UNIVERSITÀ DEGLI STUDI DI TORINO

DBios

Safety in the laboratory

Handbook for international users

INDEX

PREFACE: GENERAL RULES SOME HINTS ON LEGISLATION

"TRAINING IN SAFETY MEANS RAISING AWARENESS AND CONSCIOUSNESS, INSTILLING A CULTURE THAT IS MUCH VAUNTED BUT SOMETIMES LITTLE PRACTISED!"

In Italy, health and safety in the workplace is regulated by Legislative Decree no. 81 of 9 April 2008, also known as the Consolidated Act, which came into force on 15 May 2008, and its amending provisions, namely Legislative Decree no. 106 of 3 August 2009 and subsequent Decrees.

Legislative Decree 81 is also known as the **Consolidated Act ("Testo Unico")**, as it is a single organic text, summarising and coordinating all the regulations issued on safety at work. It applies to all sectors, both public and private, to all types of risk, to workers, subordinates, self-employed persons and all persons treated as workers.

According to current legislation, health and safety in the workplace must be the **concerted result of several actions, carried out by a multiplicity of subjects** within the organisation itself. To this end, "**System Figures**" must be identified, i.e.: professional figures who, with the aim of ensuring the health and safety of workers, must perform a series of specific tasks.

The "**System Figures**", listed below, are defined by the Workplace Safety Act:

- Employer
- Manager
- Person in charge
- Prevention and Protection Service Manager (RSPP)
- Person in charge of the Prevention and Protection Service (ASPP)
- Competent doctor
- Workers' Safety Representative (RLS)
- Emergency management teams (evacuation, fire-fighting, first aid)
- Worker

The following information can be found on the Department website http://www.dbios.unito.it under the heading **"SERVICES SUPPORTING SAFETY" -DISPENSE**- and is aimed at all users (contract students, students, trainees, doctoral students and postgraduate students) of the teaching and research laboratories.

The aim is to provide specific access procedures, information on the hazards and possible risks associated with laboratory activities, prevention and protection measures, and rules of conduct that all visitors to the Department must scrupulously follow.

The contents of this manual correspond to the contents of the annual training seminars held by Isabella Martini for all participants.

The guidelines provided by this manual will be subject to periodic updates, in relation to organisational changes in the Department offices and to current legislation.

If you need further clarification, please contact Isabella Martini:

Tel. 011.670.5973 or **e-mail** isabella.martini@unito.it

We would like to focus on some definitions of the main figures involved in occupational safety at the University:

- **EMPLOYER=RECTOR:** Manager who has management, decision-making and spending powers and responsibility for the organisation itself.

- **STUDENT=COMPARABLE TO A WORKER**: Personnel who, regardless of the type of contract, works for a public or private Employer, with or without remuneration.

- **WORKERS:** Teaching, technical and administrative staff, non-organically structured staff, university students, doctoral students, postgraduate students, research assistants, trainees, scholarship holders.

- **COMPETENT DOCTOR:** Health personnel who carries out periodic clinical and preventive examinations in the cases provided for by current legislation, expresses judgements of suitability, informing both the Employer and the Worker.

- **EMERGENCY MANAGEMENT TEAMS:** Personnel appointed by the Employer, in case of health emergencies (First Aid Officers) and fire (Fire Prevention Officers).

TASKS OF THE EMERGENCY TEAMS: PROCEDURES ACCORDING TO THE TYPE OF EVENT

In relation to the risks in the structure (art. 18 D.Lgs.81/08), the Employer must: "Designate in advance the workers in charge of implementing fire prevention and firefighting measures, evacuation of workplaces, in case of serious and immediate danger, rescue, first aid and, in any case, emergency management".

Fire prevention and evacuation officers shall:

- Collaborate in fire prevention activities
- Know and maintain fire prevention systems (fire extinguishers, alarm systems, emergency exits, safety signs, etc.).

Fire prevention and evacuation officers play an important role by periodically checking workplaces: they intervene on the event in progress, alerting people in case it is necessary to ensure a safe exit for all those present. The training of officers depends on the fire risk assessment and must be implemented by the Provincial Fire Brigade.

They are also entrusted with the function of intervening on the service systems for the sole purpose of interrupting the supply, on the fire-fighting systems in order to manually operate them (where required), as well as to direct any External Bodies (Fire Brigade, Medical Assistance, etc.) to places in a state of emergency.

Health Emergency Prevention Officers shall:

- Quickly go to the reported place, carrying the first aid kit
- Give first aid to the person in health emergency.
- If necessary, call external help (118) and inform them of their arrival, working actively to get them to the scene of the emergency as soon as possible.

The following personnel have been identified at the three Department sites, in charge of Fire, Technical and Health Emergencies:

Via Accademia, 13 Staff

Fire Prevention	***Telephone***	***Technical Emergency***	***Telephone***	***First Aid***	***Telephone***
Sergio Castellano	011.670.4557			Maurizio De Stefani	011.670.4548
Maurizio De Stefani	011.670.4548			Marilena Girotti	011.670.4551
Alessia Frasson	011.670.4617			Marco Moietta	011.670.4601
Fabrizio Grosso	011.670.4501			Simona Bonelli	011.670.4552
Giuseppe Maiorana	011.670.4522			Giuseppe Maiorana	011.670.4522
Marco Moetta	011.670.4601				
Ferruccio Pizzolato	011.670.4556				
Alfredo Santovito	011.670.4554				

Viale Mattioli, 25 Staff

Fire Prevention	***Telephone***	***Technical Emergency***	***Telephone Telefono***	***First Aid***	***Telephone Telefono***
		Silvano Panero	011.670.5497	Raffaele Macchia	011.670.5980
M. Teresa Della Beffa	011.670.5966			Stefania Daghino	011.670.5986
Raffaele Macchia	011.670.5980			Luigi Pellegrino	011.670.5981
Luigi Pellegrino	011.670.5981			Ercole Enrico	011.670.5979
Danilo Rocca	011.670.5980			Cristina Varese	011.670.5984
Immordino Alberto	011.670.5980				

Via Quarello, 15/A Staff

Emergenza Antincendio	***Telephone***	***Technical Emergency***	***Telephone***	***First Aid***	***Telephone Telefono***
Simone Bossi	011.670.6357			Simone Bossi	011.670.6357

CHAPTER 1 - GUIDELINES FOR VISITORS

1.1 RULES FOR ACCESS TO LABORATORIES

Although the Employer is primarily responsible for safety in the workplace, all persons sharing the same work environment must ensure that their health and safety is protected.

Access to the Department's laboratories is allowed only to Personnel previously authorised by the Department Director and the Laboratory Manager (**RADRL**).

The Department's "Attendees" (Student, Scholar, Contractor, Intern, etc.) must undergo specific training on theoretical and practical bases concerning all aspects of health and safety at work.

Training in this area is mandatory for all non-structured personnel.

The RADRL must plan the compulsory training of the Attendant for access to the laboratory: the training actually carried out must be certified.

In case of access to a new laboratory and for which exposure to other risks is expected, further specific training is required.

When entering the Department for the first time, the Attendees must fill in the following forms, which can be downloaded from the website www.dbios.unito.it "***SERVICES for SAFETY***" ***under the heading "FORMS":***

1. Individual risk exposure assessment form
2. Information, education and training form
3. Personal data
4. Declaration of having read the safety training material
5. Information for the insurance company
6. Attendance request form (to be sent by email **delib.dbios@unito.it**) for: Personnel from outside the University, recent graduates, personnel belonging to other public/private bodies or former personnel of the Department.

In order to assess individual occupational risks, the RADRL must draw up, together with his or her Attendee, the ***"INDIVIDUAL SCHEDULE FOR THE ASSESSMENT OF POTENTIAL EXPOSURE TO WORKPLACE RISKS".***

The sheet, which must be filled in completely, contains information on the activity carried out, necessary for assessing any risks present, for implementing health surveillance, as provided for by Legislative Decree 81/2008 Art. 4 and planned on the basis of the indications of the Competent Doctor.

