

Institute of Chemical Sciences and Engineering
(ISIC)

Section of Chemistry and Chemical
Engineering
(SCGC)



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Rules of Hygiene, Safety and Environment Protection

October 2014

Security units

EPFL: Safety, prevention and health domain (DSPA), <http://securite.epfl.ch/safety-en>

School of Basic Sciences: Occupational Safety and Health Service (SB-SST),
<http://sb-sst.epfl.ch/page-22910-en.html>

Unit (laboratory/service):

The Director of unit is the first responsible for security.

Each laboratory has a safety correspondent (COSEC) who transmits information and directives from the SST and DSPA. The COSEC can be the director or any other member of the laboratory.

In the following document, the term laboratory refers to any place where experimental or practical work is conducted, including annexes (e.g. storage rooms, hallways,...).

1. GENERAL SAFETY CONCEPT

1.1 Objectives

Committed to protect the coworker's health, to limit the risk of accident at a as low as possible level and to contribute to the respect of the environment, the Institute of Chemical Sciences and Engineering (ISIC) and the Section of Chemistry and Chemical Engineering (SCGC) jointly apply the following rules of safety, hygiene and environment protection. At the beginning of their employment, all EPFL coworkers follow an obligatory basic safety training (FOBS).

1.2 Coworkers and buildings attached to ISIC and SCGC

- All members of the teaching, scientific and technical staff, all students, apprentices and academic guests are required to respect the security instructions appearing in the regulations and its appendices.
- The Director of unit can add provisions in appendices concerning internal measures relative to specific dangers related to their laboratories/services. These directives should not be in contradiction with the common regulations.
- When a work is carried out with an organization external to ISIC/SCGC or in rooms which are not attached to it, the collaborator must take note of the local safety requirements before beginning his work and follow them.

2. RESPONSIBILITIES

2.1 Responsibility of the employers

In Switzerland, there are two legislations which deal with safety and health at work: the Law for accident insurance (LAA) and the work Law (LTr). Apart from accident assurance, the LAA regulates the prevention of professional accidents and illnesses (Prescription for the prevention of professional accidents and illnesses (OPA)). The LTr deals with protection of health at work and health prevention.

- The LTr (art. 6) says that:

« In order to protect the health of the workers, the employer has to take all measures which in the past have been shown to be necessary, are allowed by the level of the technique and are adapted to the facilities in the company ».

« The employer requests cooperation of the workers for health protection. The workers have to help the employer to implement them ».

- The obligation Law (CO) stipulates (art. 328, al. 2) that the employer has to warn the employees about the safety rules. However, he is not obliged to advise the coworkers about obvious risks.

- The LAA (art. 82) says that:

“In order to protect the health of the workers, the employer has to take all measures which in the past have been shown to be necessary, are allowed by the level of the technique and are adapted to

the working conditions. The employer requests cooperation of the workers for the prevention of illnesses and accidents. The workers have to help the employer to implement them. They must in particular use safety equipment correctly and should not remove or modify it without authorization of the employer.

- The OPA (art. 3.6 and 8 (partly)) says that:

“The employer is required to take all measures of protection described in the following prescription, in the work regulation applicable to his enterprise, in all professional security rules and in work medicine indications. He has to ensure the efficiency of safety measures and the availability of safety equipment. If infrastructures ... or working procedures are modified in the enterprise, the employer needs to adapt safety equipment and rules.

If safety or health risks cannot be completely eliminated, or can be eliminated only partially, the employer will provide individual protection equipment (EPI)... The employer has to ensure that the equipment is in good state and ready to use.

The employer can give work implying specific dangers only to specially trained workers. Employee working alone need to be checked. When dangerous works are done, the numbers of workers involved and the quantity of material and equipment used should be limited to the minimum.”

2.2 Responsibilities of coworkers

Besides the employer obligations and legal responsibilities, the coworker can also be considered responsible for the occurrence of an accident.

