



## Health and safety instructions for external staff who undertake research and technology transfer activities at the UPC

Coordination of business activities relating to  
occupational health and safety

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## 1. INTRODUCTION

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In its occupational health and safety policy, the **Universitat Politècnica de Catalunya · BarcelonaTech (UPC)** includes the strategic objective of incorporating occupational health and safety in all research, teaching and transfer activities undertaken at the University.

This principle of incorporation also applies to collaboration agreements that the UPC establishes with other entities to carry out scientific and technical tasks at the University.

If staff from an **external entity** undertake activities at the UPC as part of a research or technology transfer project, then there is a need to coordinate business activities in relation to occupational health and safety.

For this reason, and in compliance with Article 24 of the Spanish Law on Occupational Health and Safety and Royal Decree 171/2004, on the coordination of business activities in relation to occupational health and safety, the UPC has established the instructions described in this document. External staff must follow these health and safety instructions when they carry out activities at the University.

These instructions must be taken into account by external entities when they plan the research and technology transfer activities that their staff will undertake in university schools and faculties in order to determine which preventive measures should be adopted.

Prior to the start of activities, the external entity and the UPC will establish means of coordination on occupational health and safety. The main means will be the exchange of information and communications.

UPC principal investigators of research projects are the main channel of communication and coordination with external entities when external staff undertake activities at a University school or faculty. The principal investigators will be supported by technical advice provided by the UPC Occupational Health and Safety Service (SPRL).

Before the start of activities, external entities must inform all staff who will work at the UPC about these health and safety instructions. This will ensure that the instructions are followed during research and technology transfer activities undertaken at UPC schools and faculties.

Within the framework of coordination, external entities shall inform the UPC immediately of any incident relating to occupational health and safety, and any occupational accidents and diseases in particular.

The aim of these instructions is to help ensure the health and safety of all employees who carry out activities at the University. For this reason, the UPC should be informed of any doubts regarding the application of these instructions.

## 2. COORDINATION OF ACTIVITIES

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### 2.1. Documents for coordinating occupational health and safety activities

The main means of coordination that will be adopted is the exchange of information relating to occupational health and safety. For this reason, before the start of activities, the external entity must submit to the UPC principal investigator and to the SPRL:

- The forms in Appendix 1 of this document, duly filled in:
  - Document 1: Request for information about health and safety in the external entity
  - Document 2: Declaration of compliance with health and safety regulations
  - Document 3: Confirmation of reception of documents
- The assessment of specific risks involved in the activities undertaken by external staff at the UPC.
- Health and safety training certificates of external staff.
- Certificates of medical fitness (or a document waiving it, when possible).

These documents must be sent to the UPC principal investigator named in the collaboration agreement between the University and the external entity, with a copy to [spri.pacae@upc.edu](mailto:spri.pacae@upc.edu).

Depending on the activities, the external entity may be required to provide additional documents:

- A safe work procedure for the activities that will be carried out by external staff at the UPC.
- A record of appointment of a health and safety officer.
- Any other documents that are considered necessary.

## 2.2. Coordination actions

**Before the start of activities** at the UPC, the external entity and the UPC principal investigator must plan the research activities and document them appropriately.

The external entity is responsible for identifying risks in the activities that its employees will undertake at the UPC and for determining and adopting the required safety measures before the start of the activities.

If the research and technology transfer activities involve risks that could affect staff of the external entity or other people, the external entity and the UPC must agree on the preventive measures that must be adopted and document them adequately.

The external entity must consider the health and safety information established by the UPC to assess the risks of the activities that its staff will undertake at the University.

### **Training of staff from the external entity**

Staff from the external entity must be qualified for the tasks that they will undertake at the UPC, have completed suitable health and safety training relating to their activity, and possess the corresponding certificate of medical fitness for work.

### **Personal protection equipment**

Before the start of the work, the external entity will consult the UPC principal investigator to find out which personal protection equipment (PPE) its staff will need to access the UPC areas in which they will carry out activities and to use the University's work equipment, if necessary.

The external entity will give its staff the PPE required for the tasks that will be undertaken and to access the UPC areas. The PPE must be officially approved, suitable to protect against the specific risks, and in perfect condition.

### **Work equipment**

The work equipment belonging to the external entity that will be used at the UPC must be suitable for the research activities that will be undertaken, include all of the safety devices, be in perfect condition and be provided with the manufacturer's instructions.

If the use of the work equipment involves considerable risks, the external entity must have a safe work procedure that indicates the safety measures that will be adopted during the operations and/or processes carried out with this equipment.

The external entity will be responsible for ensuring that the work equipment meets the relevant health and safety regulations, and for undertaking the periodic inspections that are established in the regulations corresponding to each piece of equipment.

## **Welcome of external staff**

**At the start of external staff's activities** at the UPC, the UPC principal researcher or a person delegated by them must inform the external staff of the health and safety measures that must be followed during their work at the UPC. He/she will ensure that the external staff have received the health and safety documents and answer any questions that may arise. The principal investigator may consult the SPRL for advice on this task.

## **Aspects that the external entity must communicate to the UPC**

The external entity must inform the UPC principal investigator about:

- Any tasks that must be undertaken by their staff outside the University's normal working hours.
- Any change that could affect the activities of external staff or of UPC staff.
- Any change in relation to external staff.
- Occupational accidents involving external staff that occur at the UPC.

Any potential risk of accident or relevant safety deficiency that the external company identifies in the work zone or its surroundings must be reported immediately to the UPC principal investigator to determine the preventive actions that should be adopted.

Appendix 2 contains a document that should be used for notification of health and safety incidents.

### 3. HEALTH AND SAFETY INFORMATION AND INSTRUCTIONS

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#### General instructions

This section contains the general health and safety instructions that apply to staff from external entities during the research and technology transfer activities that they undertake at the UPC.

If the activities that external staff have to undertake at a UPC school or faculty involve serious occupational hazards (working at height, use of scaffolding, use of aerial work platforms, hot work, work in service ducts, work in confined spaces, etc.), the external entity must inform the UPC principal investigator so that the advice of the SPRL can be sought to determine which preventive actions should be adopted.

#### **External staff must:**

- Wear suitable work clothes and visible identification of the entity to which they belong.
- Properly use the PPE that is obligatory in the areas that they must access, and any specific PPE that is required for the activity.
- Follow the safety signs in the areas where the activities will be undertaken.
- Keep the work zone tidy and clean, to avoid obstructing circulation areas and causing accidents.
- Remove all the waste that has been generated when the activity has been completed.
- Note the state of the ground and the differences in level that could exist in routes around the work zone. When they go down stairs, hold onto the stair rail and avoid distractions such as reading documents, looking at a mobile phone, etc.
- Communicate any fault or deficiency in the facilities that could be a hazard. Any question or concern about health and safety that may arise during the activities should be passed on to the UPC principal investigator.



### **On work equipment**

- Use work equipment with the required protection devices and in accordance with the manufacturer's instructions. Work equipment can only be used by staff who have the specific training required to operate it and the authorisation of their entity.
- Do not override or remove safety devices or guards from work equipment.
- When work equipment is not in use, disconnect it from its electricity supply and make sure that it cannot be accessed by other people.

### **On electrical installations**

- Do not modify the distribution boards and the electrical installations of the UPC.
- If the research activities require action on the distribution board or the electrical installation, the UPC principal investigator must be asked to inform the UPC Maintenance Service of this requirement.
- Use extension cables and extension sockets that are in perfect condition and suitable for the power of the equipment that will be connected. Do not overload electrical sockets.
- To work outside or in wet areas, use suitable electrical equipment.

### **On gas installations**

- Gas installations can only be worked on or adjusted by an authorised gas fitter.
- If any activities need to be undertaken that could affect the gas installation or equipment that functions with gas, consult the principal researcher, who will pass your request on to the UPC maintenance service.

### **On work in circulation areas or spaces occupied by others**

If the activities are carried out in circulation areas or areas occupied by others and could represent a risk, the preventive measures to be adopted must be agreed with the UPC principal researcher:

- Delimit the work zone using fences or safety tape to prevent other people from entering and put up "no entry" signs.
- Try to ensure that there are no other people in the work zone.

### **Activities in traffic zones**

If the activities are to be undertaken in outside areas where there is traffic, in parking areas, or in inside areas where forklift trucks, aerial work platforms or other heavy machinery may travel, the preventive actions to adopt must be agreed with the UPC principal investigator:

- The work must be scheduled at times where there is little traffic, or the entry of vehicles should be prohibited and an alternative route established.
- The work zone must be delimited using fences and signs.
- Workers must wear high-visibility jackets or high-visibility work clothes.

### **Activities in areas where there is a risk of falls from height**

- Areas that are over 2 m high cannot be accessed unless workers are properly protected from the risk of falling to a different level. These areas include:
  - Flat roofs with no perimeter rails.
  - Sloped roofs or light-weight roof structures.
  - Skylights and other openings for lighting.
  - Walkways or places where the rails have deficiencies (no toe boards, no midrails, not strong enough).
  - Accesses to roofs or high areas with a lack of safety devices.
- The UPC's lifelines and anchor points can only be used if the University has given its authorisation.

If it is essential to access high areas to undertake the research activities, the UPC principal researcher must be informed so that this information can be passed on to the SPRL to determine the preventive actions that must be adopted.



### **On emergency prevention**

- Before work starts, check the location of fire alarms, evacuation routes, emergency exits and fire extinguishers in the areas in which the activity will be carried out.
- Keep the following free from obstacles at all times: evacuation routes, fire exits, access to fire extinguishers, equipped fire hydrants, dry standpipes and any other fire fighting system. Ensure that emergency signs remain visible.
- Keep fire doors shut. Do not wedge them open.
- Inform the UPC of any activity that affects evacuation routes and/or fire exits so that appropriate measures can be taken.
- Notify the UPC of any work that generates dust or heat that could activate automatic fire extinction systems.
- Smoking is prohibited in University buildings.

## ***i-Lab*** Instructions to follow in UPC laboratories

This section describes the health and safety instructions that apply to staff from external entities during research and technology transfer activities carried out in UPC laboratories.

External entities must consider this information when they assess risks and plan preventive actions relating to the activities that their staff will undertake at the UPC.

### **Health and safety regulations for laboratories**

**NSH-001**

#### **Work habits and personal hygiene**

- Keep your workplace clean and free from objects. Do not leave personal objects on work surfaces.
- Familiarise yourself with the location of emergency exits and evacuation routes, fire extinguishers and first aid equipment in your laboratory.
- Find out what to do in the case of an emergency.
- Do not work alone in the laboratory. If have no option but to work alone, make sure the control centre knows that you are in the laboratory.
- Do not wear contact lenses. They can cause eye injuries in cases of splashing or projection of particles.
- Tie your hair back. Do not wear pendants, bracelets or wide sleeved clothing, etc. They can cause injuries if they get caught in equipment.
- Do not eat or drink in the laboratory.
- Wash your hands after handling materials and before leaving the laboratory.

#### **Safety signs**

- Read and follow the safety signs in your workplace. They inform you of specific hazards, obligations, prohibitions and emergencies.
- Make sure that safety signs are always visible and in good condition. Do not cover them or change their position.
- If you do not know, ask what a safety sign means before you act.



### **Personal protection equipment**

- Find out which PPE should be used in the laboratory before you carry out an activity.
- Only use PPE that has CE marking.
- Read the product information booklet carefully before you use the PPE.
- Check the condition of the PPE before you use it. Withdraw any PPE that is faulty, flawed or damaged.
- Keep PPE in good condition. Store in a designated place.

### **Work equipment**

- Do not use work equipment until you know how it operates, the relevant safety regulations, and how to act in case of an emergency.
- Visually inspect the condition of the work equipment and electrical components before use.
- Use independent plug sockets to connect each piece of equipment. Do not use extension sockets. Do not connect cables with electrical tape.
- Disconnect all work equipment safely at the end of the activity.
- Do not use work equipment connected to the electricity supply if the equipment is wet or you have wet hands.
- If you see any anomaly in the work equipment, disconnect it from the electricity supply and label it as faulty so that it is no longer used.

## Specific information about activities undertaken at UPC laboratories

Appendix 3 of this document provides specific health and safety information relating to the activities that are carried out in UPC laboratories.

The following information is included on each type of activity:

- Identification of the risks involved
- Preventive measures, grouped into:

Group protection equipment: including fume cupboards, fixed extraction hoods biosafety cabinets, forced natural ventilation, protective casing and guards, safety switches and commands, etc.

Personal protection equipment: information on the characteristics that PPE must have, which can be consulted directly by clicking on the specific document [link to the catalogue] or in the UPC Catalogue of Personal Protection Equipment (<http://www.upc.edu/prevencio/ca/seguretat-higiene/arxiu/cataleg-epi.pdf>).

Technical organisational measures: relating to how the activities should be undertaken.

Health and safety information: with links to the UPC's Occupational Health and Safety website, which includes documents on each activity that should be downloaded and consulted.

**Note:** if the list of laboratory activities does not include those that external staff must undertake at the UPC, the external entity must inform the UPC principal investigator, who will then pass on the information to the SPRL.



## 4. WHAT TO DO IN THE CASE OF AN OCCUPATIONAL ACCIDENT

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In the case of an occupational accident, healthcare for external staff will be provided by the mutual insurance company for occupational accidents and diseases with which the external entity is associated.

Before work is carried out at a UPC centre, external staff should determine the location of the closest health centre of their mutual insurance company and note the numbers of the information lines.

**In the case of an occupational accident, the external entity must inform the UPC principal researcher, who will then inform the SPRL of the UPC.**



## **APPENDIX 1: Documents to be completed by the external entity**

Document 1: Request for information about health and safety in the external entity

Document 2: Declaration of compliance with health and safety regulations.

Document 3: Confirmation of reception of documents



**DOCUMENT 1 - REQUEST FOR INFORMATION ABOUT HEALTH AND SAFETY IN THE EXTERNAL ENTITY**

*This form must be filled in by the external entity and sent to the UPC principal investigator, with a copy to sprl.pacae@upc.edu.*

**External entity**

Name/registered name .....

Address ..... Tax ID number (CIF) .....

**Activity that external staff will undertake at the UPC**

**Health and safety method adopted by the external company**

Own health and safety service

	Own	Collaboration with external OHS service
Safety at work	<input type="checkbox"/>	<input type="checkbox"/>
Hygiene	<input type="checkbox"/>	<input type="checkbox"/>
Ergonomics and psychosociology	<input type="checkbox"/>	<input type="checkbox"/>
Occupational medicine	<input type="checkbox"/>	<input type="checkbox"/>

Name of the external OHS Service .....

External occupational health and safety service

Name of the collaborating external OHS service .....

Others: .....

**Occupational health and safety representative for the external entity**

Name and surnames .....

Position .....

Telephone ..... Email .....

**External staff who will carry out activities at the UPC**

*(Can be attached in a separate document)*

Name and surname(s) DNI/identification/passport number

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Activity that external staff will undertake at the UPC

- Research work in an office
Activities in a laboratory
Activities in other areas
Others:

Description of the activity (can be attached in a separate document).