Only staff who have prepared their own form and the required forms will be authorised to enter the laboratory and must always carry an identification card.

In the event of access to a new laboratory, for which exposure to other risks is expected, an integration of the previous form is required and therefore further specific training, as already mentioned.

The fully completed forms should be handed over to the following Contact Persons:

- Ms STELLA SIORI in via Accademia Albertina n°13
- Dr. ISABELLA MARTINI in viale Mattioli n°25
- Dr. SIMONE BOSSI in via Quarello n°15/A

Attendees who are authorised to access the laboratory **must** sign the "Acknowledgement of teaching materials" form contained in this handout.

In the case of personnel from outside the Department (e.g. Visiting, Guests, PhD students from other Departments, Teachers or Collaborators from other Universities) the access request form must be submitted to the above-mentioned people who will forward it to the Department Council for approval. In these cases, the forms must be submitted at least **15 days before the start of the activity**, in order to allow the activation of accident insurance coverage for the guest, if required.

1.2 OPERATIONAL INSTRUCTIONS

- What to do in case of an accident at work or an accident on the way to work

a) An accident at work is an event due to an unforeseen, violent and external cause which, occurring during the course of work, produces traumatic injuries.

b) An accident on the way to and from work is an accident sustained by a worker during the normal journey from home to work.

In the event of ***an accident at work or on the way to work***, the injured person must immediately inform the RADRL or the Contact Person at his or her office and go or be accompanied quickly to the nearest Accident and Emergency Unit.

The doctor in the Accident and Emergency Unit will issue an initial "accident certificate" and send a copy to INAIL. The certificate indicates the diagnosis and the prognosis (number of days of absence from work): the injured person must give a copy to the Head of the relevant Structure and keep it.

In the event of a certified prognosis of more than three days, the person in charge shall prepare the online accident report to INAIL and the Public Safety Service, strictly within two days of receiving the medical certificate.

If the two-day deadline expires on a holiday, the report must be sent on the working day following the holiday.

In the event of a prognosis of less than three days, the Facility Manager need not submit a report. The Facility Manager shall in any case send the medical certificate to the competent University Offices.

To report accidents, please contact the following Staff:

- Dott.ssa D. Vaccani, Dott.ssa D. Donna in Via Accademia Albertina, 13
- Dott.ssa I. Martini in Viale Mattioli, 25
- Dr. S. Bossi in Via Quarello, 15/A

- Procedure for the protection of pregnant workers

The health of female workers must be protected in the workplace during pregnancy, post-partum and the breastfeeding period.

The reference legislation is as follows:

- Consolidated text on maternity and paternity leave
- Legislative Decree 151/2001 Chapter II - Protection of the worker's health (Art. 6-15)
- D.lgs. 151/2001 Chapter XV - Provisions on contribution charges (Art. 78-84)

The worker must notify the Director of the Department, the RSPP, of her state of pregnancy by presenting a medical certificate issued by her gynaecologist.

Having acknowledged it, the RSPP carries out a risk assessment, in accordance with the procedures laid down in Legislative Decree no. 151 of 26 March 2001. This assessment must examine all aspects of the work activity, identify the dangers, the probable causes of harm and establish how any risks present can be reduced and eliminated.

Following the assessment, the necessary preventive and protective measures shall be taken to avoid the exposure of female workers to any persistent risks, for which a temporary change of job is envisaged.

1.3. GOOD PRACTICE DURING LABORATORY WORK

Some useful definitions:

- **RISK** (Art. 2, letter s, Legislative Decree 81/08): probability of reaching the potential level of harm under the conditions of use or exposure to a certain factor or agent or their combination.
- **HAZARD** (Art. 2, letter r, Legislative Decree 81/08): intrinsic property or quality of a given factor having the potential to cause harm.
- **HARM**: consequence of exposure to risks.

IN ORDER TO MAKE LABORATORIES SAFE PLACES TO WORK IN, YOU ARE INVITED TO CAREFULLY OBSERVE THE FOLLOWING RULES, AS CARELESSNESS CAN LEAD TO ACCIDENTS.

WHAT I SHOULD KNOW:

1. The CHARACTERISTICS of the workplace
2. The NUMBER of PEOPLE present
3. The AREAS of special RISK
4. The workers at special risk (disabled, contractors, External etc.)
5. EMERGENCY EXITS and safe areas
6. Type, quantity and whereabouts of EXTINGUISHING PLANTS AND EQUIPMENT
7. Whereabouts of main switches for electricity, and taps for water, gas and other fluids

The following information is displayed in each laboratory:

- Risk logo (chemical/biological/physical)
- Telephone numbers of the RADRL and of the personnel to be contacted in case of emergency. List of personnel authorised to access the laboratory
- Information on any specific hazards and risks. Use of personal protection equipment (PPE) and collective protection equipment (CPD)
- Rules of conduct to be followed at work and in case of emergency.

REMEMBER THAT: when you enter a laboratory, the first thing to do is to look at the Collective Protection Devices (CPD), to know exactly their layout and use.

CPDs are systems which, by acting directly on the pollutant source, reduce or eliminate the risk of worker exposure and contamination of the work environment. DPCs in research and teaching laboratories are as follows:

- Emergency showers
- Emergency eyewash stations
- Alarm signals (sirens, bells, environmental detectors, etc.)
- Chemical and biological fume hoods
- Safety cabinets
- Fire extinguishers
- First aid kits

AND WHEN IN THE LABORATORY

A) WHAT SHOULD YOU DO?

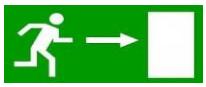
- ALWAYS WEAR A LAB COAT TO PROTECT AGAINST SPLASHES OF DANGEROUS SUBSTANCES
- USE GLOVES, GOGGLES WHERE APPROPRIATE
- KEEP THE BENCH ON WHICH YOU WORK CLEAN AND TIDY
- SEPARATE WASTE COLLECTION (SEE COLLECTION METHODS ON PAGE 23)
- BEFORE USING THE EQUIPMENT, CAREFULLY READ THE INSTRUCTION MANUAL, WHICH MUST BE CLEARLY VISIBLE AND ACCESSIBLE TO ALL.
- BE CAREFUL WHEN HANDLING CHEMICAL AGENTS: BEFORE USING THEM, ALWAYS CONSULT THE SAFETY DATA SHEETS (SDS), WHICH ARE STORED IN THE LABORATORIES
- STORE THE LIQUID AND SOLID WASTES OF DANGEROUS SUBSTANCES UNDER A FUME HOOD WITH THEIR CER CODES, PENDING DISPOSAL, IN AGREEMENT WITH THE RADRL.
- AVOID OVERLOADING ELECTRICAL OUTLETS BY ADDING MULTIPLE SOCKETS OR POWER STRIPS.
- DO NOT CLUTTER THE EMERGENCY EXITS WITH BOXES, EXTINGUISHERS OR OTHER: THE EMERGENCY ROUTES AND EXITS MUST ALWAYS REMAIN FREE TO ALLOW YOU TO REACH A SAFE PLACE QUICKLY.
- DO NOT USE FIRE EXTINGUISHERS TO KEEP FIRE DOORS OPEN (REI) WHICH MUST ALWAYS REMAIN CLOSED TO INSULATE FLAMES IN CASE OF FIRE.
- DO NOT LEAVE INCOMPLETE REACTIONS ON THE COUNTER AND IN THE CASE OF MATERIAL THAT CANNOT YET BE COLLECTED OR DISPOSED OF, MARK IT WITH THE DATE AND NAME.
- WASH GLASSWARE THOROUGHLY AFTER USE.

B) WHAT YOU MUST NOT DO!