- The LAA (art. 83, al. 3) states that:

“The coworkers have to assist the employer in the implementation of rules and regulations for the prevention of accidents and work-related illnesses. In particular, they must use the individual protective equipment and use properly the safety equipment and are prohibited to remove or modify them without authorization of the employer”.

- The OPA (art. 11) indicates:

”The coworker has to follow the directives of the employer concerning safety at work and observe the generally admitted security rules. In particular, he must use the individual protection equipment make sure that these are used in an efficient way and he should not alter the efficiency of protection installations. When a coworker detects faults that compromise safety at work, he must immediately eliminate them. If he is not able or authorized of doing so, he has to inform the employer without delay. The coworker must not bring himself in a position where his own safety or that of others is in danger. In addition, the consumption of alcohol or other drugs is prohibited

The coworkers have to wear adequate work clothing. Dirty or damaged clothes should be cleaned or repaired if they represent a danger for themselves or other coworkers.

If toxic substances are produced, used, kept, manipulated or stocked, or when coworkers are exposed to health-treating concentrations of compounds, protection measures have to be taken in accordance to the properties of the compounds. If required for security, the coworkers are required to wash or clean themselves in particular before breaks and at the end of the work. The time needed for these operations counts as working time. Consumption products like food, drinks or tobacco should not enter in contact with toxic compounds.”

2.3 To know before starting to work

Each collaborator must be able to answer the following questions:

- Which are the dangers I will be exposed to?
- Where is the emergency exit of the laboratory?
- Where are the safety exits and stairways for evacuation?
- How to reach help and whom to call?
- How to start a fire alarm?
- Where are the emergency locks for natural gas and electricity?
- Where is the firefighting equipment (extinguishers, safety blankets, sand buckets)?
- What to do in case of liquid spill?
- Where are the rinse-eye and the safety shower?
- Where is the first aid material in the unit?
- Which are the laboratories with special detectors and how is the alarm functioning?
- Where are indicated the emergency phone numbers?
- Which fume hoods are equipped with fire detection?
- What to do if I plan an unattended reaction?
- How to find safety information on chemicals?
- Where is the health point of EPFL?

3. SAFETY AT WORKPLACE

3.1 New Coworker

- Each new coworker including interns, students, apprentices, academic hosts must receive detailed instruction on the safety rules and on the specific dangers linked with their own work, the safety areas “zone Ex” (if present) and the procedures.
- Before to be allowed to start to work, he must know how to behave in case of emergency, evacuation, fire, spill, natural gas, flooding, etc.

Building	CH	BCH
Distribution fluids	<ul style="list-style-type: none"> - Compressed air - Gaseous nitrogen - Natural gas - Warm & cold water - Cooling water at 7°C - Industrial water - Vapor 	<ul style="list-style-type: none"> - Compressed air - Gaseous nitrogen - Natural gas - Warm & cold water - Cooling water at 10°C - Deionized water
How to close fluid entrance?	- Learn the dedicated place	<ul style="list-style-type: none"> - Close the connection under the bench or under the fume hood. - The sector entrance can be closed in the technical cupboard, close to the meeting area.
In case of malfunction	phone 3 4000	Technician, phone 97 2480
In case of danger	phone 115 (day & night) / 021 693 3000 (from external phone)	

In case of immediate danger	Push the fire button which transmits the alarm to the firemen
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- The unit Director is responsible for the organization of the instruction and gives the authorization to start to work in the laboratories.

- At the end of the safety introduction, the new coworker confirm by his signature that he is has read, understood and that he will apply all the safety rules presented in this document and the eventual supplementary directives specific to his unit. He also confirms that he will apply future directives given by the security units.

3.2 General working rules

3.2.1 Access to the laboratory

- Only people authorized by the unit Director are allowed to work in the laboratory.
- Students and apprentices are not allowed to work in the laboratory in absence of their supervisor. In addition, apprentices are not allowed to work at night after 6:00 pm and during weekends.