[Empty box for activity description]

Work equipment of the external entity that will be used at the UPC

[Empty box for work equipment]

UPC work equipment that staff of the external entity will use

[Empty box for UPC work equipment]

Risks of the activity

[Empty box for risks of activity]

Preventive measures

[Empty box for preventive measures]

Risks that could affect other people present in the UPC facilities

[Empty box for risks affecting others]

Signature and stamp of the external entity

In case of digital signature, protect the document after signing.

Name and surname(s) .....

Position ..... Date .....



DOCUMENT 2 DECLARATION OF COMPLIANCE WITH HEALTH AND SAFETY REGULATIONS

This form must be filled in by the external entity and sent to the UPC principal investigator, with a copy to sprl.pacae@upc.edu.

(Name and surnames)..... with ID number..... in the role of ..... from the company .....

I declare:

That the entity that I represent fulfils the obligations established in Law 31/95, on occupational health and safety, and the implementing regulations, and specifically that:

- 1. It has carried out a risk assessment of the activities that its staff will undertake at the UPC and has considered the health and safety documents provided by the UPC.
2. It has informed its staff about the risk assessment of their activity and about the health and safety documents provided by the UPC.
3. Its staff have received training on the occupational health and safety, according to the risks identified in their workplace.
4. Its staff have been provided with the personal protection equipment indicated in the risk assessment and in the UPC's health and safety documents.
5. The entity's work equipment that will be used at the UPC complies with the applicable health and safety regulations.
6. It offers its staff specific health surveillance for the risks in their workplace.
7. It will inform the UPC principal investigator of any anomaly, incident or accident that occurs on UPC premises, and of any emergency situations.

In witness whereof,

(Name and surnames).....

....., .....of .....of 20.....

(Signature and stamp of the external entity)

In case of digital signature, protect the document after signing.

Documentation that must be submitted:

- Assessment of the specific risks of the activities that will be undertaken by external staff at the UPC.
• Health and safety training certificates of external staff.
• Certificates of medical fitness (or a document waiving the health check, when possible).



DOCUMENT 3 CONFIRMATION OF RECEPTION OF DOCUMENTS

This form must be filled in by the external entity and sent to the UPC principal investigator, with a copy to sprl.pacae@upc.edu.

The contents of the documents that the UPC has provided:

- Health and safety instructions for external staff who undertake research and technology transfer activities at the UPC. Code 53.00/16/CAE/MGM.

- Others: [Empty box for additional information]

have been passed on to the staff of your external entity who will undertake activities at the UPC, so that these instructions are taken into account during activities at UPC schools and faculties.

Name and surname(s)....., with ID number ..... in the role of ..... at the company .....

I declare:

That staff from the entity that I represent who will undertake activities at the UPC have been suitably informed of the health and safety instructions described in the documents indicated above that the UPC has provided.

In witness whereof,

Name and surname(s) ..... of ..... of 20.....

(Signature and stamp of the external entity)

In case of digital signature, protect the document after signing.



## **APPENDIX 2:**

### **Document for notification of health and safety incidents**



**PROPOSAL / NOTIFICATION ON HEALTH AND SAFETY**

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Based on the right of workers to participate in improving the levels of health and safety protection, established in Article 18 of the Law on occupational health and safety and by virtue of Article 24 of the same law, referring to the coordination of business activities in relation to occupational health and safety, the following proposal and/or notification on health and safety is presented:

**Name of the external entity:** .....

**Activity contracted:** .....

**Place where the work is carried out** (indicate the campus, building, floor and door)  
.....

PROPOSAL/NOTIFICATION:

**Information about the person making the proposal/notification**

**Received on behalf of the UPC**

Name and surname(s)	Name and surname(s)
In the role of	In the role of
External entity	
Signature*	Signature
Date	Date

*\*In case of digital signature, protect the document after signing.*



## **APPENDIX 3:**

### **Health and safety information regarding activities undertaken in UPC laboratories**



## LIST OF KNOWN ACTIVITIES THAT ARE UNDERTAKEN IN UPC LABORATORIES

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Handling of hazardous chemicals (harmful, toxic, corrosive, etc.)	<i>See page. 1</i>
Handling of carcinogenic, mutagenic and/or reprotoxic chemicals	<i>See page. 2</i>
Occasional handling of hazardous chemicals (harmful, toxic, corrosive, etc.)	<i>See page. 3</i>
Handling of flammable chemicals	<i>See page. 4</i>
Handling of cryogenic chemicals	<i>See page. 6</i>
Heating processes: drying of hazardous chemicals (harmful, toxic, corrosive, etc.) with heating equipment such as heating plates, drying ovens, Bunsen burners and electric burners	<i>See page. 7</i>
Use of heating equipment such as heating plates, furnaces, drying ovens, Bunsen burners and electric burners	<i>See page. 8</i>
Handling of biological agents	<i>See page. 9</i>
Operations using pressurised equipment (compressors, heat exchangers, etc.)	<i>See page. 10</i>
Sterilisation operations with autoclaves	<i>See page. 11</i>
Handling of glassware	<i>See page. 12</i>
Oxyacetylene welding and oxyfuel cutting operations	<i>See page. 13</i>
Arc welding operations	<i>See page. 14</i>
Accessing and/or moving around the work area	<i>See page. 15</i>
Operations with pressurised technical gases	<i>See page. 16</i>
Operations with machine tools	<i>See page. 17</i>
Operations with machine tools: lathes	<i>See page. 18</i>
Operations with machine tools: milling machines	<i>See page. 19</i>
Operations with machine tools: drill presses	<i>See page. 20</i>
Operations with machine tools: grinding machines	<i>See page. 21</i>
Operations with machine tools: vertical bandsaw	<i>See page. 22</i>
Operations with portable electrical machinery	<i>See page. 23</i>
Use of stepladders (working height < 3.5 m)	<i>See page. 24</i>
Operations with traction-compression equipment	<i>See page. 25</i>
Operations with robots	<i>See page. 26</i>
Operations with textile machinery	<i>See page. 27</i>





Welding operations	<i>See page. 28</i>
Handling of encapsulated sources of radiation (measurements, determination of compositions, metrology, teaching practicals, etc.)	<i>See page. 29</i>
Handling of non-encapsulated sources of radiation (measurements, determination of compositions, metrology, teaching practicals, etc.)	<i>See page. 30</i>
Operations with atomic absorption equipment	<i>See page. 31</i>
Operations with gas chromatography equipment	<i>See page. 32</i>
Operations with class 3R, 3B and 4 laser equipment	<i>See page. 33</i>
Transport and/or manual handling of loads	<i>See page. 34</i>
Use of load-lifting equipment: hand pallet trucks	<i>See page. 35</i>
Use of load-lifting equipment: fork lift trucks	<i>See page. 36</i>
Operations with transformers and/or autotransformers	<i>See page. 37</i>
Operations with engines and/or engine benches	<i>See page. 38</i>
Tasks using visual display units	<i>See page. 39</i>
Handling of manufactured nanomaterials	<i>See page. 40</i>
Operations with table-top work equipment: mini lathes	<i>See page. 41</i>
Operations with table-top work equipment: sanders	<i>See page. 42</i>
Operations with table-top work equipment: bench saws	<i>See page. 43</i>
Operations with table-top work equipment: drills	<i>See page. 44</i>
Operations with desktop equipment: hot wire cutter	<i>See page. 45</i>
Use of 3D printers	<i>See page. 46</i>
Operations with portable machinery: thermal strippers	<i>See page. 47</i>
Operations with portable machinery: pneumatic staplers	<i>See page. 48</i>
Use of equipment with a heat source: thermoforming equipment	<i>See page. 49</i>
Use of manual tools	<i>See page. 50</i>
Handling of wastewater (sample-taking, analysis and installations)	<i>See page. 51</i>
Operations with class 2 laser equipment	<i>See page. 53</i>
Operations with table-top work equipment - Polisher	<i>See page. 54</i>
Operations with table-top work equipment - CNC engraving machine	<i>See page. 55</i>
Operations with a laser cutting machine (cutting, marking and engraving materials) - USER MODE	<i>See page. 56</i>



Operations with PCB (printed circuit board) processing equipment	<i>See page. 57</i>
Operations with desktop equipment: ballistic pendulum	<i>See page. 58</i>
Operations with desktop equipment: transilluminator	<i>See page. 59</i>
Operations with transformers and/or autotransformers (high V < 500 V)	<i>See page. 60</i>
Operations with transformers and/or autotransformers (500 V < high V < 1000 V)	<i>See page. 61</i>
Operations with a machine tool: Horizontal bandsaw	<i>See page. 62</i>
Use of load-lifting equipment: Portable mobile crane	<i>See page. 63</i>
Operations with table-top work equipment - Metallographic polisher	<i>See page. 64</i>
Operations with table-top work equipment - Melt flow index tester	<i>See page. 65</i>
Use of a Charpy pendulum	<i>See page. 66</i>
Use of rotary evaporator	<i>See page. 67</i>
Distillation operations in pilot plants	<i>See page. 68</i>
Operations with test bench (wind tunnel, wind turbine)	<i>See page. 69</i>
Testing operations with compressors	<i>See page. 70</i>
Vacuum evaporation operations	<i>See page. 71</i>
Vacuum filtration operations	<i>See page. 72</i>
Vacuum drying operations	<i>See page. 73</i>
Use of lifting equipment: bridge crane	<i>See page. 74</i>
Operations with actuators in a portal frame	<i>See page. 75</i>
Assembly and use of modular metal scaffolding	<i>See page. 76</i>
Use of lifting equipment: electric pallet stacker truck	<i>See page. 77</i>
Operations with work equipment: extruder	<i>See page. 78</i>
Operations with work equipment: disk saw with cooling system	<i>See page. 79</i>
Operations with work equipment: compactor	<i>See page. 80</i>
Operations with work equipment: Los Angeles abrasion machine	<i>See page. 81</i>
Operations with work equipment: large-format sieve shaker	<i>See page. 82</i>
Operations with work equipment: hot asphalt mixer	<i>See page. 83</i>
Operations with work equipment: track machine	<i>See page. 84</i>



Handling of bituminous materials (bitumen, asphalt)	<i>See page. 85</i>
Operations with table-top work equipment: tribometer	<i>See page. 86</i>
Operations with desktop equipment: CNC milling machine High-Z	<i>See page. 87</i>
Use of ultrasonic sonicator	<i>See page. 88</i>
Use of titrator	<i>See page. 89</i>
Operations with atomic fluorescence spectrophotometer equipment	<i>See page. 90</i>
Operations with work equipment: resonance fatigue testing machine	<i>See page. 91</i>
Handling of hazardous chemicals: mercury	<i>See page. 92</i>
Operations with equipment: plasma machine	<i>See page. 93</i>
Use of equipment with a heat source: muffle (oven)	<i>See page. 95</i>
Spray-drying operations – mini spray-dryer	<i>See page. 96</i>
Operations with work equipment: sieve shaker	<i>See page. 97</i>
Manual metal-powder grinding operations	<i>See page. 98</i>
Experimental operations with robots on mobile platforms	<i>See page. 99</i>
Carbon-fibre cutting operations (with scissors) and brush application of epoxy resin	<i>See page. 100</i>
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## HANDLING OF HAZARDOUS CHEMICALS (HARMFUL, TOXIC, CORROSIVE, ETC.)

**RISK/S:** Contact with corrosive and/or caustic substances  
Exposure to harmful and/or toxic substances

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)
Local extraction system	Fume cupboard

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask: Use when a local extraction system cannot be used (for example, a fume cupboard, extraction hood or aspiration system)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 219 - General purpose fume cupboards	[link to the PDF]
Health and safety regulations	SHR 301 - Incompatibility between chemicals	[link to the PDF]
Health and safety regulations	SHR 302 - Proper storage of chemical products	[link to the PDF]
Health and safety regulations	SHR 304 - Storage of corrosive chemicals in movable containers	[link to the PDF]
Health and safety regulations	SHR 308 - Action in the case of liquid chemical spills	[link to the PDF]
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## HANDLING OF CARCINOGENIC, MUTAGENIC AND/OR REPROTOXIC CHEMICALS

**RISK/S:** Exposure to chemical contaminants

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Fume cupboard

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask: Use when a local extraction system cannot be used (for example, a fume cupboard, extraction hood or aspiration system)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- HEALTH SURVEILLANCE: Staff must regularly undergo specific health checks.

#### \* Pregnancy and/or breastfeeding - Specific measures:

- Adapt the workplace and eliminate the process in which there is a chemical agent that is harmful for the health of the pregnant worker, the embryo, the foetus or the breastfeeding infant.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 305 - Carcinogenic chemical agents	[link to the PDF]
Health and safety regulations	SHR 306 - Mutagenic chemical agents	[link to the PDF]
Health and safety regulations	SHR 307 - Chemical Agents that are Reproductive Toxicants	[link to the PDF]
Health and safety regulations	SHR 701 - Pregnancy and breastfeeding	[link to the PDF]
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OCCASIONAL HANDLING OF HAZARDOUS CHEMICALS (HARMFUL, TOXIC, CORROSIVE, ETC.)

**RISK/S:** Contact with corrosive and/or caustic substances  
Exposure to harmful and/or toxic substances

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 301 - Incompatibility between chemicals	[link to the PDF]
Health and safety regulations	SHR 302 - Proper storage of chemical products	[link to the PDF]
Health and safety regulations	SHR 304 - Storage of corrosive chemicals in movable containers	[link to the PDF]
Health and safety regulations	SHR 308 - Action in the case of liquid chemical spills	[link to the PDF]
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]



## HANDLING OF FLAMMABLE CHEMICALS

**RISK/S:** Exposure to harmful and/or toxic substances  
Fires

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask: Use when a local extraction system cannot be used (for example, a fume cupboard, extraction hood or aspiration system)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Carry out operations of decanting flammable chemicals far from heat sources (ovens, furnaces, heating plates, etc.).
- Avoid the creation of electrostatic charges when flammable chemicals are decanted.
  - Connect recipients to each other equipotentially (the recipient that is emptied and that which is filled) and to earth.
  - Decant the product slowly, preferably using manual pneumatic pumps (if electric pumps are used, they must be flameproof).
  - Decanting must be carried out in areas that are suitable for this activity and equipped with an extraction system.
- Highly flammable chemical products should not be decanted in basements.
- Flammable chemicals must be stored in jerry cans, safety cabinets or specific stores with natural or forced ventilation. If the products need to be cooled, they should be stored in high-safety cabinets, i.e. cabinets with no electrical installation inside them.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 301 - Incompatibility between chemicals	[link to the PDF]
Health and safety regulations	SHR 302 - Proper storage of chemical products	[link to the PDF]
Health and safety regulations	SHR 303 - Storage of flammable and combustible chemicals in movable containers	[link to the PDF]
Health and safety regulations	SHR 308 - Action in the case of liquid chemical spills	[link to the PDF]

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## HANDLING OF CRYOGENIC CHEMICALS

**RISK/S:** Suffocation due to displacement of oxygen  
Thermal contact

### HEALTH AND SAFETY MEASURES:

\* **Collective protection equipment (CPE):**

Type	CPE
General extraction system	General ventilation forced (chemical)

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC019 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the body	UPC503 - Protective clothing (apron)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

\* **Technical/organisational measures (TOM):**

- Only use recipients that are designed and specifically labelled for cryogenic chemicals (such as Dewars).
- Use dispensers in operations to decant cryogenic chemicals.
- Refer to the safety data sheet (SDS) on the cryogenic chemical and follow the indicated prevention measures.
- Have oxygen deficiency monitoring equipment where cryogenic chemicals are handled.
- Periodically check that the environment gas detectors are working correctly.
- If a lift must be used to transport a cryogenic vessel, the vessel must travel in the lift unaccompanied. Transport should be coordinated between two people, with one at the start point and the other at the final destination to receive the vessel.