- IT IS STRICTLY FORBIDDEN TO EAT AND DRINK IN THE LABORATORY
- DO NOT ENTER THE LABORATORY WITH OPEN FOOTWEAR (SANDALS, SLIPPERS)
- DO NOT LEAVE THE LABORATORY WEARING A LAB COAT OR GLOVES
- DO NOT MIX DIFFERENT SUBSTANCES WITHOUT FIRST CHECKING THEIR CHEMICAL COMPATIBILITY
- DO NOT ACCUMULATE ON THE FLOOR OR COUNTER CHEMICAL AGENTS OR ANYTHING ELSE THAT COULD CONSTITUTE A HAZARD.
- DO NOT POUR WASTE REAGENTS OR SOLVENTS DOWN THE SINK.
- DO NOT USE INTERNET CONNECTIONS FOR ENTERTAINMENT PURPOSES

C) AT THE END OFA JOB WHAT SHOULD YOU DO!

- LEAVE EVERYTHING CLEAN AND TIDY
- ALWAYS REMOVE YOUR LAB COAT AND GLOVES
- SWITCH OFF ALL EQUIPMENT THAT IS NOT TO BE USED OVERNIGHT AND CLOSE THE WINDOWS
- STORE USED CHEMICALS (SOLVENTS, ALCOHOL, ACIDS, ETC.) IN SAFETY CABINETS



IN THE EVENT OF AN EMERGENCY?

- *ALWAYS REMAIN CALM AND FOLLOW THE INSTRUCTIONS GIVEN BY THE EMERGENCY TEAM*
- *DO NOT IMPROVISE AS A FIREFIGHTER*
- *GO IN AN ORDERLY MANNER TO THE OUTSIDE OF THE BUILDING AND TO THE NEAREST SAFE PLACE, FOLLOWING THE SHORTEST ROUTE INDICATED BY THE APPROPRIATE SIGNS*
- *CLOSE THE DOORS BEHIND YOU, MAKING SURE THAT NO ONE IS LEFT BEHIND.*

1.4. SAFE STORAGE OF CHEMICALS

The following are some basic rules for safe storage of hazardous chemicals.

- Laboratories may only store the amount of chemicals needed for the task at hand.
- All chemical agents must be accompanied by the appropriate safety data sheet (SDS), stored in a place known and accessible to all those working in the laboratory.
- The storage of substances must comply with the conditions set out in the relevant safety data sheet.
- All types of chemical substances must be stored in safety cabinets (vacuum/fire cabinets), consisting of shelves, subdivided in particular categories (acids, bases, flammable and/or toxic substances), with doors that allow them to be closed safely.
- A list of the agents contained must be displayed on each cabinet, which must always be up-to-date, with indications of danger, the name and telephone number of the RADRL, who can be contacted for any needs.
- Flammable substances must be stored in fireproof cabinets with REI 180 fire resistance, in accordance with the standard.
- Acidic and basic substances must be stored in safety cabinets with suction to ensure air exchange.
- Substances requiring low temperatures in explosion-proof refrigerators.

- Highly toxic agents (e.g. carcinogens) in suction locked cabinets, separate from other reagents.
- cylinders in steel cabinets with REI 90 fire resistance.

Safety cabinets are classified according to their "fire resistance", which varies from a minimum of 15 minutes, 30 minutes, 60 minutes, to a maximum of 180 minutes.

In rooms where hazardous substances are present, in the event of accidental spillage, an emergency kit must always be available to allow rapid intervention, using suitable materials and absorbent products.

In the **Viale Mattioli premises**, two emergency kits "Equipment to be used in case of leaks, spillage of dangerous liquids" have been purchased and placed in the following premises:

1. Laboratory of Plant and Microorganism Interactions 1, located under the emergency washroom (Ground floor)

2. Biochemistry Laboratory, located in the gel preparation area (Basement)

1.5 USE AND CLEANING OF LABORATORY REFRIGERATORS

There are different types of refrigerators in the laboratories, depending on the products stored.

- Laboratory refrigerators for NON-FLAMMABLE SUBSTANCES, CE marking

- Laboratory refrigerators for FLAMMABLE SUBSTANCES, CE marked.

Flammable substances must be stored in the minimum quantities for daily use; large quantities must be stored in the appropriate REI safety cabinets.

THE REFRIGERATOR MUST NOT BE USED FOR FOOD OR DRINK, BUT ONLY FOR LABORATORY EQUIPMENT.

A detailed list of the stored substances and their hazard classes must be displayed on the fridge door.

Liquid substances must be placed on trays in case of possible spillage. Avoid storing excessive quantities of products for a long time.

Check the T and humidity of the refrigerator periodically. Do not connect the refrigerator to multiple sockets or adapters.

In the event of sudden malfunctions, always inform RADRL and arrange for all material to be transferred to another fridge.

Periodically and with planned shifts, the staff, identified by the RADRL, must clean the refrigerator, respecting the following frequency: every six months for refrigerators and freezers of chemical laboratories, every two months for biological laboratories.

Before cleaning, the person in charge must inform all laboratory users to check their own material and to check the material to be removed.

During cleaning operations, if there is a danger of deterioration of the material at room T, the contents of the refrigerator must be temporarily transferred to other similar equipment.

Personnel carrying out the operations described below must wear suitable clothing: coat, gloves, goggles, cloths.

Switch off the appliance and unplug it.

Empty the fridge, removing expired, unlabelled or improperly stored products.

Use pliers to remove broken containers or glass and plastic fragments.

Use appropriate cleaning products and specific disinfectants with high bactericidal and fungicidal power.

Rinse and dry the shelves and walls of the refrigerator with paper or absorbent cloths.

After cleaning, switch the instrument on again, checking that the T is reached and reposition the material previously transferred to another refrigerator.

Any technical operations must only be carried out by authorised and specialised personnel for the maintenance of the appliance.

1.6 STERILISATION

Sterilisation is a process that results in the elimination of any living form, including spores, on a given substrate or in an environment.

It can be carried out by:

a. **Dry heat (ovens)**
b. **Damp heat (autoclaves).**

a) Dry heat sterilisation

For dry heat sterilisation, double-walled ovens are used, which can reach temperatures of up to 200°C.

- STERILISING AGENT: Hot air
- PROCEDURE: 180-200°T x 60'-90'
- LIMITS: Wet materials, liquids and plastics cannot be sterilised
- APPLICATIONS: sterilization of glassware and metal instruments.

b) Damp heat

For sterilisation with humid heat, autoclaves are usually used (although other forms exist: fractional sterilisation and steam).

With damp heat, spore destruction can be achieved at lower temperatures and times than with dry heat.

STERILISING AGENT: high temperature water vapour (good thermal conductivity and high penetrating

power = >efficiency)

The autoclave is a device with a perfectly sealed chamber that exploits the sterilisation capacity of saturated water vapour (100% relative humidity) at a T of 120-130°C.

It is a hermetically sealed metal container with an outlet valve, a thermometer, a pressure gauge and an electrical resistance.

ADVANTAGES: rapidity, effectiveness

DISADVANTAGES: not suitable for deformable materials (plastic material)

MATERIAL SUBJECTED TO STERILISATION IN AN AUTOCLAVE MUST BE HEAT-RESISTANT.

At the Viale Mattioli site, there are two autoclaves located on the ground floor in the sterilisation room, with Mr. Danilo Rocca in charge.

- The autoclaves must only be used during the following hours: from 8 a.m. to 2 p.m.. These hours coincide with the presence of, Mr Danilo Rocca, who is in charge of sterilisation operations.
- Out-of-hours use is only possible in urgent cases, subject to authorisation from your RADRL, who will be responsible for any damage or other damage caused to the equipment.
- - The use of anti-burn protective gloves is compulsory during the collection of material sterilised in the autoclave.

CHAPTER 2 - INDIVIDUAL AND COLLECTIVE PROTECTION DEVICES

2.1 INDIVIDUAL PROTECTION DEVICES (PPE)

The Legislative Decree 81/08 (Title III Chapter II) defines "Individual Protection Device (PPE) as any equipment intended to be worn and held by the worker, in order to protect against one or more risks that may threaten his safety or health during work".