3.2.2 Working alone

- It is forbidden to perform experimental work alone in the laboratory. In all cases, a second person should be able to call for help in case of accident. For some especially dangerous experiments, a second person needs to be close enough to see and hear the person working. The unit director determines for his group which experiments require a close second person.
- If research absolutely requires a person to work alone, the coworker needs to be equipped by a system of protection of the lone worker (alarm) or should be protected by an organizational system of control in discussion with the SST.

3.2.3 Work at the laboratory

- The unit Director and COSEC are responsible to regularly verify that safety rules are respected at workplace. Everybody working in the unit is required to follow the rules.
- The workplace must be kept clean and ordered.
- The sash of the fume hood must be kept closed as soon as work is finished.
- The last person leaving a room must check the laboratory.
- It is forbidden to move common safety equipment (e.g. extinguishers, showers, rinse-eye, fire blanket, pharmacy, absorbent, protection mask) and to block safety exits. It is forbidden to block fire-safe doors in open position.
- If a coworker uses common safety equipment, he had to inform the COSEC of his unit immediately.

3.2.3 Clothes and safety equipment

- Safety goggles and a lab coat have to be worn in the lab with the exception of the office spaces that are clearly separated, and are distributed for free. Wearing a lab coat is forbidden in the cafeteria, in seminar rooms, lecture halls etc. Medical glasses cannot be used as safety goggles and contact lenses

are forbidden. Co-workers with a work contract of more than one year can obtain vision-corrected safety goggles if their activity requires wearing them more than 50% of the time.

- The feet have to be entirely protected up to the ankles. Sandals and other kinds of open shoes are not allowed. The legs have to be completely covered by the clothes (tights are not considered as protection clothes).
- Protection gloves have to be worn if required according to the material safety data sheets of the product. There is no universal glove! Each material has its pros and cons. Appendix 1 provides further information concerning the characteristics of the various types of gloves.
- Gloves should also be worn to protect oneself against burns from heat or cryogenic fluids and against injuries when working with sharp objects.
- In every preparative chemistry lab at least one face shield should be available. In addition, safety shields should also be available.

3.3 Directives for use and management of chemicals

3.3.1 Material safety data sheets

- Material safety data sheets contain information for people using compounds or preparations thereof for professional or commercial uses, so that they can take the required measures for health protection, work safety and environment protection.
- All coworkers must consult the material safety data sheets of commercial products and adapt their work in consequence. In case of doubt, they should consult the unit director.
- Material safety data sheets should be kept easily accessible as long as the compounds are stored or used in the unit.

3.3.2 Acquisition and storage of chemicals

- All chemicals and biological substances ordered by the laboratory should be included in the central database.
- Acquisition of psychotropic substances required an authorization of Swissmedic to the Direction of ISIC (at the name of Dr. Sandrine Gerber). The current authorization includes the following compounds: anthranilic acid, piperidine, piperonal. For any other psychotropic substance, the ISIC direction will need to ask authorization to Swissmedic.
- A unit wanting to use radioactive substances or equipment emitting ionizing radiation needs to have an authorization of the controlling authority (OFSP). The authorization holder has the responsibility for radioprotection.
- The acquisition of substance subjected to authorization must be validated by the SST (list of substance available at <http://sb-sst.epfl.ch/site/sbsst/page-46820-fr.html>).
- The acquisition of compounds listed as chemical weapons according to the "Convention sur les armes chimiques" and the "ordonnance sur le contrôle des produits chimiques" is forbidden.
- All commercial chemicals must be identified in the electronic database. Identification bar codes are placed on the bottles by the chemical store at the time of delivery. Synthetic compounds must be clearly labeled. All labels should be clearly readable.
- The inventory of chemicals in the laboratory must be performed twice a year. At the time of inventory, chemicals which have decomposed, are contained in a damaged bottle (e. g. unreadable

label, damaged or corroded cap, ...) or are not used any more must be disposed according to the rules of special waste management. Compounds older than 5 years have to be disposed, except if they are stable and highly useful for the laboratory in accordance to the unit director.

