substances, including mixtures of laboratory chemicals (ex. unstable waste, waste containing nanoparticles)				30	30	30	30	70	70	70	50	50	35,8
180101	Waste presenting a risk of injury (sharp or peaked items)							40			40			6,7
180102	Waste presenting a risk of contamination (for example tissue waste, waste containing blood, secretions or excretions, bags of blood and blood supply) (biological waste)		40		40	30	50	20		60	50	20		25,8

DATA ANALYSIS

To start with, it is easy to see that the volume of chemical and biological waste generated in the BCH building is considerably higher. This happens because there is a great amount of laboratories in there, all of them focused on doing biological and chemical research.

On the one hand, in the CH/ PH building, the changes that are more evident between the year 2012 and the year 2013 are:

- The production of acid waste is reduced to half.
- In the year 2012 there is no use of cyanide and in the year 2013 there is.
- The production of waste containing heavy metals increases three times.
- The generation of halogenated solvents more than doubled, and the generation of non-halogenated solvents diminish slightly.
- In 2012 there are three cases of unknown waste and in the 2013 there is none.
- The production of biological waste increases by three.

Such differences show an existing change in the research done in the chemistry and physics departments of the FSB.

On the other hand, in the BCH building it has not been possible to evaluate the evolution of the generated special waste as only data from the year 2013 is conserved. However, comparing the data from the BCH building with the one from the CH/ PH building it can be seen that:

- In the laboratories of the BCH building there is less generation of acid and basic waste.
- However, the production of halogenated and non-halogenated solvents is much higher in the BCH laboratories.
- The use of silica is clearly higher in BCH laboratories (it is mostly used for Thin Layer Chromatographies, TLC).
- There are three cases of unknown waste, and its volume is bigger than the cases of the CH/ PH laboratories.
- The production of biological wastes is clearly higher.

This disparity is clearly due to the different types of experiences that are realized in the laboratories of the BCH building in comparison of the ones done in the laboratories of the CH/ PH building.

A.3.2. INFORMATION OBTAINED FROM THE COSECS OF THE RESEARCH UNITS

The information obtained from the COSECs about the nature and the approximate amount of waste regularly generated in the laboratories of each research group is represented in the Table A.3 below:

Table A.3. Amount of regularly generated waste in some CH, PH and BCH laboratories according to the COSECs

			CH laboratories	PH laboratories		BCH laboratories			
			ISIC - LCPPM	Sect. de Physique (students lab.)	ISIC - LNS, SG1, LPQM	ISIC - LIP	ISIC - LSPN	ISIC - LCS	ISIC – LPPT
BIOLOGICAL WASTE	LIQUID	Without chemical products				30l / month			
		With chemical products	10 l / month				10 l / month		100 l / month
	SOLID					8 bags / month	8 bags / month		16 bags / month
CHEMICAL WASTE	LIQUID	Acids	0,2 l / month				0,1 l / month	1 l / month	
		Bases	0,2 l / month					1 l / month	
		Contains cyanides >50 mg/kg					0,1 l / month		
		Contains mercury or derivatives	1 l / month				0,1 l / month		
		Heavy metals in aqueous solution	1 l / month		1 l / month	0,5 l / month	1 l / month	10 l / month	
		Halogenated solvents	3 kg / month	3 kg / month		20 kg / month	250 kg / month	95 kg / month	20 kg / month
		Non-halogenated solvents	2 kg / month	0,5 kg / month	4 kg / month	25 kg / month	400 kg / month	200 kg / month	45 kg / month
		Used oil		0,5 l / month	8 l / month	1 l / month	2 l / month	3 l / month	
		Contains nanoparticles					1 l / month		
	SOLID	Silica waste	2 kg / month		0,1 kg / month	2 kg / month	80 kg / month	10 kg / month	1 kg / month
		Paint waste			1 aerosol bottles / 2 month				
		Non-contaminated glassware	8 bottles / 2 month		4 bottles / 2 month	240 bottles / 2 month	170 bottles / 2 month	80 bottles / 2 month	40 bottles / 2 month
		Contaminated glassware	2 UN yellow buckets / 6 month	10 UN yellow buckets / 6 month	1 UN yellow bucket / 6 month	2 UN yellow buckets / 6 month	12 UN yellow buckets / 6 month	6 UN yellow buckets / 6 month	6 UN yellow buckets / 6 month
		Used syringes and needles	5 syringes buckets / 6 month		2 syringes buckets / 6 month	25 syringes buckets / 6 month	50 syringes buckets / 6 month	60 syringes buckets / 6 month	1 syringes bucket / 6 month
		Material contaminated with chemicals				1 bag / month	10 bags / month		