PPE therefore has the function of safeguarding the person from health and safety risks during work activity; it must be suitable for the conditions present in the workplace, have the CE mark indicating compliance with the essential health and safety requirements.

They must also be provided with an instruction manual indicating their correct use, cleaning requirements, maintenance, expiry date, and limits of use.

PPE is divided into three categories, according to the type of risk:

Category I - slight risk

Category II - significant risk

Category III - serious risk

They are also divided into different types according to the part of the body protected:

- Hands
- Face
- Eyes
- Respiratory protection
- Protection of the body.

Hand protection

In certain jobs involving risks to the hands and arms, it is necessary to use appropriate PPE, such as gloves, which must protect the worker from the following risks:

- Mechanical and electrostatic risks
- Electrical risks / electrocution
- Chemical and microbiological risks
- Cold risks
- Heat risks
- Vibration risks

Gloves of different materials are available, and the choice must be made on the basis of compatibility between the glove materials and the chemicals handled:

- Plastic or latex to protect against absorption of chemicals
- Vinyl or neoprene rubber to protect against corrosive chemicals such as acids
- Leather for electrical insulation or high T

IN THE EVENT OF A KNOWN LATEX ALLERGY, NOTIFY THE RADRL TO ACTIVATE SAFETY

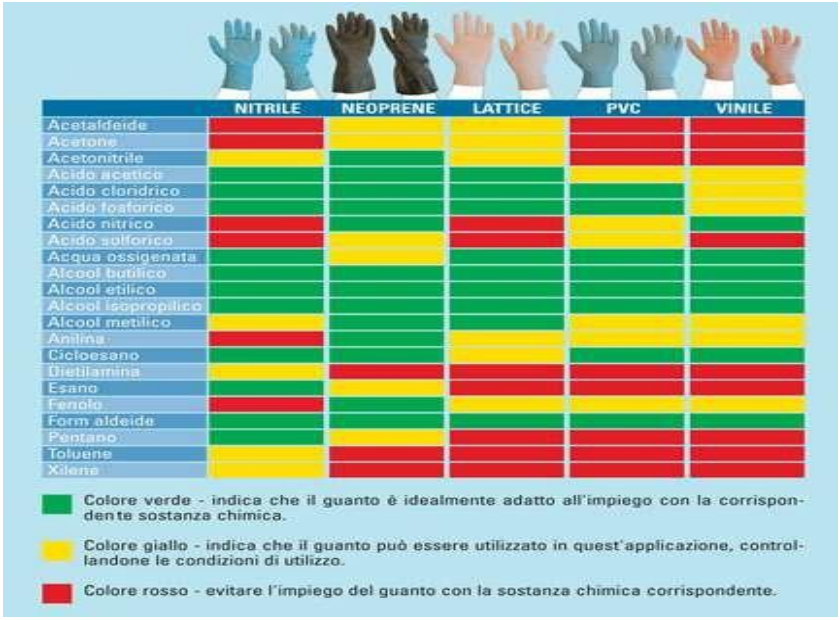
PROCEDURES, REPLACING LATEX GLOVES WITH NITRILE ONES.

Gloves should be used when there is a potential risk of skin contact. Always wash hands after use and place gloves in hazardous waste containers, using the European Waste Code (EWC), agreed with the manager.

WARNING!

- ALWAYS USE GLOVES ONLY IN THE LABORATORY
- ALWAYS REMOVE GLOVES BEFORE TOUCHING SURFACES THAT MUST NOT BE CONTAMINATED (HANDLES, TELEPHONE, ETC.)

The following image represents the different types of gloves suitable for the use of the corresponding substance (solvents, acids, etc.)



Respiratory protection

In certain jobs involving risks to the respiratory tract, appropriate PPE should be used, including different types of masks:

- Filter
- Disposable dust masks (filtering facepiece) (EN149) Semi-masks (EN140)
- Full-face masks (EN136)

Filters are devices fitted on masks or semi-masks and have the function of retaining both solid (anti-dust filters) and aeriform (anti-gas filters) pollutants.

Both types are divided into three categories according to their filtering efficiency:

- **anti-dust filters**: P1, P2, P3
- **gas filters**: 1, 2, 3.

ATTENTION: ALWAYS CHECK THE EXPIRY DATE OF THE FILTERS

Eye protection

In certain types of work that involve risks to the eyes and face, it is necessary to use appropriate PPE that must protect the worker from any splashes or spray of dangerous substances:

- Safety glasses
- Safety goggles
- Safety screen



It is important to always check the state of preservation of these PPE: they must not show scratches, abrasions or areas of discolouration and must comply with the UNI EN166 standards.

In laboratories where chemical agents are used, the use of PPE for the eyes is mandatory.

Normal eyeglasses do not provide adequate protection and safety, nor do contact lenses. Contact lenses may pose a greater danger in the event of dangerous vapours: they should be removed during laboratory activities, and if their use is indispensable, appropriate protective goggles should also be worn.

2.2 COLLECTIVE PROTECTION DEVICES (CPD)

Collective Protection Devices (CPD) are systems that, by intervening directly on the pollutant source, reduce and eliminate the risk of worker exposure and workplace contamination.

Chemical and biological fume hoods, fire-fighting and first aid equipment, and chemical storage cabinets are typical examples of PPE.

Fume hoods

Fume hoods are equipment used in laboratories to extract harmful vapours (chemical use) or to protect against pathogenic microbial agents (biological use).

When chemicals are used, chemical fume hoods have the function of protecting the operator from the risk of inhalation of vapours or toxic substances and rapidly removing toxic vapours generated during the activity. The chemical fume hood has a suction system which, by sucking in air from the environment through the front working opening, triggers and maintains air flow by an electric fan. The suction efficiency of the hood is determined by the frontal speed of the incoming air.

When biological agents are used, **biological fume hoods**, also known as biological safety cabinets (CBS), protect the operator and the surrounding environment, but are **ineffective for chemical hazards.**

Correct use of chemical fume hoods

The efficiency of a chemical fume hood is influenced by the environmental conditions in which it is used and by the operator himself: incorrect use may entail risks for the operator and the working environment.
All operations with hazardous chemicals must be carried out under a fume hood, always when this indication is given in the safety data sheet of the products to be handled.
The use of the fume hood is only allowed after prior reservation by filling in the appropriate form in each laboratory.

The following are tips and recommendations for the best use of the chemical fume hood:

- Use appropriate PPE for the task at hand
- Be aware of the emergency procedures to be adopted even in the event of a fire inside the hood
- Keep only the strictly necessary material under the hood, placing it at least 15-20 cm away from the front opening. The work area and all the material must be kept as far as possible towards the bottom of the hood, without having to lift the front panel more.
- Avoid introducing new material after starting the activity.
- The equipment placed in the hood must be kept away from the walls, in order not to obstruct the air passage and the suction slots.
- During the activity, work with the front panel lowered as much as possible, as the lower the front panel is, the less the hood is affected by currents in the room.

The first rule to be observed to maintain the efficiency of a chemical hood is daily cleaning: at the end of a job, clear and clean the work surface, remove any stains produced by any splashes of material, as many chemical substances can stain the internal surfaces of the hood if not promptly removed.

When the hood is not in use, turn off the suction and close the front panel.

Once you have finished cleaning the inside and cleared the worktop, remember to leave the hood flow on for at least 30 minutes.

Biological hoods are divided into three classes, which guarantee different levels of safety:

- Class I: for low-risk applications (MOGM group 1, 2)

- Class II: for medium-risk applications (MOGM group 2, 3)

- Class III: for high-risk applications (MOGM group 4)

They can be of two types: horizontal laminar flow and vertical laminar flow.

- The **horizontal laminar** flow hood projects air outwards, but does not provide any protection for the operator, who is directly hit by the (potentially contaminated) outgoing air flow.

This type only serves to avoid contamination of the sample and to maintain a sterile environment within the hood.