- Chemicals must be stored in ventilated closets or validated fridges/freezers and placed in secondary containers. Storage must be organized according to compatibility rules (Appendix 2) and safety data sheets.
- Chemical-containing closets/fridges/freezers must have a safety label indicating the hazard categories (Appendix 3).
- Fridges must be kept clean and without corrosion on metallic parts. The Laboratory is not allowed to buy directly a new fridge/freezer but must order it via the chemical shop.
- Freezers must be defrosted as soon as ice formation is occurring.

3.3.3 Transportation of chemicals

- Bottles containing chemicals are placed in bucket or in cart for transportation.
- The content must never be larger than the capacity or size of the container.
- It is forbidden to take a substance outside of the workplace without an authorization of the unit Director.
- The transportation of chemicals must follow the « Ordonnance sur le transport des matières dangereuses ». It is forbidden to take chemicals at home and for any private use.

3.3.4 Use of chemicals

- The unit director is responsible to protect his coworkers, the public and the environment from eventual effects of substances synthesized in his unit.
- Only chemicals needed for the current work can stay at the workplace.
- If the individual and collective protective equipment seems to be insufficient to complete your work, you must immediately inform the unit Director.
- It is forbidden to use simultaneously a workplace for storage and for an experiment. (Example: a fume hood cannot be a storage place and a place for synthesis).
- Only the needed quantity of solvents for the current work can be present at the workplace.
- The use of carbon tetrachloride as solvent is forbidden.
- No more than 100 liters of flammable substances can be stored per room (including wastes) in ventilated closets equipped with secondary containers. Each cupboard is limited to 15 L of flammable substances. EI 90-validated fire-resistant metallic closets can be used to store larger quantities with a special label. The use of other metallic closets is allowed exceptionally at BCH until all closets have been replaced by EI 90 models.
- It is forbidden to store alkali metals and their alloys. A small reserve is available at the chemical shop.
- Hydrides, silanes, phosphorus, phosphines, Raney nickel, platinum on carbon and other spontaneously flammable compounds are stocked in suitable flasks (ex. Desiccator) and, if necessary under inert atmosphere or appropriate liquid.
- All experiments involving pyrophoric compounds or more than 10 mL flammable substances must be done under inert atmosphere. A pressure-resistant flask or an installation allowing pressure adjustment (nitrogen/argon line, balloon) has to be used.

- Experience in autoclaves are allowed under the following conditions only:
 - In a ventilated fume-hood and protected by a safety shield
 - Volume inferior to 100 mL
 - No unattended experiment

3.3.5 Biological material

Specific legislation applies to work with biological material (microorganisms). At SB, only works with microorganisms of classes one and two are allowed. These experiments are supervised by a Biosafety Officer and need to be announced in advance (contact the SB-SST).

3.3.6 Gas cylinders

- Regularly used gas cylinders have to be installed in a special ventilated closet of type EI 90 outside the laboratories and need to be in the inventory.
- It is forbidden to store or use cylinders of 50 L and 200 bars in the laboratories. For specific experiments, it is possible to use smaller cylinders. The maximal quantities accepted for each type of gas is indicated in the EPFL directives for storage of gas cylinder (LEX 1.5.6, Appendix 5). After use, the cylinders are brought back to the storage room of CH and BCH (contact the chemical shop).
- Gas cylinders must be secured with a safety belt attached on a surface fixed on the ground (i.e. wall, cupboard, fume hood, bench). Tables are not fixed furniture.
- It is not allowed to keep a stock of gas cylinders in the laboratory.
- It is forbidden to keep cylinders after the date indicated by the furnisher.
- The use of toxic or flammable gas is allowed only with a detector equipped with a fix or portable alarm system as long as the gas stays in the laboratory.