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## HEATING PROCESSES: DRYING OF HAZARDOUS CHEMICALS (HARMFUL, TOXIC, CORROSIVE, ETC.) WITH HEATING EQUIPMENT SUCH AS HEATING PLATES, DRYING OVENS, BUNSEN BURNERS AND ELECTRIC BURNERS

**RISK/S:** Exposure to harmful and/or toxic substances  
Thermal contact

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Extraction hood moveable/fixed

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask: Use when a local extraction system cannot be used (for example, a fume cupboard, extraction hood or aspiration system)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Follow the safety warnings specified in the work equipment's instructions manual.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 213 - Electric burners	[link to the PDF]
Health and safety regulations	SHR 214 - Bunsen burners	[link to the PDF]
Health and safety regulations	SHR 215 - Muffle furnaces and ovens	[link to the PDF]
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## USE OF HEATING EQUIPMENT SUCH AS HEATING PLATES, FURNACES, DRYING OVENS, BUNSEN BURNERS AND ELECTRIC BURNERS

**RISK/S:** Thermal contact

### **HEALTH AND SAFETY MEASURES:**

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 213 - Electric burners	[link to the PDF]
Health and safety regulations	SHR 214 - Bunsen burners	[link to the PDF]
Health and safety regulations	SHR 215 - Muffle furnaces and ovens	[link to the PDF]

## HANDLING OF BIOLOGICAL AGENTS

**RISK/S:** Exposure to biological contaminants  
Knocks/cuts by objects or tools

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Biosafety cabinet

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Hazard group 1 biological agents can be handled on a work table or within a laminar flow cabinet (sample protection), following the appropriate hygiene measures.
- If you handle biological agents from group 3 and/or 4, inform the SPRL.
- Use hygiene and sanitary facilities, changing rooms and separate lockers to store street clothes and work clothes.
- Make sure you have the safety data sheet for the biological agent and follow the preventive measures therein.
- Avoid the use of a harmful biological agent by replacing it with a biological agent that, under its conditions of use, is not dangerous or is less dangerous to workers' health and safety.
- Only authorised personnel should be allowed to enter the laboratory.
- Hazard group 2 biological agents should be handled inside a biosafety cabinet, specifically when there is a risk of generating aerosols.
- When using the biosafety cabinet (BSC):
  - Work "from clean to contaminated".
  - Place the waste containers inside the BSC.
  - Place the material at least 10 cm away from the front part of the BSC, without covering any grids
  - The user's face must be above the front opening of the BSC while working.
  - Do not disconnect the security devices (alarms) of the BSC.
  - Disinfect the BSC for 10-15 minutes, before and after use.
- Use electric microincinerators to sterilise handles. Flame sterilisation may release aerosols. Use disposable plastic handles as an alternative.
- Follow specific disinfection procedures according to the process, considering the following:
  - Use chemicals to disinfect instruments and work surfaces that cannot withstand high temperatures at room temperature. Follow the preventive measures described on the safety data sheet (SDS) for the chemical product that you are going to use.
  - Sterilise laboratory materials and media and inert biological waste using an autoclave to destroy microorganisms.
 Follow the preventive measures described in the activity "Autoclave sterilisation operations".
- Establish appropriate working procedures that indicate the appropriate technical measures to prevent or minimise the release of biological agents.
- Safely store biological agents in containers and/or cabinets identified using the biohazard sign.

- Wear appropriate clothes (lab coat or similar) to prevent contaminating your street clothing. Do not wash work clothes at home. Use disposable lab coats or overalls as an alternative.
- Avoid using needles whenever possible. If you use needles, do not bend, break or recap them. Discard all used needles in specific containers for biohazardous waste and sharps.
- Use mechanical pipetting systems.
- HEALTH SURVEILLANCE: Periodic specific medical check-ups are recommended.

**\* Pregnancy and/or breastfeeding - Specific measures:**

- Do not work with the following biological agents from Group 2:
  - Toxoplasma gondii
  - Rubella virus
  - Campylobacter fetus
  - Treponema pallidum
  - Cytomegalovirus
  - Herpes simplex virus
  - Coccidioides immitis

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 340 – Biological agents	[link to the PDF]
Health and safety regulations	SHR 701 - Pregnancy and breastfeeding	[link to the PDF]
Specialised training	EPZ UPC003 - Safety in the handling of biological agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS USING PRESSURISED EQUIPMENT (COMPRESSORS, HEAT EXCHANGERS, ETC)

**RISK/S:** Explosions

### **HEALTH AND SAFETY MEASURES:**

#### \* **Technical/organisational measures (TOM):**

- Periodically check the manometer to monitor the working pressure.
- The increase in pressure and decompression must be gradual to avoid sudden changes.
- If pressure equipment is used at very high pressure, it should be situated in areas designed for this purpose and adapted to protect against the risk of explosion.
- Check that the obligatory periodic inspections have been carried out.

#### \* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr/>

Type	Title	Consult
Health and safety regulations	SHR 222 - Pressure equipment: regulations and inspections	[link to the PDF]



## STERILISATION OPERATIONS WITH AUTOCLAVES

**RISK/S:** Explosions  
Thermal contact

### **HEALTH AND SAFETY MEASURES:**

\* **Personal protection equipment (PPE):** <http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC006 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

\* **Technical/organisational measures (TOM):**

- Periodically check the manometer to monitor the working pressure.
- The increase in pressure and decompression must be gradual to avoid sudden changes.
- Wait until the autoclaved material has cooled down before you extract it.
- Steam purging should be performed with a sealed chamber containing water, not directly to the exterior.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Check that the obligatory periodic inspections have been carried out.

\* **Health and safety information:** <http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	NSH 226 – Autoclave	[link to the PDF]

## HANDLING OF GLASSWARE

**RISK/S:** Knocks/cuts by objects or tools

### HEALTH AND SAFETY MEASURES:

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

\* **Technical/organisational measures (TOM):**

- Examine the condition of glassware before you use it, and get rid of any items that have flaws.
- Do not directly heat glassware in a flame. Put a heat diffuser between the glassware and the flame (for example a metal mesh) to prevent breakage.
- Put glassware into hot baths, ovens, furnaces, etc. gradually and slowly, to avoid a sudden change of temperature that could cause the material to break.
- Place a thin layer of silicon between glass surfaces and use plastic tops to prevent glass items from sticking together.

## OXYACETYLENE WELDING AND OXYFUEL CUTTING OPERATIONS

**RISK/S:** Exposure to chemical contaminants  
Exposure to non-ionising radiation  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (mechanical)
Local extraction system	Extraction hood moveable/fixed
Safety devices	Protective screens

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC008 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC104 - Face shield	[link to the catalogue]
Protection of the respiratory tract	UPC204 - Respiratory protection mask: Use when a local extraction system cannot be used (for example, a fume cupboard, extraction hood or aspiration system)	[link to the catalogue]
Protection of the body	UPC504 - Protective clothing (apron)	[link to the catalogue]
Protection of the body	UPC505 - Protective clothing (gaiters)	[link to the catalogue]
Protection of feet / legs	UPC602 - Safety footwear	[link to the catalogue]

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 216 - Oxyacetylene welding	[link to the PDF]
Specialised training	EPZ UPC012 - Safety in oxyacetylene welding work	[link to the PDF]

## ARC WELDING OPERATIONS

**RISK/S:** Exposure to chemical contaminants  
Exposure to non-ionising radiation  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

**\* Collective protection equipment (CPE):**

Type	CPE
General extraction system	General ventilation forced (mechanical)
Local extraction system	Extraction hood moveable/fixed
Safety devices	Protective screens

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC008 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC104 - Face shield	[link to the catalogue]
Protection of the respiratory tract	UPC204 - Respiratory protection mask: Use when a local extraction system cannot be used (for example, a fume cupboard, extraction hood or aspiration system)	[link to the catalogue]
Protection of the body	UPC504 - Protective clothing (apron)	[link to the catalogue]
Protection of the body	UPC505 - Protective clothing (gaiters)	[link to the catalogue]
Protection of feet / legs	UPC602 - Safety footwear	[link to the catalogue]

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 217 - Arc welding	[link to the PDF]
Specialised training	EPZ UPC011 - Safety in electric welding work	[link to the PDF]

## ACCESSING AND/OR MOVING AROUND THE WORK AREA

**RISK/S:** Falling of people to the same level  
Knocks against static objects

### **HEALTH AND SAFETY MEASURES:**

#### \* **Technical/organisational measures (TOM):**

- When you go downstairs, use the stair rail and avoid distractions such as reading documents, checking your mobile phone, etc.
- Check the state of the ground and any unevenness that there may be along the route.
- Clean up spills of water, coffee or similar substances as soon as possible or inform the appropriate person.
- Gather up and/or protect electrical cables and/or data cables in circulation areas.
- Keep circulation areas and/or work areas as well as evacuation routes free from objects. Remove materials (chairs, tables and boxes, etc.) and/or equipment that is not required to complete the tasks.
- Keep the drawers of filing cabinets or chests and the doors of cupboards closed.

#### \* **Health and safety information:**

<http://www.upc.edu/prevenio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 003 - Order, cleaning and maintenance	[link to the PDF]

## OPERATIONS WITH PRESSURISED TECHNICAL GASES

**RISK/S:** Explosions  
Exposure to harmful and/or toxic substances  
Falling of detached objects

### HEALTH AND SAFETY MEASURES:

**\* Technical/organisational measures (TOM):**

- Gas cylinders must be attached by a chain to a solid support so that they cannot fall over.
- Always keep the valve guard on, as the valve is the weakest part of the gas cylinder. The guard protects against knocks and falls, preventing gas leaks.
- Keep the valve closed during storage, even when gas cylinders are empty as they always contain small amounts of residual gas.
- Periodically check the connections of gas cylinders and the gas installation using a solution of soapy water, specific products or gas detectors to prevent potential leaks.
- Regularly check the correct operation of leak detectors for flammable and inert gases.
- Do not remove or change identifying labels on gas cylinders.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr/>

Type	Title	Consult
Health and safety regulations	SHR 310 - Pressure equipment: cylinders	[link to the PDF]
Specialised training	EPZ UPC004 - Safety in the handling of technical gases	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH MACHINE TOOLS

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

**\* Collective protection equipment (CPE):**

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

**\* Technical/organisational measures (TOM):**

- Keep hands away from the cutting tool. Place hands on the equipment's controls while workpieces are being machined.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Filings and/or chips that are produced when pieces are machined must be removed with a brush.
- Use clamps, screws or other securing devices to secure the work piece.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]

## OPERATIONS WITH MACHINE TOOLS: LATHES

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 204 - Lathes	[link to the PDF]
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]



## OPERATIONS WITH MACHINE TOOLS: MILLING MACHINES

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 205 - Milling machines	[link to the PDF]
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]

## OPERATIONS WITH MACHINE TOOLS: DRILL PRESSES

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

**\* Collective protection equipment (CPE):**

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

**\* Technical/organisational measures (TOM):**

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 206 - Drill presses	[link to the PDF]
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]

## OPERATIONS WITH MACHINE TOOLS: GRINDING MACHINES

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

#### \* Technical/organisational measures (TOM):

- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 207 - Grinding machines	[link to the PDF]
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]

## OPERATIONS WITH MACHINE TOOLS: VERTICAL BANDSAW

**RISK/S:** Knocks/cuts by objects or tools  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

#### \* Technical/organisational measures (TOM):

- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Filings and/or chips that are produced when pieces are machined must be removed with a brush.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- During cutting operations, the entire path of the bandsaw must be protected, leaving open only the part of the saw that is strictly necessary for cutting.
- Use push rods to move the workpiece during manual feed operations, and guides for longitudinal cutting.
- Follow the safety warnings specified in the work equipment's instructions manual.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]

## OPERATIONS WITH PORTABLE ELECTRICAL MACHINERY

**RISK/S:** Exposure to physical contaminants: noise  
Knocks/cuts by objects or tools  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Check that the voltage indicated on the equipment's identification plate is the same as that of the electric distribution network to which it is connected.
- Keep hands away from the cutting tool. Place hands on the equipment's controls while workpieces are being machined.
- Use clamps, screws or other securing devices to secure the work piece.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Use hearing protectors according to the noise levels generated and the exposure time. Consult the manufacturer's instructions.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	NSH 225 – Portable electric machines	[link to the PDF]
Health and safety regulations	SHR 208 - Angle grinders	[link to the PDF]
Health and safety regulations	SHR 209 - Portable electric drills	[link to the PDF]
Health and safety regulations	SHR 210 - Portable electric jigsaws	[link to the PDF]
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## USE OF STEPLADDERS (WORKING HEIGHT < 3.5 M)

**RISK/S:** Falling of people to a different level

### **HEALTH AND SAFETY MEASURES:**

\* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 203 - Portable ladders	[link to the PDF]

## OPERATIONS WITH TRACTION-COMPRESSION EQUIPMENT

**RISK/S:** Projection of fragments or particles  
Trapping by or between objects

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards specific for presses
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

## OPERATIONS WITH ROBOTS

**RISK/S:** Knocks and contact with moving objects  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

**\* Collective protection equipment (CPE):**

Type	CPE
Safety devices	Delimiters of operating areas
Safety devices	Safety switches and commands

**\* Technical/organisational measures (TOM):**

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Before the robot's movement is started, check that there are no objects in its field of movement that could cause a collision.
- Control the working speed of the robot.
- Follow the safety warnings specified in the work equipment's instructions manual.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC009 - Safety when working with robots	[link to the PDF]



## OPERATIONS WITH TEXTILE MACHINERY

**RISK/S:** Exposure to chemical contaminants: powders  
Exposure to physical contaminants: noise  
Knocks and contact with moving objects  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

## WELDING OPERATIONS

**RISK/S:** Exposure to harmful and/or toxic substances  
Thermal contact

### **HEALTH AND SAFETY MEASURES:**

**\* Collective protection equipment (CPE):**

Type	CPE
Local extraction system	Table-top extractor

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 218 - Soldering	[link to the PDF]

**HANDLING OF ENCAPSULATED SOURCES OF RADIATION (MEASUREMENTS, DETERMINATION OF COMPOSITIONS, METROLOGY, TEACHING PRACTICALS, ETC.)**

**RISK/S:** Exposure to ionising radiation: external irradiation

**HEALTH AND SAFETY MEASURES:**

**\* Technical/organisational measures (TOM):**

- Consult the Radiological Protection Service (SPR) to find out which health and safety measures should be adopted.
- HEALTH SURVEILLANCE: Staff must regularly undergo specific health checks.