- The **vertical laminar** flow hood is used in the biological field to protect the operator and the surrounding environment from biological agents, allowing sterile conditions.

The sterilisation of the air inside this type of hood is achieved through HEPA filters (High Efficiency Particulate Air): these filters are made of micro fibreglass and guarantee 100% pure air and prevent particle contamination.

The filters must be checked annually and replaced, as required by the attached instructions: before being disposed of, they must be packed in nylon bags and identified as SPECIAL WASTE CER 06.13.02 - "HAZARDOUS SPENT ACTIVE CARBON ".

Correct use of biological fume hoods

The following are tips and recommendations for the best use of the biological fume hood:

- Use appropriate PPE for the task at hand.
- Be aware of the emergency procedures to be adopted in the event of a fire inside the hood.
- Ensure that the hood is suitable for the biological agent used. Turn off the UV lamp, if present.
- Position the front glass, if of the sliding type, at the height set for greater protection of the operator (20 - 30 cm).
- Switch on the hood motor and leave it running for at least 10 minutes before starting work in order to stabilise the flow.
- Keep material on the work surface to a minimum.
- Immediately remove spills or leakage of biological material
- Remove potentially infected or contaminated material in closed, tightly sealed containers, perfectly clean on the outside and labelled with the biohazard sign. Leave the fume hood in operation for about 10 min. After the end of a job, "clean up" any contamination.
- Every time you finish work, clean and disinfect the hood with suitable products.
- Close the front glass and switch on the UV lamp when the biological hood is not in use.

Fire blanket

The fire blanket is an active fire protection device (see page 28), which makes it possible to intervene in the event of certain fires.

It is made of non-combustible fibreglass covered with a special silicone resin and varies in size according to the model (standard size 120x120 cm).

It is stored in easily recognisable red bags.

It is very useful when fire extinguishers may be difficult to use; it extinguishes fire by suffocation.

In accordance with EN 1869/97, it does not burn, does not leave deposits and is not toxic. It cannot be reused, but must be disposed of as ***"Non-hazardous assimilated waste".***

The fire blanket may only be used by trained fire-fighters who have learnt to use it in an emergency.

- Protects workers from fires of limited size.
- Provides a smothering action
- Does not allow contact between the fuel and the oxidizer.
- Extinguishes the start of a fire.

Method of use:

- ✓ Take the blanket and walk towards the fire, protecting yourself with it.
- ✓ Place the blanket over the burning material and hold it until it has cooled down completely.

Fire extinguishers

Each laboratory must be equipped with a fire extinguisher, identified by its number and placed on the fire safety sign.

The fire extinguisher is limited in its effectiveness: it is useful for immediate use on small fires because it contains a ***limited amount of fire-extinguishing material***, which must be used in the correct way.

Therefore, in the event of a fire, you should always contact the Fire Brigade Staff and follow the following rules:

1. Do not improvise as a firefighter, but call for help before attempting to extinguish a large fire.
2. Before starting to extinguish a fire, always assess the fire with regard to the efficiency and safety of using a fire extinguisher.
3. If you decide to use a fire extinguisher, aim the jet at the base of the fire (see Chapter 6 "Fire").

Emergency equipment

Where there is a risk of being hit by corrosive liquids, emergency showers with water at a suitable temperature must be installed in the workrooms or in the immediate vicinity (Legislative Decree 81/08 Annex IV).

Eye washers are devices with a removable shower head to be used for immediate eye washing: they are a quick aid in case of eye injuries.

Washing should last 10 to 15 minutes.

Eye wash devices should be installed at a maximum distance of 15/20 metres, in a clearly visible position, clearly identifiable with the following sign and reachable in a few moments, even by an injured person without help.

For greater safety in use, laboratory managers must ensure that this equipment is checked and tested monthly.

At the Viale Mattioli site, ***eye wash devices*** are located in the following laboratories:

- Laboratory of Plant Interactions on the Ground Floor
- Laboratory of Biochemistry and Molecular Biology in the basement, near the toilets
- Mycotheque laboratories

Eye baths are plastic containers containing 500 ml sterile physiological solution, for immediate emergency eye wash in case of splashing of a dangerous substance into the eyes. They are located in all Department laboratories.

Emergency showers are indispensable for effective and immediate decontamination following chemical contact caused by acidic, caustic, radioactive, irritating and contaminating substances.

Immediate and rapid use by washing for at least 5/10 minutes, spraying the affected part of the body with copious amounts of running water, limits harmful consequences.

At the Viale Mattioli site, ***emergency showers*** are located in the following laboratories:

- Laboratory of Biochemistry and Molecular Biology
- Mycotheque laboratories

Emergency First Aid

In the laboratories, a medication pack or first aid kit (Decree 388/03) must be easily accessible. It must be adequate for the number of staff and contain all the products necessary for immediate treatment in the event of injury, sudden illness or other problems.

The first-aid kit or dressing pack must be accompanied by a list of the equipment provided.

In addition to the medication pack, there is a First Aid kit, also known as a "***blue PS bag***" which has a ***larger supply*** of medical equipment.

The contents must comply with the indications set out in Art 45 paragraph 2 of Legislative Decree 81/08. In the Viale Mattioli building there are two first aid bags, one of which is located on the ground floor in the reception area and the other in the basement in the biochemistry laboratory.

The "first aid" staff periodically checks the medication pack or first aid kit and requests the purchase of missing or expired medical equipment.

There are two different types of First Aid: the First Aid Kit and the First Aid Intervention

FIRST AID KIT: set of medical, surgical and pharmaceutical techniques implemented by qualified medical staff;

FIRST AID INTERVENTION: the set of actions that non-medical personnel can take while waiting for qualified personnel to arrive. If in any doubt, ask the Emergency staff (see list in Preface)

CHAPTER 3 - CLASSIFICATION AND DEFINITION OF RISKS

NOT KNOWING WHAT YOU ARE HANDLING CAN CAUSE OF ACCIDENTS!

This chapter deals with the different types of risk that can result in harm during work activity.

Work-related risks, in relation to current legislation *(Title IX of Legislative Decree 81/2008)* are divided into three groups:

a. **Health Risks** *(Risks related to Hygiene and the Environment: chemical, biological and physical agents)*
b. **Safety Risks** *(Risks of an Accidental Nature: equipment, electrical systems, fires)*
c. **Health and Safety Risks** *(Transversal Risks: ergonomic, psychological factors)*

a) Health Risks related to Hygiene and the Environment

(Title IX of Legislative Decree 81/2008 Chapter I "Protection from chemical agents")

Legislation considers all chemical agents to be hazardous because, due to their chemical-physical and toxicological properties, they represent a risk to health.

A chemical agent is defined as toxic when it causes serious, acute or chronic risks. A chemical agent is defined as harmful when it causes risks of limited severity.

There are three types of information on how hazardous a chemical agent is:

1. **Pictogram** - A symbolic image that includes a warning symbol and specific colours. Pictograms are intended to provide information about the harm that a particular substance or mixture may cause to our health or the environment.

2. **Hazard statements** Alphanumeric code consisting of the letter H followed by 3 numbers (e.g.: **H311** - Toxic in contact with skin)

3. **Precautionary statements** - Alphanumeric code consisting of the letter P followed by 3 numbers (e.g.: **P261** - Avoid breathing dust)

WHAT DOES IT INDICATE?

- May be fatal if swallowed and enters the respiratory tract
- Causes damage to organs
- May cause organ damage
- May damage fertility or the unborn child
- Suspected of damaging fertility or the unborn child
- May cause cancer
- Suspected of causing cancer
- May cause genetic changes
- Suspected of causing genetic changes
- May cause allergic or asthmatic symptoms or breathing difficulties if inhaled

Cautionary advice

- Obtain specific instructions before use
- Use required personal protective equipment
- Keep locked up
- If you feel unwell, seek medical advice
- In case of exposure, call a POISON CENTRE or doctor.

