

# Laboratory Regulations of the University of Regensburg for the Faculties of Physics

**Operating instructions according to § 14 Hazardous Substances Ordinance<sup>1</sup>**

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<sup>1</sup> Die Laboratoriumsordnung BA 003 –EN wurde mit DeepL aus dem Deutschen übersetzt – nur die deutsche Version ist juristisch relevant // The laboratory regulations BA 003 –EN was translated from German using DeepL - only the German version is legally relevant

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## 1. Scope of application

These general laboratory regulations apply to laboratories in which preparative, analytical or application-related work is carried out with hazardous substances using chemical, physical or physico-chemical methods.

It applies as an operating instruction in accordance with § 14 of the Hazardous Substances Ordinance (Gefahrstoffverordnung-GefStoffV) and the technical rules for hazardous substances TRGS 526 Laboratories and must take into account the risk assessment in accordance with the Occupational Health and Safety Act (Arbeitsschutzgesetz-ArbSchG) and GefStoffV.

The laboratory regulations are binding for all employees and students in the relevant area and must be publicised to everyone in an appropriate manner. The regulations must be strictly observed and complied with. The laboratory regulations must be kept easily accessible or posted in the respective laboratory. Access to the laboratory regulations can also be ensured electronically.

It describes the dangers to people and the environment that occur in the laboratory, specifies the generally required protective measures and rules of behaviour, provides information on special hazards and regulates the handling of hazardous substances.

It must be adapted or supplemented by each institute / chair / working group with location- and activity-related instructions for the workplaces and work procedures to the respective circumstances, whereby the additions must not fall short of the protection objectives of the general laboratory regulations.

In addition to these laboratory regulations, further operating instructions relating to substances, workplaces, activities and machines must be drawn up and observed.

In particular, the following regulations and sources of information for working in laboratories must be observed:

- Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP Regulation)
- Hazardous Substances Ordinance (GefStoffV)
- Maternity Protection Act (MuSchG)
- Youth Labour Protection Act (JArbSchG)
- Ordinance on preventive occupational health care (ArbMedVV)
- DGUV Regulation 1: Principles of prevention with specifics and explanations in DGUV Regulation 100-001
- TRGS526: Laboratories with explanations and practical information in DGUV Information 213-851: Working safely in laboratories
- TRGS400: Risk assessment for activities involving hazardous substances
- TRGS510: Storage of hazardous substances in transportable containers
- TRGS600: Substitution
- DGUV Information 213-039: Activities with hazardous substances in universities
- DGUV Information 213-026: Safety in chemical university internships
- Safety data sheets
- Hazardous substance operating instructions
- Operating instructions for machinery, equipment and work processes
- University regulations on disposal, in particular the disposal of hazardous chemical waste
- Fire safety regulations of the University of Regensburg

In laboratories where special tasks are carried out, e.g. handling genetically modified organisms, handling radioactive substances, handling biological agents, etc., the additional requirements of the respective legal area (e.g. Genetic Engineering Safety Ordinance, Radiation Protection Ordinance, Biological Substances Regulation) must also be observed. It may be necessary to draw up additional operating instructions.

## **2. Hazards for humans and the environment**

The use of physical, chemical and biological methods, including their technical applications, involves a variety of hazards.

Depending on the type of laboratory, mechanical, electrical, physical, biological, thermal, fire and explosion hazards may arise in addition to hazards from hazardous substances and ionising substances.

Substances can be absorbed into the human body by inhalation, absorption through the skin or mucous membranes or by ingestion. They can have a sensitising or toxic effect and cause illness.

Many common laboratory activities can generate vapours and dusts that can cause illnesses when exposed to humans. People can suffer acute or chronic damage to their health, e.g. injuries, burns, frostbite, chemical burns, poisoning, irritation, allergies, infectious diseases, cancer, genetic damage and reproductive damage

Improper handling, storage or disposal may result in the release of hazardous substances into the air, water and soil, causing environmental damage.