## **HANDLING OF NON-ENCAPSULATED SOURCES OF RADIATION (MEASUREMENTS, DETERMINATION OF COMPOSITIONS, METROLOGY, TEACHING PRACTICALS, ETC.)**

**RISK/S:** Exposure to ionising radiation: external irradiation and contamination

### **HEALTH AND SAFETY MEASURES:**

#### **\* Technical/organisational measures (TOM):**

- Consult the Radiological Protection Service (SPR) to find out which health and safety measures should be adopted.
- HEALTH SURVEILLANCE: Staff must regularly undergo specific health checks.

## OPERATIONS WITH ATOMIC ABSORPTION EQUIPMENT

**RISK/S:** Thermal contact

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Extraction hood fixed

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Gas cylinders must be attached by a chain to a solid support so that they cannot fall over.
- In processes in which flammable and/or oxidising gases are used, a suitable system to prevent flashback of the flame must be installed at the outlet of each pressure regulator.
- Do not look directly into the flame or the emission sources (lamps).
- Follow the safety warnings specified in the work equipment's instructions manual.
- Regularly check the correct operation of leak detectors for flammable and inert gases.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Follow the preventive measures described in the activity "Operations with pressurised technical gases".

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 310 - Pressure equipment: cylinders	[link to the PDF]
Specialised training	EPZ UPC004 - Safety in the handling of technical gases	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH GAS CHROMATOGRAPHY EQUIPMENT

**RISK/S:** Suffocation due to displacement of oxygen  
Thermal contact

### HEALTH AND SAFETY MEASURES:

**\* Collective protection equipment (CPE):**

Type	CPE
General extraction system	General ventilation forced (mechanical)

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Gas cylinders must be attached by a chain to a solid support so that they cannot fall over.
- Always keep the valve guard on, as the valve is the weakest part of the gas cylinder. The guard protects against knocks and falls, preventing gas leaks.
- Keep the valve closed during storage, even when gas cylinders are empty as they always contain small amounts of residual gas.
- Periodically check the connections of gas cylinders and the gas installation using a solution of soapy water, specific products or gas detectors to prevent potential leaks.
- Place the work equipment in an area that has a general extraction system to disperse the heat that is produced.
- Use automatic injectors. Avoid contact with the syringes by storing them in their boxes after use.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Do not remove or change identifying labels on gas cylinders.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 310 - Pressure equipment: cylinders	[link to the PDF]
Specialised training	EPZ UPC004 - Safety in the handling of technical gases	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH CLASS 3R, 3B AND 4 LASER EQUIPMENT

**RISK/S:** Exposure to non-ionising radiation  
Fires

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective screens

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC106 - Laser safety glasses: Consult the equipment's instruction manual	[link to the catalogue]
Protection of the eyes / face	UPC107 - Safety glasses: Consult the equipment's instruction manual	[link to the catalogue]
Protection of the body	UPC511 - Protective clothing: Consult the equipment's instruction manual	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Avoid exposure of eyes or skin to direct radiation or diffuse radiation from the beam.
- Establish a key control system or a laser beam attenuator.
- Establish and be familiar with the safe areas. Carry out operations with class 3B or 4 lasers in rooms that are allocated for laser use only, and restrict access to authorised personnel.
- Use a "beam stop" at the end of the useful path of the beam.
- Position the laser in such a way that the height of the beam is well above or below eye level, to avoid potential accidents.
- Follow the safety warnings specified in the work equipment's instructions manual.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 228 – Laser equipment	[link to the PDF]
Specialised training	EPZ UPC008 - Safety when working with laser equipment	[link to the PDF]

## TRANSPORT AND/OR MANUAL HANDLING OF LOADS

**RISK/S:** Falling of objects due to handling  
Knocks/cuts by objects or tools  
Overexertion

### HEALTH AND SAFETY MEASURES:

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]



## USE OF LOAD-LIFTING EQUIPMENT: HAND PALLET TRUCKS

**RISK/S:** Falling of objects due to handling  
Knocks and contact with moving objects  
Overexertion

### HEALTH AND SAFETY MEASURES:

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

\* **Technical/organisational measures (TOM):**

- Supervise the load by monitoring its stability, particularly when turning and when the load is voluminous.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Do not exceed manufacturer-specified load limits for work equipment.

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 212 - Hand pallet trucks	[link to the PDF]
Specialised training	EPZ UPC013 - Safety in mechanical lifting of loads	[link to the PDF]
Specialised training	EPZ UPC014 - Safety in the use of manual pallet trucks	[link to the PDF]

## USE OF LOAD-LIFTING EQUIPMENT: FORK LIFT TRUCKS

**RISK/S:** Knocks against static objects  
Trapping due to vehicles or machinery overturning

### HEALTH AND SAFETY MEASURES:

\* **Personal protection equipment (PPE):** <http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the head	UPC401 - Safety helmet	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

\* **Technical/organisational measures (TOM):**

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Staff must have accredited training in the use of work equipment, safety measures, preventive maintenance, etc.
- Perform preventive and/or mandatory maintenance according to current regulations.
- Do not exceed the maximum load stated on the lifting equipment under any circumstances.

\* **Health and safety information:** <http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 211 - Forklift trucks	[link to the PDF]
Specialised training	EPZ UPC013 - Safety in mechanical lifting of loads	[link to the PDF]

## OPERATIONS WITH ENGINES AND/OR ENGINE BENCHES

**RISK/S:** Electrical contact  
Knocks and contact with moving objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC011 - Protective gloves	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Use connecting cables and terminals that are properly protected, depending on the type of task or practice that is undertaken and particularly in the case of voltages higher than the safety voltage.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 501 - Working dead (no voltage)	[link to the PDF]
Health and safety regulations	SHR 502 - Grounding	[link to the PDF]
Health and safety regulations	SHR 503 - Electrical work – manoeuvres, measurements, tests and verifications	[link to the PDF]
Health and safety regulations	SHR 504 - Electrical work – the 5 basic rules	[link to the PDF]
Health and safety regulations	SHR 505 - Electrical work – the 5 additional rules	[link to the PDF]
Specialised training	EPZ UPC007 - Safety in electrical work	[link to the PDF]

## TASKS USING VISUAL DISPLAY UNITS

**RISK/S:** Discomfort caused by lighting: Visual fatigue  
Physical load: static work postures

### HEALTH AND SAFETY MEASURES:

\* Health and safety information: <http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Ergonomic recommendations	ER 004/01 - Visual display units (VDU)	[link to the PDF]
Ergonomic recommendations	ER 004/02 - Laptops	[link to the PDF]
Ergonomic recommendations	ER 004/03 - Office furniture	[link to the PDF]
Ergonomic recommendations	ER 004/04 - Exercises at the office	[link to the PDF]

## HANDLING OF MANUFACTURED NANOMATERIALS

**RISK/S:** Exposure to harmful and/or toxic substances  
Fires

### HEALTH AND SAFETY MEASURES:

**\* Collective protection equipment (CPE):**

Type	CPE
Safety devices	Glove box

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask: Use when a local extraction system cannot be used (biosafety cabinet, glovebox, aspiration system, etc.)	[link to the catalogue]

Note: Consult the safety data sheet for the nanomaterial to ensure the right PPE is used. Consult the manufacturer.

**\* Technical/organisational measures (TOM):**

- Change the process, reduce the amount of nanomaterials or replace powdered nanomaterials with nanomaterials in another form, in a liquid medium or absorbed by a solid matrix.
- Use adherent mats to eliminate the possibility of nanomaterials sticking to shoes and thus being taken out of the work areas in which they are handled.
- Delimit and signpost the work areas by putting up warning signs: "Danger: presence of nanomaterials". Restrict access to the area in which nanomaterials are handled.
- If you use disposable nitrile gloves, wear two layers of gloves and ensure that they cover your wrists.
- Carefully clean all of the work surfaces on which nanomaterials are handled using wet cloths or a vacuum cleaner equipped with a high efficiency filter (HEPA) of class H14 or higher (ULPA). Do not use pressurised air, brushes or strong jets of water.
- Store products in rigid, impermeable, closed containers that are labelled to show that they contain nanomaterials.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC010 - Safety when working with nanotechnology	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT: MINI LATHES

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Filings and/or chips that are produced when pieces are machined must be removed with a brush.
- Use clamps, screws or other securing devices to secure the work piece.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Check that work equipment is fixed to a stable, firm surface.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT: SANDERS

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Do not touch the blade (and never brake it) when it is moving.
- Use clamps or other holding devices to secure the workpiece and use push rods to move it.
- Check that work equipment is fixed to a stable, firm surface.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT: BENCH SAWS

**RISK/S:** Knocks/cuts by objects or tools  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Filings and/or chips that are produced when pieces are machined must be removed with a brush.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Use push rods to move the workpiece during manual feed operations, and guides for longitudinal cutting.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Check that work equipment is fixed to a stable, firm surface.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-primera>

Type	Title	Consult
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]



## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT: DRILLS

**RISK/S:** Knocks/cuts by objects or tools  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Filings and/or chips that are produced when pieces are machined must be removed with a brush.
- Use clamps, screws or other securing devices to secure the work piece.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Check that the drill bit is correctly fitted to the tool holder and sharpened properly.
- Check that work equipment is fixed to a stable, firm surface.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## OPERATIONS WITH DESKTOP EQUIPMENT: HOT WIRE CUTTER

**RISK/S:** Thermal contact

### **HEALTH AND SAFETY MEASURES:**

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Check that the voltage indicated on the equipment's identification plate is the same as that of the electric distribution network to which it is connected.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Use a carrier or angle stopper to carry out the cutting operation.

## USE OF 3D PRINTERS

**RISK/S:** Thermal contact  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC204 - Respiratory protection mask	[link to the catalogue]

\* **Technical/organisational measures (TOM):**

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Let the 3D printer cool down for at least 15 minutes before accessing its interior.
- Handle the glass surface of the 3D printer with great care so that it does not break.

## OPERATIONS WITH PORTABLE MACHINERY: THERMAL STRIPPERS

**RISK/S:** Thermal contact

### **HEALTH AND SAFETY MEASURES:**

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC204 - Respiratory protection mask	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Check that the voltage indicated on the equipment's identification plate is the same as that of the electric distribution network to which it is connected.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Keep hands far from the tip of the thermal stripper and on the controls of the work equipment.
- Do not direct the stream of hot air at the same point for prolonged periods to avoid the continuous emission of gases when paint, plastics, varnishes or similar materials are stripped.
- Leave the work equipment to cool down before you put it away or change the tip.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## OPERATIONS WITH PORTABLE MACHINERY: PNEUMATIC STAPLERS

**RISK/S:** Exposure to physical contaminants: noise  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

\* **Technical/organisational measures (TOM):**

- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Regularly check the trigger lock and the springs that permit free movement of the pieces.
- Transport the work equipment and load consumable materials with the trigger lock on to avoid potential accidents.
- Check whether the line or compressor pressure is compatible with the elements or tools that will be used. Check the equipment's identification plate and the manometer of the supply network.
- Do not put staples into very hard or brittle materials such as concrete or steel at very acute angles or close to the end of a workpiece, to avoid potential projections.
- Keep the tip of the tool away from your body and from other people.

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	NSH 225 – Portable electric machines	[link to the PDF]
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## USE OF EQUIPMENT WITH A HEAT SOURCE: THERMOFORMING EQUIPMENT

**RISK/S:** Thermal contact

### **HEALTH AND SAFETY MEASURES:**

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Keep your hands away from the resistance box while the work equipment is connected.

## USE OF MANUAL TOOLS

**RISK/S:** Knocks/cuts by objects or tools  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Keep the tip of the tool away from your body and from other people.
- Put a protective guard or cover over pointed tools or tools with sharp edges.
- Store tools and accessories in a cupboard or suitable place (tool holder panel or tool box).
- Regularly maintain tools.
- Select the right tool before starting the task.
- Do not overload the capacity of a hand tool by using extensions or hitting with a hammer.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	NSH 227 – Hand tools	[link to the PDF]
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## HANDLING OF WASTEWATER (SAMPLE-TAKING, ANALYSIS AND INSTALLATIONS)

**RISK/S:** Exposure to biological contaminants  
Knocks/cuts by objects or tools

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)
Local extraction system	Biosafety cabinet

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask: Use when a local extraction system cannot be used (biosafety cabinet, glovebox, aspiration system, etc.)	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Use the PPE that has been indicated as well as closed-toe shoes when you take samples or handle waste waters.
- Processes of treating and analysing wastewaters that could generate aerosols (such as centrifugation, trituration and vigorous shaking) should be carried out within a biosafety cabinet (BSC).
- Use hygiene and sanitary facilities, changing rooms and separate lockers to store street clothes and work clothes.
- Only authorised personnel should be allowed to enter the laboratory.
- When using the biosafety cabinet (BSC):
  - Work "from clean to contaminated".
  - Place the waste containers inside the BSC.
  - Place the material at least 10 cm away from the front part of the BSC, without covering any grids.
  - The user's face must be above the front opening of the BSC while working.
  - Do not disconnect the security devices (alarms) of the BSC.
  - Disinfect the BSC for 10-15 minutes, before and after use.
- Use electric microincinerators to sterilise handles. Flame sterilisation may release aerosols. Use disposable plastic handles as an alternative.
- Follow specific disinfection procedures according to the process, considering the following:
  - Use chemicals to disinfect instruments and work surfaces that cannot withstand high temperatures at room temperature. Follow the preventive measures described on the safety data sheet (SDS) for the chemical product that you are going to use.
  - Sterilise laboratory materials and media and inert biological waste using an autoclave to destroy microorganisms.
 Follow the preventive measures described in the activity "Autoclave sterilisation operations".
- Establish appropriate working procedures that indicate the appropriate technical measures to prevent or minimise the release of biological agents.
- Safely store biological agents in containers and/or cabinets identified using the biohazard sign.



- Wear appropriate clothes (lab coat or similar) to prevent contaminating your street clothing. Do not wash work clothes at home. Use disposable lab coats or overalls as an alternative.
- Avoid using needles whenever possible. If you use needles, do not bend, break or recap them. Discard all used needles in specific containers for biohazardous waste and sharps.
- Use mechanical pipetting systems.
- HEALTH SURVEILLANCE: Periodic specific medical check-ups are recommended.