3.4 Working with fume hoods

- All manipulations involving chemical or biological compounds need to be done in the fume hood, even if they don't represent safety hazards. All experiments involving toxic or volatile substances need to be done under urgency mode. As soon as the manipulation is finished, the sash must be lowered and the hood put back to the normal mode (exception: for reactions producing toxic volatile substances, the urgency mode must remain activated). The sash must always protect the face of the experimenter. All interventions requiring a complete opening of the sash need to be done as fast as possible.
- In BCH, it is forbidden to perform any work with a risk of emission in a hood that is not equipped with a low aspiration. Hoods allowing such work carry a "ready for heavy gases" label (équipé pour gaz lourds).

3.5 Directives for unattended experiments

- Rooms containing unattended experiments needs to be indicated by a sheet at the entrance door.
- Unattended experiments are done in priority in fume hoods equipped with heat detectors. A reaction can only be done in a hood without detector if it answers the following criteria:
 - No storage of chemicals in the hood (e.g. solvents, chemicals,...)

- Less than 50 mL of flammable substances including solvents.
- No exothermic behavior, or any exothermic process is already finished.
- No continuous gas flow or production.
- No system of refrigeration (e.g. cooling water).
- No incompatible substances in the different reactions in the same fume hood.
- Hood sash lowered to the maximum.

- Unattended reactions must be accompanied by a safety sheet describing the experiment (to download from: http://sb-sst.epfl.ch/felss_en).

- When heating is required, an oil bath is favored. The temperature should be checked by a double safety system: a) a probe linked to the heating device and b) an independent probe which cuts power in case of trouble. Heating mantels are forbidden.

- The following reactions cannot be let unattended: not finished exothermic reactions (e.g. Grignard, reaction with alkali metals,...), continuous gas flow or production, highly pyrophoric substances, reactions producing toxic volatile compounds (e.g. HCN, NH₃, HCl, phosgene,...), any other reaction representing elevated hazard. An exception is possible for hydrogenation reactions using a balloon of hydrogen of less than 500 mL at room temperature, as long as no heat source is present in the fume hood.

4. WASTE DISPOSAL AND TREATMENT

4.1 Conventional wastes

All coworkers are asked to contribute to the general effort of collecting and recycling conventional waste and to follow the EPFL directives. The waste emptied by the central service must not contain substances or objects dangerous for the cleaning and transport staff.

4.2 Chemical wastes

Each coworker is responsible for the correct elimination and destruction of all ordered, used or synthesized chemicals. In case of doubt, he should contact the unit director.

- Not used commercial chemical substances should be brought back to the collecting point for special waste in their original container. Particularly hazardous substances (e.g. explosives, highly reactive compounds) need to be announced separately.

- All other substances need to be collected in special waste containers according to the waste disposal diagram (to download from: <http://sb-sst.epfl.ch/chemical-waste>). The waste containers need to be correctly labeled and their size should be reasonable in comparison with the expected waste production. All waste containers need to be discarded after 60 days. Special waste containers and labels are available at the chemical shop.

- Unknown substances also need to be brought to the collecting point for special waste and labeled as such.

- Unused gas cylinders have to be brought back to the chemical shop and labeled as empty or not.

- All special substances listed in the waste disposal diagram (<http://sb-sst.epfl.ch/chemical-waste>) must be recovered separately and labeled correctly (OMoD Code).

- Special canisters are ready for the disposal of solvents:

- Non-halogenated solvents (less than 1% halogenated compounds)
 - Halogenated solvents (more than 1% halogenated compounds)
 - Special listed substances cannot be discarded in the solvent canisters
- Special canisters are ready for the disposal of aqueous solutions:
- Basic solutions
 - Acidic solutions
 - Special listed substances cannot be discarded in the aqueous solution canisters.
- Contaminated used glass is discarded as special waste in a dedicated container. Cleaned used glass can be discarded in the container for glass recycling.
- Syringe needles are discarded in special dedicated rigid containers and then brought sealed to the collecting point for special wastes.

4.3 Biological wastes

Biological waste is discarded according to the waste disposal diagram (<http://sb-sst.epfl.ch/chemical-waste>).

5. EMERGENCIES

FOR ANY CASE OF EMERGENCY CALL 115 (from EPFL phone) or 021 693 3000 (from external phone). This phone number is active on both EPFL and UNIL campus.