DATA ANALYSIS

Despite the limited information that has been collected it can be seen that:

- In the CH laboratory that has been studied the nature of waste is very diverse but the generated amount of each one is small.
- In the PH laboratories only some types of waste are generated, and their volume is small. Wastes produced are principally halogenated and non-halogenated solvents, and contaminated glassware.
- In the BCH laboratories all types of biological waste is generated. In some cases mercury or cyanide waste is also generated. In addition, a great amount of halogenated and non-halogenated wastes are produced, and also a lot of silica waste. Finally there is also a big generation of contaminated glassware and contaminated syringes and needles.

A.3.3. FUTURE WORK

Both in the case of the information obtained through the tracking documents and the one obtained talking to the COSECs of each research group, no decisive conclusions can be taken. The data is not complete neither regular. This is due to the continuous evolution of the research and that some projects finish and others begin constantly.

In the long term, information of all the tracking documents generated from now on should be collected. In addition, concrete information about the generation of special waste in each group should be compiled by the COSECs of the FSB. Then, an analysis of the consistency of all this information over the time should be done.

B. SPECIAL WASTE AND ASSOCIATED HAZARDS

It is vital to know which are the different types of waste **[1]**, as the better they are categorised, the more effective and will be their subsequent treatment (valuation, incineration, etc.). The proper packaging of wastes destine for destruction depends, mostly, on their physicochemical characteristics (in order to avoid possible incompatibilities).

A.1. COMMON WASTE

The concept of common waste includes all those which are household refuse. They are either incinerated or disposed in controlled dumping areas. Common wastes should contain neither chemical, toxic, flammable or reactive substances, nor biologically active products, as this would represent serious dangers both for personnel responsible for their elimination as well as for the environment.

A.2. SPECIAL WASTE

Special wastes are all wastes resulting from industrial or laboratory operations and whose disposal requires special technical and organisational measures due to their composition and physicochemical or biological properties.

The different types of special waste are:

- Radioactive waste
- Biological waste
- Chemical waste

B.2.1. RADIOACTIVE WASTE

Radioactive wastes may take the form of solids, aqueous or organic solutions, etc. Regardless the nature of the radioactivity, risks associated with the physicochemical form of the radioactive waste should not be ignored.

B.2.2. BIOLOGICAL WASTE

All biologically active substances must be neutralized with certainty before packaging or disposal. In the case of microorganisms, destruction may be achieved either by autoclaving or with chemicals.

B.2.3. CHEMICAL WASTE

The producer of the waste must assure that this one is removed under the best possible conditions, taking particular care in packaging them properly and informing the persons responsible for their removal of the risks involved. In relation to its packaging, glass containers should be avoided. The contents have to be precisely identified in order to avoid any possible confusion.

Compressed gas cylinders are subject to the regulations concerning equipment operating under pressure. The proper application of these rules allows avoiding the problems associated with the long-term storage of unused cylinders.

A.3. ASSOCIATED HAZARDS

Most special waste is identified by one or more of the below hazardous properties:

B.3.1. IGNITABILITY

Waste is said to exhibit ingnitability characteristics if:

- It is a liquid other thant an aqueous solution containing cless that 24% alcohol by volume and has a flash point less that 60ºC.
- It is an ignitiable, compressed gas.
- It is an oxidizer.

B.3.2. CORROSIVITY

Waste is said to be corrosive if:

- It is aqueous and has a pH less that or equal to 2 or greater or equal to 12.5.
- It is a liquid that corrodes steel at a rate greater that 6.35mm per year at a tgest temperature of 55ºC.

B.3.3. REACTIVITY

Waste is said to exhibit reactivity characteristics if:

- It is normally unstable and readily undergoes violent change without detonating.
- It reacts violently with water.
- It forms potentially explosive mixtures with water.
- When mixed with water, it generates toxic gases, vapours, or fumes in a quantity sufficient to present a danger to human health or the environment.
- It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

B.3.4. TOXICITY

Waste is said to be toxic if it is harmful or fatal when ingested or absorbed (for example: waste containing mercury, lead, etc.). When toxic wastes are land disposed, contaminated liquid may leach from the waste and pollute ground water.

REFERENCES

[1] FREEMAN, H. *Standard handbook of hazardous waste treatment and disposal.* Michican, McGraw-Hill, 1998, p. 2.4 - 2.5.