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 340 – Biological agents	[link to the PDF]
Health and safety regulations	SHR 701 - Pregnancy and breastfeeding	[link to the PDF]
Specialised training	EPZ UPC003 - Safety in the handling of biological agents	[link to the PDF]

## OPERATIONS WITH CLASS 2 LASER EQUIPMENT

**RISK/S:** Exposure to non-ionising radiation

### **HEALTH AND SAFETY MEASURES:**

**\* Technical/organisational measures (TOM):**

- Follow the safety warnings specified in the work equipment's instructions manual.
- Never direct a laser beam at any part of a person's body and particularly not at the eyes. Do not look directly into the laser beam.
- Do not direct the laser beam at reflective surfaces.
- Do not stare directly into the beam (class 2) or through optical instruments (class 2M).

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 228 – Laser equipment	[link to the PDF]
Specialised training	EPZ UPC008 - Safety when working with laser equipment	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT - POLISHER

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Use clamps or other holding devices to secure the workpiece and use push rods to move it.
- Use an angle stop when you polish the thin ends at a 45° angle.
- Do not access the abrasive disc of the work equipment.
- Check that work equipment is fixed to a stable, firm surface.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT - CNC ENGRAVING MACHINE

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Check that work equipment is fixed to a stable, firm surface.

## OPERATIONS WITH A LASER CUTTING MACHINE (CUTTING, MARKING AND ENGRAVING MATERIALS) - USER MODE

**RISK/S:** Exposure to harmful and/or toxic substances  
Exposure to radiation

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* **Technical/organisational measures (TOM):**

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Only process the materials authorised by the manufacturer.
- Do not leave the machine unattended if it is in operation.
- Turn off the key switch when the machine is not in use.
- Do not carry out repair, calibration, maintenance, inspection, and start up tasks in user mode. These tasks must be carried out by qualified staff trained in the work equipment.

## OPERATIONS WITH PCB (PRINTED CIRCUIT BOARD) PROCESSING EQUIPMENT

**RISK/S:** Exposure to harmful and/or toxic substances  
Exposure to physical contaminants: noise

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Soundproof booth

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Only change tools when the work equipment is turned off and disconnected from the electricity supply.
- Check that the plate is positioned before you start machining.
- Periodically check that the high efficiency filter (HEPA) in the exhaust system is not saturated.

## OPERATIONS WITH DESKTOP EQUIPMENT: BALLISTIC PENDULUM

**RISK/S:** Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Follow the safety warnings specified in the work equipment's instructions manual.
- Check that the retaining screw is secure during operation of the ballistic pendulum.
- Do not look down the barrel of the projectile launcher in case it is loaded.
- Before using the ballistic pendulum, note the position of the piston using the yellow indicator on the upper part of the barrel.

## OPERATIONS WITH DESKTOP EQUIPMENT: TRANSILLUMINATOR

**RISK/S:** Exposure to non-ionising radiation: optical (>300 GHz)

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC105 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Follow the safety warnings specified in the work equipment's instructions manual.



## OPERATIONS WITH TRANSFORMERS AND/OR AUTOTRANSFORMERS (HIGH V < 500 V)

**RISK/S:** Direct electrical contact  
Indirect electrical contact

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC011 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Use connecting cables and terminals that are properly protected, depending on the type of task or practice that is undertaken and particularly in the case of voltages higher than the safety voltage.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 501 - Working dead (no voltage)	[link to the PDF]
Health and safety regulations	SHR 502 - Grounding	[link to the PDF]
Health and safety regulations	SHR 503 - Electrical work – manoeuvres, measurements, tests and verifications	[link to the PDF]
Health and safety regulations	SHR 504 - Electrical work – the 5 basic rules	[link to the PDF]
Health and safety regulations	SHR 505 - Electrical work – the 5 additional rules	[link to the PDF]
Specialised training	EPZ UPC007 - Safety in electrical work	[link to the PDF]

## OPERATIONS WITH TRANSFORMERS AND/OR AUTOTRANSFORMERS (500 V < HIGH V < 1000 V)

**RISK/S:** Direct electrical contact  
Indirect electrical contact

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC012 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Use connecting cables and terminals that are properly protected, depending on the type of task or practice that is undertaken and particularly in the case of voltages higher than the safety voltage.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 501 - Working dead (no voltage)	[link to the PDF]
Health and safety regulations	SHR 502 - Grounding	[link to the PDF]
Health and safety regulations	SHR 503 - Electrical work – manoeuvres, measurements, tests and verifications	[link to the PDF]
Health and safety regulations	SHR 504 - Electrical work – the 5 basic rules	[link to the PDF]
Health and safety regulations	SHR 505 - Electrical work – the 5 additional rules	[link to the PDF]
Specialised training	EPZ UPC007 - Safety in electrical work	[link to the PDF]

## OPERATIONS WITH A MACHINE TOOL: HORIZONTAL BANDSAW

**RISK/S:** Knocks/cuts by objects or tools  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

#### \* Technical/organisational measures (TOM):

- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Filings and/or chips that are produced when pieces are machined must be removed with a brush.
- Use clamps, screws or other securing devices to secure the work piece.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]

## USE OF LOAD-LIFTING EQUIPMENT: PORTABLE MOBILE CRANE

**RISK/S:** Falling of dropped objects due to dropping  
Knocks and contact with moving objects

### HEALTH AND SAFETY MEASURES:

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Supervise the load by monitoring its stability, particularly when turning and when the load is voluminous.
- Periodically check the bearing system and the correct functioning of the brake.
- Do not use the equipment in inappropriate work conditions, such as when the ground is in bad condition, irregular or slippery.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Raise and lower the load vertically and smoothly to prevent it from swinging and avoid sudden starts and stops.
- Before lifting a load, secure it correctly and check the condition of cables, slings and hook (safety catch).
- Do not put any part of your body under an elevated load.
- Ensure that the centre of gravity of the load is always within the base of the crane.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Do not exceed the maximum load stated on the lifting equipment under any circumstances.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC013 - Safety in mechanical lifting of loads	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT - METALLOGRAPHIC POLISHER

**RISK/S:** Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* **Technical/organisational measures (TOM):**

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT - MELT FLOW INDEX TESTER

**RISK/S:** Exposure to harmful and/or toxic substances: inhalation  
Thermal contact

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (mechanical)
Local extraction system	Extraction hood moveable
Safety devices	Protective housing and guards general

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask: Use when a local extraction system cannot be used (for example, a fume cupboard, extraction hood or aspiration system)	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.

## USE OF A CHARPY PENDULUM

**RISK/S:** Knocks/cuts by objects or tools

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
Safety devices	Delimiters of operating areas
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]

#### \* **Technical/organisational measures (TOM):**

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.

## USE OF ROTARY EVAPORATOR

**RISK/S:** Explosions  
Projection of fragments or particles  
Thermal contact

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Examine the condition of glassware before you use it, and get rid of any items that have flaws.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Do not use the equipment with heat sources that provide a temperature above 180°C, such as a Bunsen burner.
- Do not use the equipment with a sample that weighs over 3 kg within the evaporation flask.
- Do not process hard and brittle materials, such as stones, sand samples, etc. that could lead to breakage of the evaporation flask.
- Do not overfill round-bottom flasks and avoid overheating the mixture that you are separating by evaporation. If unstable products such as peroxides may form, do not evaporate until dry.
- Wait until the round-bottom flask containing the mixture has cooled before you relieve the vacuum.
- Protect the coolant, the receiving flask and, in general, the entire evaporation system with a screen or elastic nets adapted to the various pieces of glassware.
- Cover the recipient under depression with a metal net.
- Change from vacuum to atmospheric pressure gradually and slowly.
- Follow the preventive measures described in the activity "Occasional handling of hazardous chemicals (harmful, toxic, corrosive, etc.)" when you handle specific chemicals in tests with the equipment.



## DISTILLATION OPERATIONS IN PILOT PLANTS

**RISK/S:** Exposure to harmful and/or toxic substances  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)
Local extraction system	Extraction hood specific

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Before each operation, always check the material and ensure that the distillation apparatus is leak-tight, especially in the case of flammable liquids, in order to prevent any risk of leakage or system failure.
- Adapt the distillation apparatus to the quantities and characteristics of the product to be distilled.
- Heat the mixture using heating mantles or baths that must be placed under mobile systems (lifters) so that the heat can be removed rapidly if necessary.
- Use temperature control devices that provide heat and cooling.
- For vacuum distillations:
  - Regulate the boiling of the liquid using a capillary tube that bubbles air or an inert gas. Check that the capillary tube does not get blocked during operation by the start of crystallisation, for example, and ensure that the coolant does not get blocked if you are using one with a narrow passage.
  - Do not start to heat until the vacuum is established to avoid spontaneously triggering boiling.
  - Cool the system before relieving the vacuum to avoid potential ignition or exposure due to the introduction of air into a hot round-bottom flask.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH TEST BENCH (WIND TUNNEL, WIND TURBINE)

**RISK/S:** Exposure to physical contaminants: noise  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- If you use a smoke generator, divert the outflow of the wind tunnel to a localised extraction system.
- Disconnect the work equipment from the electricity supply when it is not in use.
- Regularly check that all the fastenings are well tightened and all the guards are in good condition.

## TESTING OPERATIONS WITH COMPRESSORS

**RISK/S:** Explosions  
Exposure to physical contaminants: noise  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Pressure relief devices and safety valves
Safety devices	Protective housing and guards general

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Periodically check the manometer to monitor the working pressure.
- The increase in pressure and decompression must be gradual to avoid sudden changes.
- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Disconnect the work equipment from the electricity supply when it is not in use.
- Regularly check that all the fastenings are well tightened and all the guards are in good condition.
- Carry out the tests at low working pressures to avoid potential explosions.
- Check that the obligatory periodic inspections have been carried out.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 222 - Pressure equipment: regulations and inspections	[link to the PDF]

## VACUUM EVAPORATION OPERATIONS

**RISK/S:** Explosions  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)
Local extraction system	Fume cupboard

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Examine the condition of glassware before you use it, and get rid of any items that have flaws.
- Use special glass recipients that can withstand a vacuum.
- Do not overfill round-bottom flasks and avoid overheating the mixture that you are separating by evaporation. If unstable products such as peroxides may form, do not evaporate until dry.
- Wait until the round-bottom flask containing the mixture has cooled before you relieve the vacuum.
- Protect the coolant, the receiving flask and, in general, the entire evaporation system with a screen or elastic nets adapted to the various pieces of glassware.
- Cover the recipient under depression with a metal net.
- Change from vacuum to atmospheric pressure gradually and slowly.
- If you use an aspirator to create a vacuum, first close the tap between the equipment under vacuum and the aspirator. You can also place a safety container between them.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## VACUUM FILTRATION OPERATIONS

**RISK/S:** Explosions  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

\* **Collective protection equipment (CPE):**

Type	CPE
General extraction system	General ventilation forced (chemical)

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

\* **Technical/organisational measures (TOM):**

- Examine the condition of glassware before you use it, and get rid of any items that have flaws.
- Cover the recipient under depression with a metal net.
- Change from vacuum to atmospheric pressure gradually and slowly.
- If you use an aspirator to create a vacuum, first close the tap between the equipment under vacuum and the aspirator. You can also place a safety container between them.
- Use high quality, Kitasato-type glass flasks, which have a thick wall to withstand pressure difference when a vacuum is created inside them.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## VACUUM DRYING OPERATIONS

**RISK/S:** Explosions  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Examine the condition of glassware before you use it, and get rid of any items that have flaws.
- Use special glass recipients that can withstand a vacuum.
- Change from vacuum to atmospheric pressure gradually and slowly.
- Keep the desiccator away from direct sunlight.
- Do not transport the desiccator while it is under vacuum.
- Protect the desiccator with a metal net.
- Lubricate contact edges and keys properly.
- Place a flask or safety bubbler between the desiccator and the aspirator to avoid possible water flowback.

## USE OF LIFTING EQUIPMENT: BRIDGE CRANE

**RISK/S:** Falling of dropped objects due to dropping  
Knocks and contact with moving objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	End stops
Safety devices	Safety hooks
Safety devices	Safety switches and commands
Safety devices	Surge arresters

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the head	UPC401 - Safety helmet	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Do not lift people on the hook, load or sling.
- Do not handle elevated loads above people present in the work area. Do not pass below suspended loads.
- Do not leave loads suspended.
- Staff must have accredited training in the use of work equipment, safety measures, preventive maintenance, etc.
- Perform preventive and/or mandatory maintenance according to current regulations.
- Do not exceed the maximum load stated on the lifting equipment under any circumstances.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	NSH 223 – Bridge crane	[link to the PDF]
Specialised training	EPZ UPC013 - Safety in mechanical lifting of loads	[link to the PDF]
Specialised training	EPZ UPC015 - Safety in the use of bridge cranes	[link to the PDF]

## OPERATIONS WITH ACTUATORS IN A PORTAL FRAME

**RISK/S:** Falling of dropped objects due to dropping  
Knocks against static objects

### **HEALTH AND SAFETY MEASURES:**

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of the head	UPC401 - Safety helmet	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]
Protection against falling from height	UPC701 - Safety harness	[link to the catalogue]



## ASSEMBLY AND USE OF MODULAR METAL SCAFFOLDING

**RISK/S:** Falling of objects due to handling  
Falling of people to a different level

### **HEALTH AND SAFETY MEASURES:**

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the head	UPC401 - Safety helmet	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]
Protection against falling from height	UPC701 - Safety harness	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Only authorised staff with proper training may use the work equipment.
- Scaffolding must be locked to prevent any unexpected movements.
- Check the structural stability of the structure as a whole before starting work.
- Keep the surface of the work platform free of obstructions, debris, etc.
- Check that guardrails and structural elements are strong enough for the intended use and in good condition.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 220 - Use of scaffolding	[link to the PDF]
Health and safety regulations	SHR 221 - Safety regulations for scaffolding use	[link to the PDF]

## USE OF LIFTING EQUIPMENT: ELECTRIC PALLET STACKER TRUCK

**RISK/S:** Falling of objects due to handling  
Knocks and contact with moving objects

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Safety switches and commands
Safety devices	Surge arresters

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Do not place objects or tools on the battery, as the metal components of the battery cells are live.
- Only authorised staff with proper training may use the work equipment.
- While driving, keep the forks lowered, at a height of approximately 15 cm from the ground, whether or not a load is being transported.
- Do not exceed manufacturer-specified load limits for work equipment.
- Slow down when turning, and never turn with an elevated load.
- Do not use the electric pallet stacker truck to lift people or in any other manner not specified by the manufacturer.
- Observe the load at all times while it is being handled.
- Recharge the batteries in a well-ventilated space so that the fumes and heat generated are dissipated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC013 - Safety in mechanical lifting of loads	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: EXTRUDER

**RISK/S:** Exposure to harmful and/or toxic substances  
Thermal contact  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Extraction hood moveable/fixed
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Check that the voltage indicated on the equipment's identification plate is the same as that of the electric distribution network to which it is connected.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.