3.1 SAFETY DATA SHEETS

Safety Data Sheets (SDS) must be consulted before using chemicals. They are the most important technical document and contain information on the use and handling of chemicals, storage methods, disposal, and procedures to be followed in the event of a spill or emergency.

They must be stored in the laboratory (electronically or in paper format) and must be easily accessible to all users.

They are structured in the following 16 points and must be requested from the supplier

1. Identification of the substance/preparation
2. Composition
3. Hazards identification
4. First aid measures
5. Fire-fighting measures
6. Accidental spillage measures
7. Handling and storage
8. Individual exposure controls
9. Chemical and physical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

In the SDS each substance is identified by its chemical formula and two numbers: CAS number and EINECS number

- *The **CAS number*** is a numerical identifier, assigned by the Chemical Abstract Service Registry, that identifies a chemical substance.

The CAS number consists of three sequences of numbers separated by hyphens.

The first group consists of a variable number of digits, up to six; the second group consists of two digits; and the third and final group consists of a single digit that serves as a check code.

The numbers are assigned in sequential order (e.g.: CAS Phenol 108-95-2).

- *The **EINECS*** (European Inventory of Existing Commercial Chemical Substances) ***number*** is a registration code that indicates the compound on the market (e.g.: N EINECS Phenol 203-632-7).

3.2. CARCINOGENIC AND MUTAGENIC SUBSTANCES - PREVENTION AND PROTECTION MEASURES

"Protection from Carcinogenic and Mutagenic Agents" (D.lgs. 81/08 TITLE IX CHAPTER II)

Carcinogenic agent: substance or preparation that can cause cancer or is capable of increasing the frequency of its occurrence following exposure

Mutagenic agent: a substance or preparation which may produce heritable genetic defects or increase the frequency of their occurrence following exposure.

This risk situation covers all activities involving the use and handling of carcinogens and mutagens that are labelled and indicated in safety data sheets with the following pictogram

a) CARCINOGENS are grouped into ***two Hazard Categories***:

Category 1 **(H350/H340):** Substances that are proven or suspected human carcinogens based on epidemiological data or data obtained from animal experiments.

Category 1 is further subdivided into:

- ***Category 1A***: Evidence-based human carcinogen (H350 and H350i)

- ***Category 1B***: Presumed human carcinogen based on animal studies (H350 and H350i)

Category 2 **(H351/H341):** Suspected human carcinogen.

b) MUTAGENE SUBSTANCES are grouped into ***two Hazard Categories: Category 1 and Category 2*** **(H340, H341)**

For each carcinogen/mutagen used, the person in charge of the Prevention and Protection Service (RSPP) derives an exposure value *(**Lcan**),* the result of which will lead to the following classification:

1. Worker **"potentially exposed"**, for whom health surveillance is envisaged.
2. Worker **"not exposed"**, for whom the provisions of Legislative Decree 81/2008 (art. 242 and 243) do not apply.

The database of classifications of carcinogenic, mutagenic and toxic to reproduction substances can be found on the ISPESL website.

Some rules for the correct use of carcinogens and mutagens

When using carcinogens/mutagens, the ***following recommendations*** should be followed:

- Isolate the areas of use in areas with appropriate warning signs and restrict access to the laboratory to authorised personnel
- Always use lab coats, PPE, PPE.
- Consult SDS section 6 (Accidental Release Measures).
- Carry out all activities under fume hood.
- If weighing powdery substances, then out of the fume hood, use the Personal Protective Equipment (PPE) supplied and mask with FFP3S filter.
- Reduce and where possible eliminate the use of carcinogens or mutagens.

Storage of carcinogens/mutagens should be in locked, vacuum cabinets, the key to which is in the possession of the laboratory manager.

Waste and processing residues should be stored safely, following the instructions of the manager and using airtight containers labelled with the relevant EWC codes.

3.2. USE OF URANYL ACETATE - PREVENTION AND PROTECTION MEASURES

In addition to the common applications of depleted uranium in the civilian sector, it is also used as a contrast agent in electron microscopy.

In the Advanced Microscopy Laboratory at the Viale Mattioli site, uranyl acetate solution is used as a dye for samples subjected to electron microscopic analysis.

Only personnel who have received appropriate training are authorised to use it.

The activity is carried out under conditions of maximum safety, confined to an area, identified by the Qualified Expert and intended exclusively for such use.

Although the quantities are generally relatively small, the compound has significant chemical and radiological toxicity.

The chemical toxicity of uranyl acetate after inhalation or ingestion is due to renal toxicity.

Radiological toxicity is due to the various alpha- and beta-type emissions that characterise the radioactive decay of uranium and its decay products.

Given the low penetration capacity of this radiation, the radiological risk from direct exposure is negligible.

The radiological risk is therefore essentially linked to the possibility of introduction either by inhalation or ingestion into the human body.

Storage conditions

Uranyl acetate powder is stored, as required by the standard, in glass containers in a locked lead box outside the laboratory. The keys are kept by Mara Novero and Antonella Faccio.

Weighing of the powder, which is necessary for the preparation of aqueous solutions, is carried out under the chemical hood.

The solid and liquid waste of uranyl acetate, produced under the hood during the operations, are collected in an acrylic container, closed by a lid, waiting to be delivered to the company authorised to collect, transport and dispose of them.

3.3. USE OF LIQUID NITROGEN (N2) - PREVENTION AND PROTECTION MEASURES

Nitrogen is a colourless, odourless, tasteless and inert gas, very common in nature (it makes up 78% of the Earth's atmosphere). It is not dangerous on its own, but can become so depending on its chemical and physical properties and the way it is used.

The main risks of nitrogen are related to its temperature of up to -196°C, which keeps the substance in a liquefied state, necessary for storing biological material for long periods.

Cryogenic containers are called DEWARS (from James Dewar): designed at atmospheric pressure, with materials able to withstand sudden and high variations in temperature and keep the contents isolated from the external environment.

Particular attention should be paid to all operations involving the direct use of the liquid, as contact can cause severe cold burns and, if prolonged, can lead to freezing of the affected area.

Before use, follow the indications given in the safety data sheets for the substance that the supplier company must issue at the time of first purchase and which are available online.

The main risks associated with the use of N2 are:

1) **Burns from contact** with the cold parts of the device (dispensing tube, valves)

2) **Eye injuries** following pouring, immersion and removal of objects from the liquid due to the formation of splashes caused by the change in temperature of the cryogenic liquid.

3) **Asphyxiation** due to leakage of the liquid in liquid or gaseous form from the container. In these cases, the rapid evaporation of the liquefied gas will cause a change in the concentration of oxygen in the air, resulting in hypoxigenation of the breathed air. The under-oxygenated atmosphere formed can cause very serious effects ranging from loss of consciousness to asphyxiation. The operator may be in serious danger if action is not taken immediately.

During activities that 'may expose you to a **high safety risk**, operators handling or transferring liquid nitrogen should adhere to the following rules and **always use cryogenic PPE**:

- Extra-wide diathermic gloves
- Cryogenic apron and long trousers Goggles or face shields
- Pliers or other tools to immerse or extract materials from the Dewar




Gloves should be loose so that they can be easily removed in case of penetration of drops or splashes.

In case of liquid nitrogen spillage in closed rooms: ventilate the room immediately.

In case of splashes in the eyes: immediately flush eyes with water for at least 15 minutes. Call a doctor as soon as possible.
In the event of a high-pressure alarm inside the DEWAR (whistling of the safety valve accompanied by the formation of frost): open the vent valve, ventilate the room
If the supply valve breaks: inform RADRL immediately.

Also: check that the room is sufficiently ventilated and that a good exchange of air is guaranteed, also by means of suction devices or mechanical ventilation capable of preventing the accumulation of gas.

When the handling and use of cryogenic liquids in poorly ventilated rooms cannot be avoided, it is essential to use *analysers (**oximeters**),* equipped with an acoustic-luminous alarm signal that is automatically activated in the event of an alarm.