5.1 Fire

5.1.1 Fire detection

- The principles of fire detection and alarm system are described in the table below.

	CH	BCH
Detection	Each room is equipped with one or more detectors	
Type de detection	- Smoke detector	- Smoke detector - As soon as a detector is activated, the red lamp at the entry of the room turns on.
Manual alarm	- Press the emergency button to alert the firemen of the school and those of Lausanne.	- Press the emergency button located near sanitary block of every sector.

- Fume hoods are not equipped with fire detector except those described in appendix 4. In the case of fire, **alarm will not be transmitted** as long as the smoke is circulating in the fume-hood!
- In the case of activities which release dust or fume being likely to initiate a false alarm, the smoke detector of the room or the zone can be deactivated for a strictly limited duration if the user contacts:

	CH	BCH
Work releasing dust	phone 3 4000	UNIL technical assistance phone 97 2480

5.1.2 Firefighting equipment

- All coworkers at EPFL will receive an introduction on the use of firefighting equipment.
- The personnel have to check alarm and firefighting equipment in order to know their locations to act quickly in case of required intervention.
- Protection masks must not be used for personal protection in the case of fire!

5.1.3 Used or defective firefighting equipment

- Anyone observing used or defective firefighting equipment (unsealed, empty extinguisher, etc.) has to warn:

	CH	BCH
Used extinguisher	Phone 3 4000	Technical exploitation UNIL phone 97 2480
Defective equipment	Phone 3 4000	Technical exploitation UNIL phone 97 2480
Periodic control	Organized by DSPS	Organized by technical exploitation UNIL, phone 97 2480

5.1.4 Behavior in case of fire

- 1) Alarm (push fire alarm button).
- 2) Evacuate person in danger
- 3) Close windows and doors.
- 4) Close gas and remove flammable liquids from danger
- 5) Stop you laboratory equipment
- 6) Use the firefighting equipment (extinguisher, ...).
- 7) Inform the firefighters (person to save, special dangers).

5.2 General evacuation

5.2.1 Principle

- The evacuation is DECIDED by the security service or firemen.
- The emergency lighting and the indicators of safety exit are activated.

5.2.2 Behavior in case of evacuation

- Take your personal belongings (Camipro card, key, coat,...). It is not possible to come back.
- Follow the safety exits indicated by illuminated signs
- Use only the stairways
- Follow the indications of the firefighters, who will indicate you the place of assembly.
- Move with calm
- Register yourself with the Camipro card on the reader of the firefighter at the place of assembly
- All information concerning the nature of the fire, chemical dangers and possible victims has to be communicated to the security service, the firefighters and the unit director.

5.3 Accident

FOR ANY CASE OF EMERGENCY CALL 115

- While calling to the rescuers, indicate:
 - The place where the victim is.
 - The room number where the victim is.
 - The phone number where one can contact a person staying near the victim.
- The persons close to the event assist the rescuers.

5.4 Liquid substance spill




- The emergency kit (mineral absorbent) which allows collecting liquid substance spill on the ground can be found in buckets:

	CH et BCH
Where to find it?	Containers available in the safety cupboards
Compatible substance ?	Suitable for all organic solvents, oils, acids and bases
How to use it?	<ul style="list-style-type: none"> - Pour a 3 to 5 mm layer of absorbent on the contaminated floor. - Let to absorb for a few minutes. - Collect the used absorbent and place it in a chemical resistant container
How to dispose it?	<ul style="list-style-type: none"> - The used absorbent becomes a special waste. - Label it with a sticker indicating the content : "mineral absorbent containing approximately X mL of substance Y".
Where to dispose it?	- Bring the container to the chemical shop
How to restock the absorbent?	<ul style="list-style-type: none"> - Prepare an event report on the safety website of SST - Order a new bag of absorbent on the buying platform of SESAME. Containers and labels are taken from the chemical shop. The chemical shop also has a reserve of a few absorbent bags in stock.
Si un liquide se répand dans les canalisations ?	phone 115 (internal phone) 021 693 3000 (external phone)

Appendix 1 Classification of different gloves types

I- Protecting gloves against chemicals

The norm EN 374 indicates the gloves capacity to protect the user against chemical products and micro-organisms. EN 374-2 determines their resistance to penetration (air/ water test) and EN 374-3 their resistance to permeation by chemicals (test with chemicals).