## OPERATIONS WITH WORK EQUIPMENT: DISK SAW WITH COOLING SYSTEM

**RISK/S:** Exposure to physical contaminants: noise  
Knocks/cuts by objects or tools  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Fixed stops, by length and/or depth
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC305 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

#### \* Technical/organisational measures (TOM):

- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Use clamps, screws or other securing devices to secure the work piece.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Carry out operations such as tool changes, checks, measurements, adjustments, etc. with work equipment stopped and disconnected from any power supply.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: COMPACTOR

**RISK/S:** Exposure to physical contaminants: noise  
Projection of fragments or particles  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Place switches and controls for work equipment outside the soundproof booth/room so that they can be operated from outside the area where the machine is running.

## OPERATIONS WITH WORK EQUIPMENT: LOS ANGELES ABRASION MACHINE

**RISK/S:** Exposure to physical contaminants: noise  
Falling of objects due to handling  
Knocks and contact with moving objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Place switches and controls for work equipment outside the soundproof booth/room so that they can be operated from outside the area where the machine is running.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: LARGE-FORMAT SIEVE SHAKER

**RISK/S:** Exposure to chemical contaminants: powders  
Exposure to physical contaminants: noise  
Falling of objects due to handling

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC005 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Establish a maintenance programme for the local extraction system to ensure proper aspiration efficiency during the activities carried out.
- Do not open the sieve shaker until the sieving process is complete, and allow extra time to prevent dispersion of residual dust.
- Clean using aspiration and wet methods.
- When handling large quantities of aggregates, follow the preventive measures described in the activity "Manual handling of small stones and aggregates (fine and coarse)".

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: HOT ASPHALT MIXER

**RISK/S:** Exposure to harmful and/or toxic substances  
Knocks and contact with moving objects  
Thermal contact

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Extraction hood moveable/fixed
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]
Protection of the body	UPC504 - Protective clothing (apron)	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Before using the work equipment, make sure it is level and on a firm, stable surface.



## OPERATIONS WITH WORK EQUIPMENT: TRACK MACHINE

**RISK/S:** Falling of objects due to handling  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## HANDLING OF BITUMINOUS MATERIALS (BITUMEN, ASPHALT)

**RISK/S:** Exposure to harmful and/or toxic substances  
Thermal contact

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (mechanical)
Local extraction system	Extraction hood specific

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]
Protection of the body	UPC504 - Protective clothing (apron)	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Establish a maintenance programme for the local extraction system to ensure proper aspiration efficiency during the activities carried out.

#### \* Pregnancy and/or breastfeeding - Specific measures:

- Adapt the workplace and eliminate the process in which there is a chemical agent that is harmful for the health of the pregnant worker, the embryo, the foetus or the breastfeeding infant.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT: TRIBOMETER

**RISK/S:** Projection of fragments or particles  
Thermal contact  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Allow the operating area to cool down before accessing the interior.

## OPERATIONS WITH DESKTOP EQUIPMENT: CNC MILLING MACHINE HIGH-Z

**RISK/S:** Exposure to physical contaminants: noise  
Knocks and contact with moving objects  
Projection of fragments or particles  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Disconnect the work equipment from the electricity supply when it is not in use.
- Allow the operating area to cool down before accessing the interior.

## USE OF ULTRASONIC SONICATOR

**RISK/S:** Exposure to physical contaminants: noise

### **HEALTH AND SAFETY MEASURES:**

#### **\* Collective protection equipment (CPE):**

Type	CPE
Safety devices	Soundproof booth

#### **\* Technical/organisational measures (TOM):**

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Do not activate the ultrasound until the protection box is properly closed.
- Do not get close to the tip of the ultrasound-emitting device while it is operating.
- Prevent the tip of the sonicator from coming into contact with laboratory equipment such as beakers.

## USE OF TITRATOR

**RISK/S:** Exposure to harmful and/or toxic substances

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
Local extraction system	Extraction hood fixed

#### \* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* **Technical/organisational measures (TOM):**

- Follow the safety warnings specified in the work equipment's instructions manual.
- Check that the titration vessel is properly fitted to the titration stand.

## OPERATIONS WITH ATOMIC FLUORESCENCE SPECTROPHOTOMETER EQUIPMENT

**RISK/S:** Exposure to harmful and/or toxic substances

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
Local extraction system	Extraction hood fixed
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* **Technical/organisational measures (TOM):**

- Check that the voltage indicated on the equipment's identification plate is the same as that of the electric distribution network to which it is connected.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Before using the work equipment, make sure it is level and on a firm, stable surface.
- Do not use air as a carrier gas. Use argon or nitrogen as the carrier gas. Argon is recommended since fluorescence sensitivity is reduced when nitrogen is used. Make sure the carrier gas used is free of contaminants.
- Use any inert gas in the drying system.
- Do not install or replace pump tubes while the peristaltic pump is operating.

## OPERATIONS WITH WORK EQUIPMENT: RESONANCE FATIGUE TESTING MACHINE

**RISK/S:** Exposure to physical contaminants: noise  
Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Place switches and controls for work equipment outside the soundproof booth/room so that they can be operated from outside the area where the machine is running.



## HANDLING OF HAZARDOUS CHEMICALS: MERCURY

**RISK/S:** Exposure to chemical contaminants

### HEALTH AND SAFETY MEASURES:

**\* Collective protection equipment (CPE):**

Type	CPE
Local extraction system	Fume cupboard

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC108 - Safety goggles (panoramic view, airtight)	[link to the catalogue]
Protection of the respiratory tract	UPC205 - Respiratory protection mask	[link to the catalogue]
Protection of the respiratory tract	UPC206 - A1HgP3 filter	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

**\* Pregnancy and/or breastfeeding - Specific measures:**

- Do not work with chemicals that are reprotoxic and contain the following phrases: H360F (R60), H360D (R61), H361d (R63), H360FD, H360Fd, H360Df when you are pregnant and H362 (R64) when you are breastfeeding.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 219 - General purpose fume cupboards	[link to the PDF]
Health and safety regulations	SHR 307 - Chemical Agents that are Reproductive Toxicants	[link to the PDF]
Health and safety regulations	SHR 309 - Action in the case of a mercury spill	[link to the PDF]
Health and safety regulations	SHR 701 - Pregnancy and breastfeeding	[link to the PDF]
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH EQUIPMENT: PLASMA MACHINE

**RISK/S:** Exposure to harmful and/or toxic substances  
Exposure to non-ionising radiation: electromagnetic (0 Hz- 300 GHz)  
Thermal contact

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Extraction hood specific
Safety devices	Pressure relief devices and safety valves
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Do not use ferromagnetic tools or components. Having non-magnetic deionised water mist fire extinguishers is recommended.
- Do not leave small steel objects (screwdrivers, screws, etc.) on the floor or next to the magnet.
- Keep disks, credit cards and electronic devices away from the work equipment and the identified area.
- Persons with a pacemaker or medical/metal implants should not be allowed to use the equipment.
- Equipment labels must be legible. Immediately replace damaged or illegible signs and labels by requesting them from the equipment manufacturer.
- Follow the preventive measures described in the activity "Operations with pressurised technical gases".
- Select the appropriate pressure regulator based on gas type.
- Keep hands away from vacuum chamber openings and pump valves and connections during operation.
- Do not produce explosive gas mixtures inside the chamber.
- Do not cover the outlet for vapours that are formed during the process.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 310 - Pressure equipment: cylinders	[link to the PDF]

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specialised training	EPZ UPC004 - Safety in the handling of technical gases	[link to the PDF]

## USE OF EQUIPMENT WITH A HEAT SOURCE: MUFFLE (OVEN)

**RISK/S:** Exposure to harmful and/or toxic substances  
Thermal contact

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Extraction hood fixed

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask: Use when a local extraction system cannot be used (for example, a fume cupboard, extraction hood or aspiration system)	[link to the catalogue]
Protection of the body	UPC504 - Protective clothing (apron)	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- If a heating process may produce hazardous chemical fumes, a local extraction system (fixed fumed hood) must be in place to remove any fumes emitted.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr/>

Type	Title	Consult
Health and safety regulations	SHR 215 - Muffle furnaces and ovens	[link to the PDF]

## SPRAY-DRYING OPERATIONS – MINI SPRAY-DRYER

**RISK/S:** Exposure to chemical contaminants: powders  
Thermal contact

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Examine the condition of glassware before you use it, and get rid of any items that have flaws.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Spray-dry corrosive samples in a fume cupboard.
- Place a ground wire in the product collection vessel and in the cyclone to prevent electrostatic charges.
- Do not use gases of unknown chemical composition.
- Do not spray-dry organic solvents without the safety curtains in place.
- Do not spray-dry toxic substances.
- Do not use samples that may produce oxygen during the process.
- Allow the system to cool for a few minutes after use.
- To prevent burns, do not touch system parts and/or surfaces that are at a high temperature.
- To prevent the product from being scattered due to airflow, do not remove it from collection vessel while the vacuum is running.
- Spray-dry corrosive samples in a fume cupboard.

## OPERATIONS WITH WORK EQUIPMENT: SIEVE SHAKER

**RISK/S:** Exposure to physical contaminants: noise  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.

## MANUAL METAL-POWDER GRINDING OPERATIONS

**RISK/S:** Exposure to chemical contaminants

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
Safety devices	Glove box

#### \* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask: Use when a local extraction system cannot be used (biosafety cabinet, glovebox, aspiration system, etc.)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* **Technical/organisational measures (TOM):**

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## EXPERIMENTAL OPERATIONS WITH ROBOTS ON MOBILE PLATFORMS

**RISK/S:** Knocks and contact with moving objects  
Trapping by or between objects

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Distance sensors
Safety devices	Safety switches and commands
Safety devices	Torque sensors (F·d)

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Before the robot's movement is started, check that there are no objects in its field of movement that could cause a collision.
- Control the working speed of the robot.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC009 - Safety when working with robots	[link to the PDF]



## CARBON-FIBRE CUTTING OPERATIONS (WITH SCISSORS) AND BRUSH APPLICATION OF EPOXY RESIN

**RISK/S:** Contact with corrosive and/or caustic substances  
Exposure to harmful and/or toxic substances  
Knocks/cuts by objects or tools

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
General extraction system	General ventilation forced (chemical)
Local extraction system	Extraction hood moveable

#### \* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC108 - Safety goggles (panoramic view, airtight)	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]
Protection of the body	UPC512 - Protective clothing (overalls)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* **Technical/organisational measures (TOM):**

- Keep the tip of the tool away from your body and from other people.
- Put a protective guard or cover over pointed tools or tools with sharp edges.
- Store tools and accessories in a cupboard or suitable place (tool holder panel or tool box).
- Regularly maintain tools.
- Manual application of epoxy resin must be done outdoors or in adequately ventilated spaces with a general or local extraction system to prevent fume formation.
- Carefully read information and guidelines for any personal protective equipment used to ensure effective protection.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## MACHINING OF EPOXY-RESIN CARBON-FIBRE PLATES (WITH PORTABLE ELECTRIC EQUIPMENT)

- RISK/S:**
- Exposure to harmful and/or toxic substances
  - Exposure to physical contaminants: noise
  - Knocks/cuts by objects or tools
  - Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (mechanical)
Local extraction system	Extraction hood moveable

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC108 - Safety goggles (panoramic view, airtight)	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of the body	UPC512 - Protective clothing (overalls)	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Check that the voltage indicated on the equipment's identification plate is the same as that of the electric distribution network to which it is connected.
- Use clamps, screws or other securing devices to secure the work piece.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Carefully read information and guidelines for any personal protective equipment used to ensure effective protection.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 208 - Angle grinders	[link to the PDF]
Health and safety regulations	SHR 209 - Portable electric drills	[link to the PDF]

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 210 - Portable electric jigsaws	[link to the PDF]
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT: MOUNTING PRESS

**RISK/S:** Contact with corrosive and/or caustic substances  
Exposure to chemical contaminants: powders  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (mechanical)

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Check that the voltage indicated on the equipment's identification plate is the same as that of the electric distribution network to which it is connected.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## HANDLING OF CARCINOGENIC, MUTAGENIC AND/OR REPROTOXIC CHEMICALS: FORMALDEHYDE

**RISK/S:** Exposure to chemical contaminants

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Fume cupboard

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC108 - Safety goggles (panoramic view, airtight)	[link to the catalogue]
Protection of the respiratory tract	UPC205 - Respiratory protection mask	[link to the catalogue]
Protection of the respiratory tract	UPC207 - A1 + formaldehyde filter	[link to the catalogue]

Note: Wear a respiratory mask if a local extraction system cannot be used (fume cupboard, extraction hood, aspiration system, etc.).

#### \* Technical/organisational measures (TOM):

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- HEALTH SURVEILLANCE: Staff must regularly undergo specific health checks.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 219 - General purpose fume cupboards	[link to the PDF]
Health and safety regulations	SHR 305 - Carcinogenic chemical agents	[link to the PDF]
Health and safety regulations	SHR 306 - Mutagenic chemical agents	[link to the PDF]
Health and safety regulations	SHR 307 - Chemical Agents that are Reproductive Toxicants	[link to the PDF]
Health and safety regulations	SHR 701 - Pregnancy and breastfeeding	[link to the PDF]
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH TABLE-TOP WORK EQUIPMENT: VERTICAL BANDSAW

**RISK/S:** Knocks/cuts by objects or tools  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]

Note: Wear a respiratory mask if a local extraction system cannot be used (fume cupboard, extraction hood, aspiration system, etc.).

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- During cutting operations, the entire path of the bandsaw must be protected, leaving open only the part of the saw that is strictly necessary for cutting.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Use clamps or other holding devices to secure the workpiece and use push rods to move it.
- Check that work equipment is fixed to a stable, firm surface.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## HANDLING OF CHEMICALS: CONCRETE

**RISK/S:** Exposure to chemical contaminants  
Falling of objects due to handling

### HEALTH AND SAFETY MEASURES:

\* **Collective protection equipment (CPE):**

Type	CPE
General extraction system	General ventilation forced (mechanical)

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC005 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC108 - Safety goggles (panoramic view, airtight)	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]
Protection of the body	UPC512 - Protective clothing (overalls)	[link to the catalogue]
Protection of feet / legs	UPC604 - Safety footwear (boot)	[link to the catalogue]
Protection of feet / legs	UPC606 - Knee protectors	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

\* **Technical/organisational measures (TOM):**

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Perform the operation outdoors or in adequately ventilated spaces with general extraction systems to prevent dust formation.

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## MANUAL HANDLING OF SMALL STONES AND AGGREGATES (FINE AND COARSE)

**RISK/S:** Exposure to chemical contaminants

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
Local extraction system	Aspiration system

#### \* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC005 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC108 - Safety goggles (panoramic view, airtight)	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]
Protection of the body	UPC512 - Protective clothing (overalls)	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* **Technical/organisational measures (TOM):**

- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Use dust aspiration systems with suitable filters (according to the size of the particles to be aspirated) to collect the dust generated.
- HEALTH SURVEILLANCE: Staff must regularly undergo specific health checks.
- Replace any aggregates that contain crystalline silica with others that do not contain carcinogenic agents.