Before commencing any operation, ensure that the ***oximeter*** is functioning properly and is calibrated to operate when the oxygen concentration falls below **19%.**

3.5 SOME INFORMATION ON GMO

Genetically modified microorganisms (GMMs) are cellular and non-cellular microbiological entities (including viruses, viroids, animal cells and plant cells in culture), whose genetic material has been modified in a way that differs from the recombination or crossing processes that occur in nature.

In our laboratories, we use GMOs belonging mostly to genera widely used in the agro-food industry. They consist of species that are not pathogenic to humans, animals or plants and are used for normal molecular biology techniques.

All strains are exclusively used as systems for the genetic transformation of plants for basic research. GMO and non-GMM cultures must be autoclaved before disposal.

They include the following species, belonging to Class 1:

1. *Agrobacterium rhizogenes*
2. *Agrobacterium tumefaciens*
3. *Escherichia coli*
4. *Mesorhizobium loti.*

Legislative Decree 206 of 2001 provides for a notification regime for the authorisation of contained uses of GMMs and the facilities where they are used. All notifications must be submitted to the Ministry of Health.

Laboratories for Class 1 contained use of MOGMs do not have special requirements for either design or containment, but must have the following characteristics:

- Containment level labelled with the biohazard sign
- Smooth, easy-to-clean counters, impermeable to liquids and resistant to chemicals and disinfectants
- Hand-washing facilities
- Disposal of materials used in handling according to established inactivation procedures.
- Biohazard hoods

CHAPTER 4 - WASTE MANAGEMENT

WHAT IS WASTE?

- Any substance or object which the holder discards or intends or is required to discard (Directive 2006/12/EC)

- Substances, solutions, mixtures or objects which cannot be used as such but which are transported for reprocessing, disposal in a landfill or disposal by incineration or other method.

Each visitor must ensure that waste is collected separately according to the different types (paper, glass, plastic, cartridges, municipal waste, hazardous waste, etc.)

4.1. STORAGE OF HAZARDOUS WASTE

What waste is produced in the laboratory?

- Waste from washing and discarded solutions
- Broken glassware or contaminated disposable glassware
- Contaminated solid material of various kinds
- Contaminated containers or packaging

"Hazardous waste", defined in the previous legislation as ***"toxic harmful waste",*** is generated by production activities that contain a high proportion of pollutants.

- It is not treated as municipal waste and must not be disposed of either through the municipal collection bins or through the sewage network.

An authorised company must collect, recover or dispose of this type of waste.

- The teaching staff responsible for the activity from which the waste arises is the internal producer of that waste and is therefore required to complete the waste characterisation sheets in duplicate, sign them and hand them over to the Person in Charge. The signature of the RADRL constitutes an assumption of responsibility for the content of the waste.

- Before starting an activity in the laboratory, ask your RADRL about the procedures for laboratory safety and waste management.

How is waste sorted and labelled?

The correct coding of waste, i.e.: the allocation of the EWC code and, if dangerous, the **HP** hazard codes, is defined by current legislation.

Each waste is identified by an **EWC Code** consisting of six digits, the full list of which can be found in DECISION 2014/955/EU (Official Journal of the European Union, 30/12/2014); as for the **HP hazard codes**, they can be found in REGULATION (EU) No.1357/2014 (Official Journal of the European Union, 19/12/2014).

The "**EWC**" consists of three pairs of numbers, marked with an asterisk* in the case of hazardous waste.

The pairs of numbers are intended to identify a waste, according to the following:

- the **first pair** of digits, called the "two-digit code or class", **identifies the source that generated the waste**, i.e.: the production sector from which the waste comes;
- the **second pair** of digits of the code, called "four-digit code or subclass", **identifies the process and/or processing that generated the waste** within the production sector of origin;
- the **third pair** of digits of the code **identifies the specific type of waste**.

Below are some examples of EWCs that identify the waste produced:

06.01.02* ***Hydrochloric acid***

07.07.04* Organic solvents, washing solutions and mother liquors

15.01.10* ***Packaging contaminated with toxic/harmful substances***

16.05.06* Hazardous chemicals from laboratories, mixtures of laboratory substances

PRE-COLLECTION OF HAZARDOUS WASTE

NO WASTE MAY BE DISPOSED OF DOWN THE SINK. THE USE OF LAB COATS, PPE AND PPCS IS COMPULSORY.

MIXING OF WASTE WITH DIFFERENT CER CODES OR WITH THE SAME CER CODE BUT WITH DIFFERENT HAZARD CLASS.

DO NOT LEAVE THE WASTE FROM YOUR ACTIVITY ABANDONED ON THE WORK SUFACE.

STORE WASTE BY CATEGORY (SOLID/LIQUID) AND MARKED WITH THE RELEVANT CER CODE UNDER THE LABORATORY CHEMICAL HOOD, PENDING DISPOSAL IN THE TEMPORARY STORAGE FACILITY. PAY ATTENTION TO THE HAZARD CLASSES (HP PHRASES).

SEPARATE STRONG ACIDS AND BASES.

SEPARATE THE FOLLOWING WASTES: FORMALIN, ACETIC ACID, HYDROFLUORIC ACID.

4.1.1. PROCEDURE FOR KEEPING WASTE IN TEMPORARY STORAGE

Temporary storage means the grouping of waste pending its collection, transport and disposal by the authorised company.

The following procedure is used in Viale Mattioli, 25, where Isabella Martini organises and coordinates waste collection operations every 15 days.

For this purpose, a closed room outside the Advanced Microscopy laboratories has been identified, the key to which is kept by Isabella Martini.

All operators must be trained in advance on the safety procedures to be adopted during waste disposal.

All operators must be trained in advance on the safety procedures to be adopted when delivering waste, the movement of which from the laboratories to the temporary storage facility is the responsibility of the laboratory technicians and/or laboratory visitors, as identified by the RADRL.

The waste delivered must be recorded on the relevant characterisation sheets, which are collected and filed in Isabella Martini's office.

DELIVERY OF WASTE TO TEMPORARY STORAGE

1. WHEN HANDLING WASTE, APPROPRIATE PPE MUST BE USED (GLOVES, LAB COAT, GOGGLES, MASKS).
2. THE WASTE MUST BE COLLECTED AND CORRECTLY LABELLED, USING THE CONTAINERS AVAILABLE, SEPARATING WASTE BY CER, SOLIDS FROM LIQUIDS.
3. USE RIGID PLASTIC BOXES FOR SOLID WASTE, PLASTIC CANISTERS FOR LIQUID WASTE, POLYETHYLENE BUCKETS WITH LIDS FOR ETHIDIUM BROMIDE GEL, RIGID AND STRONG CONTAINERS FOR WASTE THAT MAY CUT OR PRICK.
4. AT THE TIME OF DELIVERY, WEIGH THE WASTE ON THE SCALES PROVIDED IN THE ADVANCED MICROSCOPE ROOM AND RECORD THE WEIGHT ON THE WASTE CHARACTERISATION SHEET.

Note: The following is a list of EWC codes that identify the waste produced in the Department. Any other codes will be assigned in particular cases by RADRL at the time of loading and internal delivery.