## **3. Protective measures and rules of behaviour**

### **3.1. Basic principles for activities in the laboratory**

#### **Instruction**

Before commencing employment, the supervisor responsible for occupational health and safety or their representative must instruct employees, students and trainees in detail and in a relevant manner about general and activity-related hazards in the laboratory and the measures to prevent them, both verbally and in relation to the workplace. The same applies to employees of Department V Buildings and Technology (Abteilung V Gebäude und Technik) as well as personnel from external companies or cleaning staff. Here too, instruction on the hazards and the necessary protective measures must be ensured before starting work.

Instruction must be given before starting work and then at least once a year. The content and time of the instruction must be recorded in writing and confirmed by the instructed persons by signature.

#### **Occupational health care**

The aim of occupational health care is to recognise and prevent work-related illnesses at an early stage. It is regulated in the Ordinance on Occupational Health Care (ArbMedVV) and is an individual protective measure that supplements technical and organisational protective measures. In addition, preventive occupational health care contributes to maintaining employability and to the further development of occupational health protection.

The basis for determining the reasons for precautionary measures is the risk assessment in accordance with Section 5 of the Occupational Health and Safety Act in conjunction with the Ordinance on Occupational Medical Precautions (ArbMedVV) and radiation protection legislation.

The occupational health screening questionnaire at the University of Regensburg provides the tools for a very informative risk assessment, which provides the result of whether and which occupational health screening is necessary. The procedure is also explained in detail under point B of the questionnaire. The result of the risk assessment must then be entered under point F. If necessary, a separate sheet can also be used, which is attached to the risk assessment.

## **Maternity protection and youth protection**

Expectant and breastfeeding mothers as well as adolescents are under special legal protection.

Young people may only handle certain hazardous substances under certain conditions and only under supervision (see Youth Labour Protection Act - JArbSchG).

For expectant and breastfeeding mothers, employment restrictions and employment bans apply when handling hazardous substances in accordance with the requirements of the Maternity Protection Act (MuSchG). Therefore, the supervisor responsible for occupational health and safety should be informed of a pregnancy immediately.

If a pregnancy is reported, the incident-free risk assessment must then be supplemented immediately by the incident-related risk assessment and any resulting protective measures must be implemented immediately so that an irresponsible risk can be ruled out. Information on this can be found on the homepage of the Safety unit under "Maternity protection".

## **Hygiene**

Food, stimulants, tobacco products, cosmetics and drinks may not be stored or consumed in the laboratory due to the risk of contamination.

If the ability to work is impaired due to alcohol, drugs or medication, working in the laboratory area and entering the laboratory area is prohibited.

Hands must be washed thoroughly at the end of work. To avoid skin damage, the skin protection plan of the University of Regensburg must be observed. It is forbidden to keep or store chemicals in the changing area. Lab coats used in laboratories may not be worn in libraries and reading rooms, lecture halls and seminar rooms, canteens and cafeterias.

## **Workwear, protective clothing and personal protective equipment**

Suitable work and protective clothing must be worn when working in laboratories.

Basic clothing with sufficient protective function is usually a long lab coat with long, close-fitting sleeves and a cotton content of at least 35%. Street clothes are not suitable clothing for the laboratory.

Only sturdy, closed and slip-resistant footwear may be worn in laboratories.

To prevent the spread of contamination, personal protective equipment, laboratory and work clothing must be stored separately from street clothing.

In laboratories, it is also mandatory to wear safety spectacles with adequate side protection. If eye hazards can be safely excluded on a permanent basis due to the work processes and activities, eye

protection may be dispensed with in exceptional cases. This must be documented as part of a risk assessment.

In the event of particular hazards, it may be necessary to wear goggles or a face shield. This must be documented accordingly as part of a risk assessment.

Suitable gloves (e.g. disposable or chemical protective gloves) must be worn for activities involving particular risks to the hands. Gloves suitable for the intended use when handling chemicals must be selected in accordance with the safety data sheet and included in the operating instructions.

Information on this topic can also be found in the information sheet of the V/3 Safety unit "Selection criteria: Gloves for laboratory activities"

Attention must be paid to the spread of contamination when wearing gloves. For example, light switches, door handles, taps at washbasins, telephone receivers, computer keyboards or writing utensils must not be touched with used gloves. In the event of (possible) contamination, gloves must be changed immediately

If the risk assessment shows that additional personal protective equipment is required, it must be worn as intended.