#### \* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]



## OPERATIONS WITH WORK EQUIPMENT: JAW/CYLINDER CRUSHER

**RISK/S:** Exposure to chemical contaminants: powders  
Exposure to physical contaminants: noise  
Falling of objects due to handling  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Use respiratory protective equipment in operations that generate dust (introduction of material, removal of samples).

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: ABRASION TEST

**RISK/S:** Falling of objects due to handling

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.

## OPERATIONS WITH WORK EQUIPMENT: AUTOMATIC SAMPLE SPLITTER

**RISK/S:** Exposure to chemical contaminants: powders  
Falling of objects due to handling

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Use respiratory protective equipment in operations that generate dust (introduction of material, removal of samples).

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: INDUSTRIAL-SCALE BALL MILL

**RISK/S:** Exposure to physical contaminants: noise  
Falling of objects due to handling  
Knocks and contact with moving objects  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Place switches and controls for work equipment outside the soundproof booth/room so that they can be operated from outside the area where the machine is running.
- Do not enter the soundproof room while the industrial-scale ball mill is operating. This work equipment can be switched on and off from the laboratory control room and operates without staff present.
- Avoid using the industrial-scale ball mill for more than 6 hours on a single day and when there are staff members in the laboratory in order to protect employees doing routine work.
- Restrict access to the soundproof room where the industrial-scale ball mill is located.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: BOND INDEX MILL

**RISK/S:** Exposure to physical contaminants: noise  
Falling of objects due to handling  
Knocks/cuts by objects or tools

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the ears	UPC305 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Stay in the soundproof room only for the minimum time necessary and use ear protection.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## USE OF LIFTING EQUIPMENT: HOIST

**RISK/S:** Falling of dropped objects due to dropping  
Knocks and contact with moving objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	End stops
Safety devices	Safety hooks
Safety devices	Surge arresters

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the head	UPC401 - Safety helmet	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Only authorised staff with proper training may use the work equipment.
- If after elevating a load you see that is not positioned correctly, lower the load gradually and reposition it.
- Do not handle elevated loads above people present in the work area. Do not pass below suspended loads.
- Avoid letting the hook rest on the floor/ground. When working without a load, the hook should be in an elevated position to ensure that people and objects are protected.
- Do not leave loads suspended.
- Perform maintenance regularly and as required by regulations.
- Observe the load at all times while it is being handled.
- Always lift loads vertically. Do not exceed the maximum hoist load.
- Perform preventive and/or mandatory maintenance according to current regulations.
- Do not exceed the maximum load stated on the lifting equipment under any circumstances.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC013 - Safety in mechanical lifting of loads	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: BALL/BAR MILL (ROLLER TABLE)

**RISK/S:** Exposure to physical contaminants: noise  
Falling of objects due to handling  
Knocks and contact with moving objects  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## OPERATIONS WITH MACHINE TOOL: GRINDING MACHINE

**RISK/S:** Exposure to harmful and/or toxic substances: inhalation  
Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

N.B. Use protective gloves when changing tools and handling parts.

#### \* Technical/organisational measures (TOM):

- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Use fastening devices to hold the workpiece and check that it is securely fastened.
- Check the visor of the protective guard to guarantee an unobstructed view of the workpiece.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]



## OPERATIONS IN THE WALK-IN CLIMATIC CHAMBER (–15 °C / +50 °C)

**RISK/S:** Exposure to extreme environmental temperatures  
Thermal contact

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC010 - Protective gloves	[link to the catalogue]
Protection of the body	UPC506 - Protective clothing (jacket)	[link to the catalogue]
Protection of the body	UPC507 - Protective clothing (trousers)	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Do not work alone in the cyclic chamber. Make sure that there is someone else outside when you enter the chamber.
- Before accessing the chamber, check the temperature inside to take the appropriate preventive measures.
- Ensure that the chamber has a visual and/or acoustic alarm that can be activated from inside in the event of an emergency. Perform periodic checks to ensure that the visual and/or acoustic alarm is working properly.

## OPERATIONS WITH EQUIPMENT: PADDLE MORTAR MIXER

**RISK/S:** Exposure to harmful and/or toxic substances  
Knocks and contact with moving objects  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (mechanical)
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC005 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC108 - Safety goggles (panoramic view, airtight)	[link to the catalogue]
Protection of the respiratory tract	UPC203 - Respiratory protection mask	[link to the catalogue]
Protection of the body	UPC512 - Protective clothing (overalls)	[link to the catalogue]
Protection of feet / legs	UPC604 - Safety footwear (boot)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Perform the operation outdoors or in adequately ventilated spaces with general extraction systems to prevent dust formation.
- Once the mixing blade is inserted up to the stop, fix it with the clamping screw.
- In the event that material needs to be inserted while the work equipment is operating, use the funnel.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: VIBRATING TABLE

**RISK/S:** Exposure to physical contaminants: noise  
Falling of objects due to handling

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Fastening/protection systems
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Keep hands away from the operating area to prevent possible vibration transmission.
- Use clamping devices to fasten the moulds of the test tubes that you want to work with.
- Prevent access to the work equipment while it is in operation by delimiting its operating area.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]

## OPERATIONS WITH WORK EQUIPMENT: DEEP FREEZER

**RISK/S:** Thermal contact  
Trapping by or between objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC010 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- After each use, check that the door of the deep freezer is hermetically closed.
- Periodically check that the installation of the system that prevents the equipment from tipping over is in good condition.
- Keep your hands or other body parts away from the freezing unit before closing the internal doors and the external door of the work equipment.
- Keep air vents free and unobstructed.
- Keep the door of the deep freezer open for as short a time as possible.

## OPERATIONS WITH PRESSURE EQUIPMENT: COMPACT ELECTRIC STEAM BOILER

**RISK/S:** Explosions  
Thermal contact

### HEALTH AND SAFETY MEASURES:

\* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

\* **Technical/organisational measures (TOM):**

- Periodically check the manometer to monitor the working pressure.
- The increase in pressure and decompression must be gradual to avoid sudden changes.
- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Steam purging should be performed with a sealed chamber containing water, not directly to the exterior.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Disconnect the work equipment from the electricity supply when it is not in use.
- Regularly check that all the fastenings are well tightened and all the guards are in good condition.
- Carry out the tests at low working pressures to avoid potential explosions.
- Check that the obligatory periodic inspections have been carried out.

\* **Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 222 - Pressure equipment: regulations and inspections	[link to the PDF]

## OPERATIONS WITH DESKTOP WORK EQUIPMENT: PRECISION CUTTING MACHINE

**RISK/S:** Knocks/cuts by objects or tools  
Projection of fragments or particles

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Check that work equipment is fixed to a stable, firm surface.

## OPERATIONS WITH DESKTOP WORK EQUIPMENT: SPUTTER COATER

**RISK/S:** Exposure to harmful and/or toxic substances

### **HEALTH AND SAFETY MEASURES:**

#### \* **Collective protection equipment (CPE):**

Type	CPE
Local extraction system	Extraction hood moveable

#### \* **Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* **Technical/organisational measures (TOM):**

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.

## OPERATIONS WITH WORK EQUIPMENT: NUCLEAR MAGNETIC RESONANCE (NMR)

**RISK/S:** Exposure to non-ionising radiation: electromagnetic (0 Hz- 300 GHz)  
Suffocation due to displacement of oxygen

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (mechanical)

#### \* Technical/organisational measures (TOM):

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Adopt the preventive measures described in the activity "Handling cryogenic chemicals" while reloading the NMR equipment.
- Periodically inspect the condition of the work equipment for signs of damage.
- Periodically check that the magnet and its support are connected to the cabinet's ground.
- Do not use ferromagnetic tools or components. Having non-magnetic deionised water mist fire extinguishers is recommended.
- Do not leave small steel objects (screwdrivers, screws, etc.) on the floor or next to the magnet.
- Only use non-ferromagnetic threads or pressure cylinders (dewars) for transporting cryogenic agents.
- Only use ladders or steps of a non-ferromagnetic material such as aluminum.
- Use the magnet system as instructed by the manufacturer.
- Persons with a pacemaker or medical/metal implants should not be allowed to access the area of the work equipment. Therefore, there must be adequate signalling to warn of the possible presence of magnetic fields and potential hazards in all areas where the field may exceed 0.5 mT (5 gauss).
- Access signs and work equipment labels must be legible. Immediately replace damaged or illegible signs and labels by requesting them from the work equipment manufacturer.
- Keep disks, credit cards and electronic devices away from the work equipment and the identified area.
- Do not exceed the values specified for operating the magnet system.
- Ensure adequate ventilation where the work equipment is used. If you have any queries, contact the manufacturer.
- Staff must have accredited training in the use of work equipment, safety measures, preventive maintenance, etc.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	Work equipment training: nuclear magnetic resonance (NMR)	



## PHYSICALLY DEMANDING ACTIVITIES. HEAVY WORK

**RISK/S:** Physical load: general physical effort

### **HEALTH AND SAFETY MEASURES:**

**\* Technical/organisational measures (TOM):**

- Alternate heavy tasks with light tasks.
- Plan an appropriate work schedule: rest breaks, work pace, etc.
- Do not exceed weight limits and use appropriate techniques for handling loads.
- Use mechanical means to transport loads.
- Adopt safe work postures and avoid awkward postures as much as possible.
- Change position often and avoid maintaining a fixed posture for a long time.
- Take regular breaks during the job.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Ergonomic recommendations	ER 001/01 - Introduction to the manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/02 - Techniques for manual handling of loads	[link to the PDF]
Ergonomic recommendations	ER 001/03 - Manual handling of special loads	[link to the PDF]
Ergonomic recommendations	ER 002 - Posture at work	[link to the PDF]
Ergonomic recommendations	ER 003 - Effects of physical loads on health	[link to the PDF]

## MORTAR SAMPLE MANUFACTURING OPERATIONS USING THE SPRAYING TECHNIQUE

**RISK/S:** Exposure to harmful and/or toxic substances  
Physical load: general physical effort  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]
Protection of the eyes / face	UPC108 - Safety goggles (panoramic view, airtight)	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of the body	UPC512 - Protective clothing (overalls)	[link to the catalogue]
Protection of feet / legs	UPC604 - Safety footwear (boot)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Periodically check that all of the safety devices are working correctly.
- Carefully read information and guidelines for any personal protective equipment used to ensure effective protection.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Follow the preventive measures described in the activity: "Activities with physical demands. Heavy tasks."
- Operate in well-ventilated areas to ensure adequate air renewal.
- Keep an eye on the spray gun to prevent product splashes and spills.
- Mark out the work area to keep unprotected workers away.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## TRAVEL TO EXTERNAL FACILITIES

**RISK/S:** Falling of people to the same level  
Traffic accidents

### **HEALTH AND SAFETY MEASURES:**

**\* Technical/organisational measures (TOM):**

- Avoid distractions, such as music, reading and using phones and/or other devices.
- Obey all traffic lights, signals and road markings and keep an eye out for poor or uneven road conditions.
- When using private vehicles: observe traffic rules and carry out appropriate preventive maintenance.
- When using public transport: follow the safety measures in place according to the means of transport.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Road safety information	Consult the information available on the SPRL website	[link to the PDF]

## OPERATIONS WITH EQUIPMENT: SALT SPRAY CHAMBER

**RISK/S:** Exposure to harmful and/or toxic substances

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Leave enough space around the equipment for cleaning and maintenance purposes.
- Install the chamber in a place that is isolated from the rest of the laboratory and that has an appropriate air extraction system to prevent salt spray evaporation from corroding materials or equipment near the chamber.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]

## OPERATIONS WITH RHEOSTATS

**RISK/S:** Direct electrical contact  
Indirect electrical contact

### HEALTH AND SAFETY MEASURES:

**\* Collective protection equipment (CPE):**

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC011 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Use connecting cables and terminals that are properly protected, depending on the type of task or practice that is undertaken and particularly in the case of voltages higher than the safety voltage.

**\* Health and safety information:**

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 504 - Electrical work – the 5 basic rules	[link to the PDF]
Health and safety regulations	SHR 505 - Electrical work – the 5 additional rules	[link to the PDF]
Specialised training	EPZ UPC007 - Safety in electrical work	[link to the PDF]

## OPERATIONS WITH DESKTOP EQUIPMENT: ELECTRIC ROLLING MILL

**RISK/S:** Knocks and contact with moving objects  
Trapping by or between objects

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Keep hands away from the operating area while you machine parts.
- Wear protective gloves when you laminate parts with sharp edges.

## **OPERATIONS WITH IONISING RADIATION-GENERATING EQUIPMENT: X-RAY GENERATORS AND ELECTRON MICROSCOPES (PROPERTIES STUDY, DEFECT ANALYSIS, METROLOGY, ETC.)**

**RISK/S:** Exposure to ionising radiation: external irradiation

### **HEALTH AND SAFETY MEASURES:**

#### **\* Technical/organisational measures (TOM):**

- Consult the Radiological Protection Service (SPR) to find out which health and safety measures should be adopted.
- HEALTH SURVEILLANCE: Staff must regularly undergo specific health checks.

## OPERATIONS WITH MACHINE TOOL: BELT SANDER

**RISK/S:** Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Do not touch the blade (and never brake it) when it is moving.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specialised training	EPZ UPC005 - Safety when using machine tools	[link to the PDF]



## OPERATIONS WITH DESKTOP EQUIPMENT: SPIN COATER

**RISK/S:** Exposure to harmful and/or toxic substances  
Knocks/cuts by objects or tools  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Extraction hood specific
Safety devices	Protective housing and guards general

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Keep your hands away from the operation area and on the controls of the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Equipment labels must be legible. Immediately replace damaged or illegible signs and labels by requesting them from the equipment manufacturer.
- Follow the preventive measures described in the activity "Occasional handling of hazardous chemicals (harmful, toxic, corrosive, etc.)" when you handle specific chemicals in tests with the equipment.
- Do not use incompatible chemicals inside the spin processor to prevent hazardous chemical reactions.
- Open and close the lid of the equipment carefully to prevent injury to fingers.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 301 - Incompatibility between chemicals	[link to the PDF]

## UNDERWATER ACTIVITIES – SCIENTIFIC DIVING

- RISK/S:** Accidents caused by living beings  
 Exposure to extreme environmental temperatures  
 Exposure to harmful and/or toxic substances: inhalation  
 Exposure to physical contaminants: exposure to pressure variations

### HEALTH AND SAFETY MEASURES:

- \* **Personal protection equipment (PPE):** <http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
	- Scuba diving equipment	[link to the catalogue]

- \* **Technical/organisational measures (TOM):**

- HEALTH SURVEILLANCE: Staff must regularly undergo specific health checks.
- Divers must pass a medical examination that includes at least a spirometry test, an electrocardiogram and an ENT examination and that establishes their fitness to dive at least every two years.
- Check that the scuba diving equipment is in good working order.
- A health and safety resource must be appointed to monitor compliance with all safety regulations prior to any scientific diving activity.

- \* **Pregnancy and/or breastfeeding - Specific measures:**

- Pregnant or breastfeeding workers should not work in high atmospheric pressure conditions.