List of EWC codes for waste produced in the Department:

02 01 waste from agriculture, horticulture, aquaculture, forestry, hunting and fishing

02 01 08* Agrochemical wastes containing dangerous substances

06 01 waste from the manufacture, formulation, supply and use of acids

06 01 01* Sulphuric acid and sulphurous acid

06 01 03* Hydrofluoric acid

06 01 06* Other acids

06 02 waste from the manufacture, formulation, supply and use of bases

06 02 05* Other bases

06 04 waste containing metals other than those mentioned in 06 03

06 04 04* Wastes containing mercury

06 13 waste from inorganic chemical processes not otherwise specified

06 13 02* Spent activated carbon (except 06 07 02)

07 07 waste from the MFSU of fine chemicals and chemical products not otherwise specified

06 07 04* Other organic solvents, washing liquids and mother liquors

09 01 waste from the photographic industry

09 01 01* Water-based developer and activator solutions

09 01 04* Fixing solutions

13 02 waste engine, gear and lubricating oils

13 02 07* readily biodegradable engine, gear and lubricating oils

15 01 packaging (including separately collected municipal packaging waste)

15 01 10* Packaging containing residues of or contaminated by dangerous substances

15 02 absorbents, filter materials, wiping cloths and protective clothing

15 02 02* Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths and protective clothing contaminated by dangerous substances

16 01 end-of-life vehicles from different modes of transport (including off-road machinery) and waste from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)

16 01 14* antifreeze fluids containing dangerous substances

16 05 gases in pressure containers and discarded chemicals

16 05 06* laboratory chemicals consisting of or containing dangerous substances, including mixtures of laboratory chemicals

16 05 08* discarded organic chemicals consisting of or containing dangerous substances

16 05 08* DISCARDED ORGANIC CHEMICALS CONSISTING OF OR CONTAINING DANGEROUS SUBSTANCES

RELATED RESEARCH (except kitchen and restaurant wastes not arising from treatment)

18 01 waste from natal care and wastes related to diagnosis, treatment and prevention of disease in humans

18 01 03* waste whose collection and disposal is subject to special requirements in order to prevent infection

18 01 04 waste whose collection and disposal is not subject to special requirements to prevent infection (e.g. bandages, plaster casts, bed linen, disposable clothing, sanitary towels)

18 02 waste from research, diagnosis, treatment or prevention of disease involving animals

18 02 02* waste whose collection and disposal is subject to special requirements in order to prevent infection

20 01 separately collected fractions (except 15 01)

20 01 21* fluorescent tubes and other mercury-containing waste

4.2 DISPOSAL OF CARTRIDGES, TONERS, COMPUTERS

Spent toners, inkjet and laser printer cartridges also fall into the ***Special Waste*** category.

Waste Electrical and Electronic Equipment (WEEE) is equipment that the owner intends to dispose of because it is unused, obsolete and therefore destined to be abandoned.

They are characterised by the presence of substances considered toxic to the environment due to their non-biodegradability. Up to now, most of the WEEE generated by university facilities consists of computer equipment, accumulated over time and were sent for disposal during removals, cleaning of premises, etc.

WEEE intended for administrative activities is called ***PROFESSIONAL WEEE***.

When this equipment is disposed of, the Department has to turn to specialised companies for collection and transport.

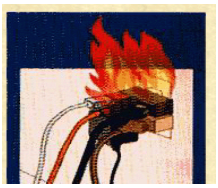
CHAPTER 5 - SOME INFORMATION ABOUT FIRE

Combustion is an oxidation reaction that takes place quickly and with the development of heat. Fire (i.e. the process of combustion), an uncontrolled reaction that develops without limitation in space and time, giving rise to flames, smoke and heat, is caused by the combination of three elements that must all be present at the same time for it to occur. In the absence of even one of these three elements, combustion will not occur.

A fire can be started for a variety of reasons:

Flames

Ignited cigarettes or matches



Electrical short circuits

In addition, three basic elements must be present for a fire to occur (fire triangle):

1) Fuel: material that is able to combine chemically with the combustion agent (usually oxygen);
2) Comburent: substance that fuels combustion by oxidising the fuel (combustion process);
3) A source that releases adequate thermal energy capable of initiating the combustion process (reaching the 'ignition' temperature of the fuel);

The fire phases are:

1) Ignition: the main phase of the fire, where the vapours of combustible substances, whether solid or liquid, begin the combustion process and combustion is easily controlled.

2) Propagation: characterised by low temperature and low quantity of fuel. The heat spreads the fire and there is a slow rise in temperature, with the emission of smoke.

3) Flash Over: sudden rise in temperature and massive increase in the amount of material participating in the combustion.

4) Generalised fire: all the material present takes part in the combustion, the temperature becomes very high(even over 1000 °C) and the combustion is uncontrollable.

5) Extinction: the final phase of the conclusion of combustion by Exhaustion and/or Smothering.

6) Cooling: phase that involves the cooling of the area concerned and coincides with the solidification on the ground of the "heavier" volatile substances of the combustion residues.

The fire is extinguished by:

1) **Exhaustion**: separation of the fuel from the firebed

2) **Smothering**: separation of the combustion agent from the fuel

3) **Cooling**: removal of heat.

The temperature **(T)** of an environment in which a fire occurs, as a function of the time variable **(t),** can be simply schematised into three phases:

1) ignition and first propagation;

2) flash over and generalised fire (transition from the initial propagation phase to the generalised propagation phase)

3) extinction (final phase of the fire: exhaustion of the combustible material).

5.1 PROTECTION SYSTEMS

Fire-fighting measures are divided into **PASSIVE PROTECTION** measures and **ACTIVE PROTECTION** measures.

PASSIVE PROTECTION includes all those measures aimed at containing and limiting the impact of a fire ***without the need for human intervention or a system and include:***

a) emergency routes and exits
b) fire resistant structures
c) R.E.I. doors.

On the other hand***, all actions that require the intervention of a person or a system*** in order to extinguish the fire, are classifiable as **ACTIVE PROTECTION MEASURES** and include:

a) fire-fighting water supply
b) fire extinguishers
c) safety lighting
d) automatic extinguishing systems

Fire resistance is the ability of an element to maintain certain parameters for a set time in the presence of fire and high temperature.

An R.E.I. door, due to its high fire resistance, has the possibility to isolate the flames in case of fire. It is therefore used as part of a passive protection system, to reduce the spread of flames or smoke between compartments and to ensure safe egress from a structure.

The acronym that defines these characteristics is of the type "REI 60, REI 120, REI 180" which indicates **Resistance (R), Hermeticity (E), Insulation (I) 60, 120, 180** identify the first minutes of fire resistance. **"REI 120"** means that the conditions listed are maintained for at

least two hours.

- **Resistance R**: ability to maintain mechanical resistance under the action of fire

- **Hermeticity E**: ability to prevent the passage or production of fire or smoke to the side opposite to that on which the fire develops;

- **Thermal insulation I**: ability to reduce the transmission of heat from one side of the door to the other and to maintain the surface temperature within fixed limits (about 150°C).

Fire doors or R.E.I. doors are fitted with panic bars: mechanical devices which, by means of a simple pressure on the bar, facilitate the escape of persons.

They must open outwards, they MUST NEVER BE LOCKED WITH A KEY OR CHAINS and they must be easily and immediately opened by any person who needs to use them in an emergency.

Once opened, they must close automatically to prevent the rapid spread of fire.

They must also divide adjoining rooms and prevent the passage of fire and overheated gases from the room at risk to the adjoining room.

ACTIVE PROTECTION MEASURES - *Fire extinguishers*

Fire extinguishers are the first means of extinguishing the "beginning" of a fire. They are easy to use, but to obtain the best performance, the operator must know the characteristics, the technique, the limits of use deriving from the extinguishing agent contained in them.

Fire extinguishers are classified according to their extinguishing capacity and according to their total mass, i.e.: the weight of the extinguishing agent contained in the extinguisher. Fire extinguishers weighing up to 20 kg are portable fire extinguishers, and can easily be used by a single operator. Fire extinguishers whose extinguishing agent weighs between 20 and 100 kg need wheels for transport, and are called wheeled fire extinguishers.

Portable fire extinguishers should preferably be placed along or close to exit routes, without obstructing access to them. The most commonly used are powder (CO_2) extinguishers.

The regulations require that all fire extinguishers be fixed to the wall at a height of 1.10-1.5 metres, clearly visible, easily accessible and indicated by signs in accordance with the regulations in force.

In the Department the different types of fire extinguishers are distributed in the corridors and laboratories.

1. Dispensing tube
2. Control lever
3. Cylinder
4. Pressure gauge
5. Safety device