## **Emergency facilities**

All employees and students must know the locations of the emergency facilities and be informed about their functions:

- Safety showers (body and eye safety showers)
- First aid facilities such as first aid kits and defibrillators
- Emergency shut-off devices for power, water, gas and/or electricity. After an emergency shutdown, the person responsible for the laboratory must be informed immediately.
- Fire alarm and fire extinguishing equipment such as manual call points, manual fire extinguishers, wall hydrants
- Escape routes and emergency exits
- Location of rescue meeting points and assembly points
- Location of emergency kits (binding agent, metal shovel, broom, required personal protective equipment)

All emergency facilities must not be obstructed or blocked. They must be kept easily recognisable and freely accessible and must not be rendered ineffective.

Safety showers (body and eye safety showers) must be inspected quarterly in accordance with the extended inspection period agreed with the Bavarian State Accident Insurance Fund (Bayerische Landesunfallkasse). The inspections must be documented.

Do not return used portable fire extinguishers to their location, but have them replaced by the V/3 Safety unit. This also applies to damaged portable fire extinguishers.

The contents of first aid kits must be regularly checked for completeness and supplemented if necessary.

## **Non-laboratory personnel**

Cleaning staff may only work if they have been instructed by the person responsible for the laboratory or a person authorised to do so and have been made aware of the dangers in the laboratory. The instructions must be given in a comprehensible form and language, repeated sufficiently often (at least once a year) and documented.

The cleaning staff must not be allowed to clean the laboratory benches and other laboratory equipment. This is to be carried out by the employees in the laboratory concerned.

Laboratory-specific waste of any kind must not be disposed of by cleaning staff in order to avoid unintentional contamination.

Corrosive and flammable liquids must be stored in the appropriate safety cabinets after work so that they cannot be knocked over by the cleaning staff. Very toxic and toxic substances and preparations must be kept under lock and key or stored in such a way that cleaners cannot gain access to them.

The cleaning staff must be given one or more telephone numbers where they can call for assistance in the event of an accident and ask for expert information on appropriate behaviour and how to proceed.

For all activities carried out in the laboratory by employees of Department V Buildings and Technology and by personnel from external companies, the laboratory personnel must clear the work area of chemicals over a large area so that no hazards can arise. This must not be left to the specialised technical personnel themselves.

Employees of Department V Buildings and Technology as well as personnel from external companies must be instructed about possible hazards and supervised to a sufficient extent. The instruction must be documented.

## **Working alone**

As part of a risk assessment, it must be checked whether working alone is possible. The risk assessment determines any additional organisational and technical measures that need to be taken. If working alone cannot be adequately safeguarded, it must not be carried out.

Monitoring must be organised in such a way that sufficiently rapid assistance is ensured in the event of a hazard. The type of monitoring depends on the type of hazard to be determined by the risk assessment.

In particular, the following must be taken into account:

- Type, quantity or concentration of the substances (e.g. toxic, asphyxiating, cryogenic),
- Probability of an accident occurring
- Type and severity of the possible injury,
- Ability to act after an accident,
- Availability and operational readiness of the emergency and rescue services.

## **Inclusion**

Persons with disabilities can carry out activities in laboratories safely for themselves and others under certain conditions. Suitable measures must be defined and documented as part of a risk assessment, which must be tailored to the specifics of each individual case. This is also necessary in the event of a disability occurring at a later date, for example illness. Special consideration must be given to the

feasibility, practicability and effectiveness of the necessary organisational measures and the ability of all persons to cooperate.

The safety concept in laboratories is based on people working there - with and without disabilities - being able to recognise any hazardous situations quickly and act fast enough to avoid an accident or damage to health. The protective measures must be selected in such a way that they are safely effective despite disabilities or restrictions. This can be, for example, the accessibility and reachability of emergency stop buttons, the accessibility and effectiveness of emergency showers or the recognisability and audibility of alarm signals.

Further information on this topic can be found in DGUV Information 213-851 "Working safely in laboratories" under 3.4.5 "Accommodating persons with disabilities in the laboratory".