- \* **Health and safety information:** <http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 901 – Underwater activities – Scientific diving	[link to the PDF]
Health and safety regulations	SHR 902 – Underwater activities – Main hazards and preventive measures	[link to the PDF]
Specialised training	Adequate and necessary training in accordance with hyperbaric exposure	

## OPERATIONS WITH PRESSURE EQUIPMENT: MINICLAVE PRESSURE REACTOR

**RISK/S:** Explosions  
Projection of fragments or particles  
Thermal contact

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Pressure relief devices and safety valves

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Periodically check the manometer to monitor the working pressure.
- The increase in pressure and decompression must be gradual to avoid sudden changes.
- If pressure equipment is used at very high pressure, it should be situated in areas designed for this purpose and adapted to protect against the risk of explosion.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Regularly check that all the fastenings are well tightened and all the guards are in good condition.
- Carry out the tests at low working pressures to avoid potential explosions.
- Check that the obligatory periodic inspections have been carried out.
- Keep pressure and temperature within safe working limits.
- Before using a particular pressure vessel, read the safety warnings.
- Avoid using the equipment with glass pressure vessels due to their fragility. If it is necessary to use one, use a specific glass vessel with a specific protective mesh. Contact the equipment manufacturer.
- Do not attempt chemical reactions with unknown predicted pressure and temperature.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 222 - Pressure equipment: regulations and inspections	[link to the PDF]

## OPERATIONS WITH DESKTOP EQUIPMENT: MAGNETIC PROPERTIES MEASURING DEVICE

**RISK/S:** Exposure to non-ionising radiation: electromagnetic (0 Hz- 300 GHz)

### **HEALTH AND SAFETY MEASURES:**

#### **\* Technical/organisational measures (TOM):**

- Follow the safety warnings specified in the work equipment's instructions manual.
- Periodically inspect the condition of the work equipment for signs of damage.
- Do not use ferromagnetic tools or components. Having non-magnetic deionised water mist fire extinguishers is recommended.
- Do not leave small steel objects (screwdrivers, screws, etc.) on the floor or next to the magnet.
- Keep disks, credit cards and electronic devices away from the work equipment and the identified area.
- Do not exceed the values specified for operating the magnet system.
- Persons with a pacemaker or medical/metal implants should not be allowed to use the equipment.
- Equipment labels must be legible. Immediately replace damaged or illegible signs and labels by requesting them from the equipment manufacturer.

## USE OF LIFTING EQUIPMENT: VEHICLE LIFT

- RISK/S:**
- Falling of detached objects
  - Knocks against static objects
  - Trapping by or between objects
  - Trapping due to vehicles or machinery overturning

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Holding device
Safety devices	Locking device
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Staff must have accredited training in the use of work equipment, safety measures, preventive maintenance, etc.
- Equipment labels must be legible. Immediately replace damaged or illegible signs and labels by requesting them from the equipment manufacturer.
- Periodically check the condition of the chains, lifting cables and support pads.
- Perform preventive and/or mandatory maintenance according to current regulations.
- Before lifting a vehicle, place it on the tracks and lock it.
- Do not exceed the maximum load stated on the lifting equipment under any circumstances.
- Follow the instructions on the signs of each operating control in order to activate the corresponding functions.
- Keep your work area clean and free from objects in order to prevent knocks and/or falls. Clean up any spills immediately.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC013 - Safety in mechanical lifting of loads	[link to the PDF]

## OPERATIONS WITH EQUIPMENT: UV AGING TEST CHAMBER

**RISK/S:** Exposure to non-ionising radiation: optical (>300 GHz)

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Wear safety goggles when you calibrate the equipment.
- Do not stare directly into UV light lamps without safety goggles.
- Disable the lamps (do not break them) when you discard them to prevent unauthorised use; follow the manufacturer's instructions.

## OPERATIONS WITH EQUIPMENT: COMPUTER-CONTROLLED STEAM TURBINE (TTVC)

**RISK/S:** Explosions  
Exposure to physical contaminants: noise  
Projection of fragments or particles  
Thermal contact

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Pressure relief devices and safety valves
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands
Sound insulation system	Soundproof booth/room

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC007 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Periodically check the manometer to monitor the working pressure.
- The increase in pressure and decompression must be gradual to avoid sudden changes.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Health and safety regulations	SHR 222 - Pressure equipment: regulations and inspections	[link to the PDF]

## USE OF UV 3D PRINTERS

**RISK/S:** Exposure to non-ionising radiation: optical (>300 GHz)

### **HEALTH AND SAFETY MEASURES:**

#### **\* Collective protection equipment (CPE):**

Type	CPE
Safety devices	Protective screens
Safety devices	Safety switches and commands

#### **\* Technical/organisational measures (TOM):**

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Follow the preventive measures described in the activity "Occasional handling of hazardous chemicals (harmful, toxic, corrosive, etc.)" when you handle specific chemicals in tests with the equipment.
- In maintenance and/or calibration tasks that require the projector to be activated, use the UPC105 UV safety goggles.



## USE OF LIFTING EQUIPMENT: RADIAL JIB CRANE

**RISK/S:** Falling of dropped objects due to dropping  
Knocks and contact with moving objects

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	End stops
Safety devices	Safety hooks
Safety devices	Surge arresters

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the head	UPC401 - Safety helmet	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Follow the safety warnings specified in the work equipment's instructions manual.
- Only authorised staff with proper training may use the work equipment.
- Always lift loads vertically. Do not exceed the maximum load of the lifting equipment.
- If after elevating a load you see that it is not positioned correctly, lower the load gradually and reposition it.
- Observe the load at all times while it is being handled.
- Do not handle elevated loads above people present in the work area. Do not pass below suspended loads.
- Avoid letting the hook rest on the floor/ground. When working without a load, the hook should be in an elevated position to ensure that people and objects are protected.
- Do not leave loads suspended.
- Perform preventive and/or mandatory maintenance according to current regulations.
- Do not exceed the maximum load stated on the lifting equipment under any circumstances.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	EPZ UPC013 - Safety in mechanical lifting of loads	[link to the PDF]

## OPERATIONS WITH DESKTOP EQUIPMENT: CUT-OFF SAW

**RISK/S:** Exposure to physical contaminants: noise  
Knocks and contact with moving objects  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Aspiration system
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC202 - Respiratory protection mask	[link to the catalogue]
Protection of the ears	UPC304 - Ear defenders	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

Note: Wear a respiratory mask if a local extraction system cannot be used (fume cupboard, extraction hood, aspiration system, etc.).

#### \* Technical/organisational measures (TOM):

- Carry out visual inspections of the condition of work equipment connected to the electric current.
- Wear well-fitting clothes, with sleeves that are tightly-fitting at the wrists.
- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Use fastening devices to hold the workpiece and check that it is securely fastened.
- Check that work equipment is fixed to a stable, firm surface.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	NSH 224 – Cut-off saw	[link to the PDF]
Specialised training	EPZ UPC006 - Safety when using portable electric equipment and hand tools	[link to the PDF]

## OPERATIONS WITH EQUIPMENT: SERVO-CONTROLLED PORTABLE CONTROL DESK

**RISK/S:** Exposure to harmful and/or toxic substances  
Overexertion  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Protective housing and guards general
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC004 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]
Protection of feet / legs	UPC601 - Safety footwear	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- In the case of an incident, use the emergency stop device, which will halt the work equipment in a shorter time than a normal shutdown.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that the work equipment's electrical circuit is connected to ground.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Make visual inspections of the condition of work equipment. If any potential defects are identified, remove the equipment from use and communicate the incident so that the equipment can be repaired.
- Define a safety perimeter around the work area during preparation to prevent people who are not involved in testing from entering the area. Mark off the area with appropriate signage.
- When using the overhead crane, follow the preventive measures described in the activity "Use of lifting equipment: overhead crane".
- When using the forklift truck, follow the preventive measures described in the activity "Use of lifting equipment: forklift truck".

## HANDLING OF LITHIUM-ION POLYMER (LIPO) BATTERIES

**RISK/S:** Explosions  
Fires

### **HEALTH AND SAFETY MEASURES:**

**\* Personal protection equipment (PPE):**

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

**\* Technical/organisational measures (TOM):**

- Take care during the loading process. Overcharging a LiPo battery generates carbon dioxide at the cathode. If a battery swells or leaks, disconnect it from the power supply.
- Use LiPo battery safety bags for both charging and transport.
- Use specific chargers for lithium polymer (LiPo) batteries.
- Take extreme care to ensure that the two battery terminals never make contact with each other. In the event of a short circuit, the battery could catch fire.
- To avoid a short circuit between charging wires, always connect the charger wire first and then the battery. When disconnecting the wires, reverse the sequence.
- To avoid the risk of a short circuit with the terminals, do not wear rings or bracelets when handling batteries.
- Do not leave batteries charged if they are not expected to be used in the short term (2–3 days).
- Do not expose batteries to extreme temperatures.
- Follow the recommendations provided in the manufacturer's instruction manual.
- Keep any combustible or flammable material away from the battery charging area.
- If there are a considerable number of lithium polymer (LiPo) batteries, store and charge them in specific safety cabinets.

## FIRE EXPERIMENTS USING VARIOUS FUELS (GAS, LIQUID AND SOLID)

**RISK/S:** Exposure to harmful and/or toxic substances  
Fires

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Fume isolation system	Room/Booth with general forced extraction
Safety devices	Fire detection systems

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Gas cylinders must be attached by a chain to a solid support so that they cannot fall over.
- Periodically check the connections of gas cylinders and the gas installation using a solution of soapy water, specific products or gas detectors to prevent potential leaks.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Follow the preventive measures described in the activity "Occasional handling of hazardous chemicals (harmful, toxic, corrosive, etc.)" when you handle specific chemicals in tests with the equipment.
- Have extinguishing media that are suitable for the type of test being performed to hand in case of an emergency.
- Do not store combustible or flammable material in the isolation chamber.
- Follow the preventive measures described in the activity "Handling of flammable chemicals" when handling specific test chemicals.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 302 - Proper storage of chemical products	[link to the PDF]
Health and safety regulations	SHR 303 - Storage of flammable and combustible chemicals in movable containers	[link to the PDF]
Health and safety regulations	SHR 308 - Action in the case of liquid chemical spills	[link to the PDF]
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH EQUIPMENT: PCB HOLE PLATING – METALLISATION

**RISK/S:** Contact with corrosive and/or caustic substances  
Exposure to harmful and/or toxic substances

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
General extraction system	General ventilation forced (chemical)
Local extraction system	Extraction hood moveable/fixed
Safety devices	Protective housing and guards general

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC001 - Protective gloves	[link to the catalogue]
Protection of hands / arms	UPC002 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC103 - Face shield	[link to the catalogue]
Protection of the respiratory tract	UPC201 - Respiratory protection mask	[link to the catalogue]
Protection of the body	UPC501 - Protective clothing (apron)	[link to the catalogue]
Protection of the body	UPC502 - Protective clothing (apron)	[link to the catalogue]

Note: Consult the safety data sheet for the chemical product to ensure the right PPE is used. Consult the manufacturer.

#### \* Technical/organisational measures (TOM):

- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Use appropriate transfer systems. Avoid transferring chemicals by open pouring.
- Before filling the tanks and after each emptying, close the drain valves.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Health and safety regulations	SHR 301 - Incompatibility between chemicals	[link to the PDF]
Health and safety regulations	SHR 302 - Proper storage of chemical products	[link to the PDF]
Health and safety regulations	SHR 304 - Storage of corrosive chemicals in movable containers	[link to the PDF]
Health and safety regulations	SHR 308 - Action in the case of liquid chemical spills	[link to the PDF]
Specialised training	EPZ UPC001 - Safety in the handling and storage of chemical agents	[link to the PDF]
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH DESKTOP EQUIPMENT: DESOLDERING AND SOLDERING STATION – REWORK

**RISK/S:** Exposure to harmful and/or toxic substances  
Exposure to radiation  
Thermal contact

### **HEALTH AND SAFETY MEASURES:**

#### \* Collective protection equipment (CPE):

Type	CPE
Local extraction system	Extraction hood moveable
Safety devices	Safety switches and commands

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Only undertake checking, measuring or adjustment operations, among others, when the work equipment has stopped and is disconnected from any power source.
- Do not inactivate safety devices or remove protective elements or guards from the work equipment.
- Periodically check that all of the safety devices are working correctly.
- Follow the safety warnings specified in the work equipment's instructions manual.
- Ensure that safety data sheets (SDS) for any chemicals used are available, and take the precautionary measures indicated.
- Follow the preventive measures described in the activity "Operations with class 2 laser equipment".
- Ensure that the fume hood-type localised extraction system is fitted with a HEPA particulate filter and an active carbon filter.

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-pr>

Type	Title	Consult
Specific information	Safety data sheets (SDS) for chemicals and/or biological agents	[link to the PDF]

## OPERATIONS WITH EQUIPMENT: DRONES IN INDOOR SPACES

**RISK/S:** Exposure to physical contaminants: noise  
Falling of objects due to handling  
Knocks/cuts by objects or tools  
Projection of fragments or particles

### HEALTH AND SAFETY MEASURES:

#### \* Collective protection equipment (CPE):

Type	CPE
Safety devices	Perimeter protection of the operating area
Safety devices	Protective guards on the propellers

#### \* Personal protection equipment (PPE):

<http://www.upc.edu/prevencio/ca/epi>

Part of the body to protect	PPE	Consult
Protection of hands / arms	UPC005 - Protective gloves	[link to the catalogue]
Protection of the eyes / face	UPC101 - Safety goggles : For use if you wear prescription glasses	[link to the catalogue]
Protection of the eyes / face	UPC102 - Safety glasses	[link to the catalogue]
Protection of the ears	UPC301 - Ear plugs with headband	[link to the catalogue]
Protection of the head	UPC401 - Safety helmet	[link to the catalogue]

#### \* Technical/organisational measures (TOM):

- Perform preventive and/or mandatory maintenance according to current regulations.
- Delimit the flying area to prevent access. Stay out of the flying area during drone operation.
- Keep the flying area free of objects and obstacles.
- The perimeter protection net (perimeter protection device for the operating area) must be made of a strong material and must be loose to prevent the drone propellers from cutting it.
- Disconnect the battery before replacing parts or performing maintenance.
- If you need to be within the flying area when you put the drone into operation, use a helmet and goggles to protect yourself from knocks and flying particles (dust or others) from the propellers.
- Use mechanical protective gloves when maintaining, repairing or tuning up the drone.
- The battery connection/disconnection socket must be accessible and clearly identified to prevent accidental misconnection.
- The drone pilot needs training and information on how to use drones and handle batteries safely.
- Follow the preventive measures described in the activity "Handling of lithium-ion polymer (LiPo) batteries".

#### \* Health and safety information:

<http://www.upc.edu/prevencio/ca/informacio-en-prl>

Type	Title	Consult
Specialised training	Equipment training: safety in the use of drones	





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Servei de Prevenció de Riscos Laborals

Barcelona, March 2022

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