Symbols and meaning		
		
gloves passing the permeation test.	gloves failing permeation test but passing penetration test.	gloves passing the penetration test to at least level 2 are considered to be micro-organism resistant.

Letters underneath the symbol indicate against which chemicals, the gloves have been tested:

A: methanol	B: acetone
C: acetonitrile	D: dichloromethane
E: carbon disulphide	F: toluene
G: diethylamine	H: tetrahydrofurane
I: ethyl acetate	J: n-heptane
K: caustic soda 40%	L: sulphuric acid 96%

Thin gloves = disposable gloves (list not exhaustive):



latex



nitrile



vinyl

Material	Recommended when working with	Avoid when working with
Latex*	diluted acidic, basic aqueous solutions	organic substances, hydrofluoric acid
Nitrile	organic substances	halogenated substances
Vinyl	acids, bases, amines, peroxides	organic substances

*can cause allergies

Thick gloves = re-utilisable gloves:



neoprene



nitrile







butyle



pvc

Material	Recommended when working with	Avoid when working with
Latex/ neoprene (dish gloves)	diluted acidic, basic aqueous solutions, alcohols	organic substances, hydrofluoric acid
Nitrile	organic substances, strong acids and bases	aromatics, halogenated substances
Butyl	ketones, esters	acidic, aliphatic, aromatic, halogenated substances
Neoprene	acids, bases, alcohols, peroxides, hydrocarbons	aromatic, halogenated substances
PVC (snorkel®)	aqueous solutions, hydrofluoric acid	
PVC	strong acids	



















II- Gloves protecting against thermal burns

Type - function	Use	Norm & symbol		Type - function	Use	Norm & symbol	
Gloves to protect against cold burns	Manipulation of dry ice, cryogenics	EN 511		Gloves to protect against heat	Manipulation of warm objects	EN 407	
							

Check <http://sb-sst.epfl.ch/gloves-guide> for further information.

Appendix 2 Incompatibility between chemicals

Rules for the separation of hazards:

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

+: can be stored together

- : must be stored separately

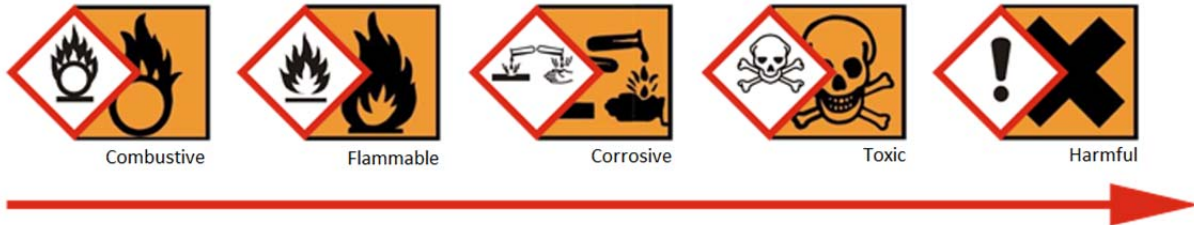
O : can be stored together if certain dispositions are taken (put them in separated retention trays and in a fireproof cabinet)

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 than 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.

Appendix 3

Warning symbols for chemical and biological dangers

	Danger général
	General hazard
	Matières toxiques
	Toxic materials
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  Acide/ Acid </div> <div style="text-align: center;">  Base </div> </div>	Matières corrosives
	Corrosive materials
	Matières inflammables
	Flammable materials
	Matières comburantes
	Oxidizers
	Matières explosives
	Explosive materials
	Atmosphère explosive/ risque d'explosion
	Explosive atmosphere/ explosion risk
	Bouteille de gaz
	Gas bottle

	Gaz toxique
	Toxic gas
	Gaz corrosif
	Corrosive gaz
	Gaz inflammable
	Flammable gaz
	Gaz comburant
	Oxidizing gas
	Risque biologique
	Biohazard

Appendix 4

“Ex” Room and automatic extinction.