### **3.2. Protective measures and rules of behaviour when working with hazardous substances**

Hazardous substances within the meaning of the Ordinance on Protection against Hazardous Substances (GefStoffV) are solid, liquid or gaseous substances, including mixtures and solutions (so-called preparations), if the following applies:

1. Hazardous substances and mixtures that are assigned to a hazard class according to § 3 GefStoffV,
2. Substances, mixtures and articles which are explosive,
3. Substances, mixtures and articles that lead to the formation or release of substances specified under numbers 1 or 2 during their manufacture or use
4. substances and mixtures that do not fall under numbers 1 to 3, but which may endanger the health and safety of workers on account of their physicochemical, chemical or toxic properties and the manner in which they occur or are used in the workplace,
5. all substances that have been assigned an occupational exposure limit.

#### **Standard laboratory conditions**

In the laboratory, a safety basis is created through construction and technical equipment as well as organisational and personal protective measures in order to minimise hazards even when working with new or not yet sufficiently investigated substances.

According to DGUV Information 213-851 "Working safely in laboratories", no impermissibly high exposure to hazardous substances and thus compliance with the hazardous substance limit values is assumed if

1. expert and reliable staff
2. in accordance with the relevant regulations and the state of the art and
3. works in particular in accordance with DGUV Information 213-851 and standard laboratory conditions.

The following boundary conditions apply as standard laboratory conditions within the meaning of DGUV I 213-851 "Working safely in laboratories" for working procedures and quantities for the use of toxic, very toxic, carcinogenic, mutagenic or fertility-endangering hazardous substances:



1. Activities involving hazardous substances in which hazardous substances may occur in dangerous concentrations or quantities in the air at the workplace are carried out in suitable fume hoods that have been tested for their effectiveness or in equipment that offers comparable safety, such as vacuum equipment.
2. The maximum quantity used in each case is adapted to the hazard potential of the individual hazardous substance:
  - Liquids are used in quantities of no more than 2.5 litres each.
  - Toxic, carcinogenic, mutagenic or fertility-threatening liquids are used in quantities of no more than 0.5 litres each..
  - Very toxic liquids are used in quantities of no more than 0.1 litres each.
  - Solids are used in quantities of no more than 1 kg each.
  - Toxic, carcinogenic, mutagenic or fertility-threatening solids are used in quantities of no more than 0.5 kg each.
  - Very toxic solids are used in quantities of no more than 0.1 kg each
  - If no central gas supply is available for gases such as nitrogen, argon, hydrogen or propane, the smallest possible container size (maximum 50 litre pressurised gas cylinder) is used. For very toxic, carcinogenic, mutagenic or fertility-endangering gases, lecture bottles or small steel cylinders are used; if this is not possible, no larger than 10 litre pressurised gas cylinders are used.

Experience shows that typical laboratory equipment can safely process batch sizes in the quantities mentioned above.

A general limit of 2.5 litres for liquids and 1 kg for solids per apparatus therefore serves to ensure the controllability of substances below the hazard level of toxic substances within the system of measures of DGUV Information 213-851 "Working safely in laboratories". It has therefore proved useful to apply the limits specified in this section to all hazardous substances, including those that do not have the above-mentioned hazard characteristics.

If activities involving larger quantities of hazardous substances than those mentioned here are carried out in laboratories, this must be considered separately in the risk assessment, as it cannot be assumed that events or exposures can be controlled by the measures described in DGUV Information 213-851 without further assessment. This often requires additional measures that go beyond those contained in DGUV Information 213-851.

The risk assessment determines whether and with which additional measures the activities can be carried out in the laboratory or whether it is not possible to carry them out in the laboratory and, for example, work must be carried out in an appropriately equipped technical centre for reasons of explosion protection.

### **Activities involving hazardous substances**

In addition, the following protective measures and rules of behaviour must be observed as a minimum when working with hazardous substances:

- Work organisation must be designed in such a way that hazards are avoided or reduced to a minimum. Cleanliness and tidiness at the workplace contribute significantly to safe working. Each user is responsible for keeping the workplace clean and tidy..
- Before starting activities with hazardous substances and before carrying out procedures in which hazardous substances may be released, the hazard potential must be determined and the user must be informed about the properties, effects, protective measures to be taken,

behaviour in the event of danger and possible first aid measures. They must also know how to dispose of the product properly. Furthermore, as part of a substitution test, it must be determined whether a less hazardous substance is available for the intended use.

- Sources of information on the properties of hazardous substances are, in particular, safety data sheets, manufacturer or distributor catalogues and hazardous substance databases (e.g. GESTIS substance database).
- Appropriate operating instructions must be drawn up. The university chemicals management system LabSafe can be used for this purpose.
- The handling of substances whose harmlessness has not been established beyond doubt must be carried out in the same way as the handling of hazardous substances.
- Inhalation of vapours and dusts and contact of hazardous substances with skin and eyes must be avoided at all costs. Substances that can emit very toxic, toxic, carcinogenic, mutagenic, reprotoxic, harmful, corrosive or flammable gases, vapours, aerosols or dusts may only be handled in the fume hood. The sashes of the fume hoods must be closed as far as possible.
- Liquids that tend to form organic peroxides must be analysed for the presence of peroxides before distillation and evaporation and the peroxides must be removed. Liquids that tend to form organic peroxides must be stored away from light - especially UV radiation. Peroxides are highly volatile and accumulate in the distillation bubble, especially during distillation, where they can decompose explosively. If peroxides have formed, some of them may be sensitive to vibrations.
- When decanting, rapidly flowing in hoses or spraying (this also applies to waste from flammable liquids) flammable liquids, there is a risk of ignition due to electrostatic charges. The same applies, for example, to whirling up, grinding, mixing and sieving combustible dusts and granulates.

Suitable protective measures include earthing conductive containers and devices and pouring electrostatically non-dischargeable liquids slowly and not in free fall and bringing the funnel close to the bottom of the container.

- When carrying out experiments that require constant supervision, the workplace may only be left if another instructed person takes over the supervision or the occurrence of dangerous conditions is safely prevented by suitable automatic protective measures. Supervision must be organised in such a way that sufficiently rapid assistance is ensured in the event of danger.
- Hazardous substances must not be stored above head height. It must be possible to safely remove containers of hazardous substances from a storage location with two hands. This is not possible if a ladder or step must be used for removal.

## **Storage and transport of hazardous substances**

When storing and transporting hazardous substances, the following protective measures and rules of behaviour must be observed as a minimum:

- Hazardous substances must not be stored or kept in containers whose shape or labelling could cause the contents to be confused with foodstuffs..
- All hazardous substance containers must be labelled with: Name of the hazardous substance, hazard symbols, H and P phrases, signal word, manufacturer or supplier and, in the case of self-presented substances, user name and date of manufacture.
- If the risk assessment shows that complete labelling is not necessary for activities, the simplified labelling system of the DGUV can be used. However, all hazards occurring at the workplaces and the necessary protective measures must be addressed in the operating instructions and instruction.

- The labelling obligation also applies to waste containers.
- Hazardous substances kept in the laboratory must be checked at least once a year to ensure that they are in proper condition (inventory). Hazardous substances that are no longer required or have become unusable must be disposed of properly.
- A list of the hazardous substances present and used in the respective work area, including the storage rooms, must be kept and kept up to date (list of hazardous substances).  
The university chemicals management system LabSafe can be used for this purpose. The system offers the option of automatically generating a hazardous substance register from the inventory of chemicals.
- Fume hoods are not storage locations for hazardous substances. Substances and equipment that are not immediately required for the continuation of work must be removed from the fume cupboard.
- Flammable liquids and highly flammable and highly flammable substances that are to be stored in a cool place may only be stored in refrigerators or deep freezers whose interior is free of ignition sources.
- Very toxic and toxic substances and preparations must be stored under lock and key or in such a way that only specialised or instructed persons have access to them.
- The amount of flammable liquid present in the laboratory must be limited to what is absolutely necessary. Flammable liquids with a flash point below 55°C for manual use may only be stored in containers with a maximum nominal volume of 1 litre. For laboratories in which larger quantities of flammable liquids are constantly required, storage in a protected location is permitted. The protected location is, for example, a safety cabinet for flammable liquids in accordance with DIN EN 14470-1:2004.
- Depending on their type and concentration, acids and alkalis can give off corrosive vapours. Therefore, they are generally not suitable for storage in a safety storage cabinet for flammable liquids. Permanently extracted "acid-alkali cabinets" made of corrosion-resistant material, which are also equipped with corrosion-resistant drip pans, are suitable for storage.
- Hazardous substances and other work equipment must be transported using suitable aids (e.g. gas cylinder transport trolleys). Glass bottles must not be carried by the neck. Bottle baskets, buckets with handles or other suitable means of transport must be used. Attention is drawn to the special regulations for the transport of hazardous substances in lifts.