I- "Ex" rooms in BCH

Room number	Type of "Ex" room	Note
Chemical Shop	100%	No extinction
Chemical Shop	100%	No extinction
BCH 1206	"Ex" 1 m from floor	Automatic extinction with CO ₂
BCH 1208	"Ex" 1 m from floor	Automatic extinction with CO ₂
BCH 1237	"Ex" 1 m from floor	Automatic extinction with CO ₂
BCH 1238	"Ex" 1 m from floor	Automatic extinction with CO ₂
BCH 5432	"Ex" 1 m from floor	Automatic extinction with CO ₂
BCH 6239	"Ex" 1 m from floor	Automatic extinction with CO ₂

II – Fume-hoods equipped with temperature detections and automatic extinction with CO₂

Room	Number of fume hoods
BCH 1438	3 fume hoods
BCH 2438	5 fume hoods
BCH 3238	3 fume hoods
BCH 3430	7 fume hoods
BCH 3438	4 fume hoods
BCH 4238	2 fume hoods
BCH 4415	3 fume hoods
BCH 4432	2 fume hoods
BCH 4438	2 fume hoods
BCH 5230	4 fume hoods
BCH 5430	3 fume hoods
BCH 5438	3 fume hoods

- These hoods are the only one allowing to detect a fire inside the fume hood. The other fume hoods are not equipped with internal detection.
- If the temperature is higher than 60 °C, an automatic extinction with CO₂ starts and the alarm is transmitted to the firefighters in Lausanne.
- Except during manipulations, the sash has to stay permanently closed.

Appendix 5

Directive concerning the storage of gas cylinders LEX 1.5.6

10 Juny 2013

The Direction of the Ecole polytechnique fédérale de Lausanne hereby adopts the following:

Preamble

There are different types of gas: inert, inflammable, toxic and/or oxidant. This directive determines the storage instructions and quantities of compressed gas authorised on a premises. It also determines the measures to take in case of accident.

Section 1 Instructions

Article 1 General measures

¹ All compressed gas cylinders must be stored in a secure ventilated cabinet of the EI90 type minimum. A detector, in the place of use and in the cabinet, with servo control must be present for toxic and/or inflammable gases.

² Gases must be physically separated according to their chemical incompatibilities¹.

³ No cylinders of 50 l at 200 bars must be present in the premise.

⁴ For any special needs that may require greater quantities than those specified above, a possible dispensation may be considered by contacting the Domaine sécurité, prévention et santé (DSPS).

Article 2 Maximal volume per gas

¹ **Inert gas:** the maximum volume of inert gas authorised per premises outside of these cabinets is 2 Nm³ (maximum 4 cylinders).

² **Inflammable gas:** the maximum volume of inflammable gas authorised per premises outside of these cabinets is 0.6 Nm³ (maximum 2 cylinders).

³ **Toxic gas:** the maximum volume of toxic gas authorised per premises outside of these cabinets is 0.2 Nm³ (maximum 2 cylinders).

⁴ **Oxidant gas:** the maximum volume of oxidant gas authorised per premises outside of these cabinets is 0.6 Nm³ (maximum 2 cylinders).

Section 2 In case of accident

Article 3 Turn off the gas supply

Close the valve whenever possible.

Article 4 Immediately alarm 115

Try to gather ad hoc information concerning the gas or mixture that caused the accident.

¹ Directive sur les Laboratoires chimiques (# 1871)

Directive sur Gaz liquéfiés, 1ère partie ; Récipients, stockage, transvasement et remplissage (# 1941)

Feuillelet d'information Bouteilles à gaz, Entrepôts, rampes, systèmes de distribution de gaz (# 66122)