For radioactive substances, the special provisions of radiation protection legislation apply, in particular the Radiation Protection Act (Strahlenschutzgesetz - StrlSchG) and the Radiation Protection Ordinance (Strahlenschutzverordnung - StrlSchV) and the University of Regensburg's radiation protection guidelines.

The special regulations of the Biological Substances Regulation (Biostoffverordnung - BioStoffV) and the corresponding operating instructions apply to biological agents.

The special provisions of the Genetic Engineering Safety Ordinance (Gentechnik-Sicherheitsverordnung - GenTSV) and the supplementary university documents apply to the handling of genetically modified organisms.

## **Apparatus and devices**

Electrical equipment, apparatus, machines and tools etc. must be visually inspected and functionally checked for damage before use. Defective or damaged devices or equipment may no longer be used and must be reported to the person responsible for the laboratory.

Repairs to electrical equipment may only be carried out by qualified electricians. Protective devices must not be removed. Protective devices are, for example, hazardous substance extractors, touch-proof panelling on live parts or access protection in machines.

Interventions in the electricity, water and gas supply and corresponding repairs to devices may only be carried out by authorised persons with the appropriate specialist knowledge

### Inspections

The supervisor responsible for occupational health and safety must monitor compliance with the inspection intervals for recurring inspections of work equipment and devices and arrange for the necessary inspections to be carried out. Information on this can be found in DGUV Information 213-851 "Working Safely in laboratories", point 7.

In addition to the information in DGUV Information 213-851, the BG RCI provides an overview of the inspections that typically occur in laboratories.

The table available for download contains the recommendations of the "Laboratories" section of the DGUV's "Raw materials and chemical industry" specialist area for deadlines for periodic inspections of work equipment in laboratories as well as basic principles from the state and trade association regulations with further information on the scope of testing. ([https://www.bgrci.de/fileadmin/BGRCI/Downloads/DL\\_Praevention/Fachwissen/Laboratorien/Arbeitsmittel/20210802\\_Pr%C3%BCfliste\\_Version\\_L.pdf](https://www.bgrci.de/fileadmin/BGRCI/Downloads/DL_Praevention/Fachwissen/Laboratorien/Arbeitsmittel/20210802_Pr%C3%BCfliste_Version_L.pdf).)

### Fume Hoods

Fume hoods in the laboratories are designed to prevent hazardous substances from entering the breathing air during work and to protect the user against splashes of hazardous substances or flying glass splinters.

Fume hoods are only fully effective when the sash and sideshift are closed. When working in the fume hood, do not open the sash more than necessary. The head of the person working in the fume hood should always remain protected by the window. After finishing work, the sash must be closed.

The functionality of the fume hoods must be checked before each use, e.g. using a strip of paper or woollen thread (if no electronic warning device is available). Defective fume hoods must not be used and must be labelled accordingly. Any obvious defects must be rectified immediately. To do so, please contact the Unit V/2 - Machine Technical Systems unit of Department V Buildings and Technology.

Harmful substances may only be released in the fume hoods in the event of malfunctions or when filling the equipment. Excess reaction gases, vapours, aerosols or dusts that are produced during normal work processes must be collected by special measures (e.g. using appropriate wash bottle arrangements or special filters).

In the event of failure, malfunction or reduced function of the exhaust air in the fume hood, which is indicated by the monitoring device, use must be discontinued. Equipment must be switched off (cooling water must continue to run if necessary). The person responsible for the laboratory must be informed.

Substances and equipment that are not immediately required for the continuation of work must be removed from the fume hood. Fume hoods must not be used as storage locations for hazardous substances. Shelves or installations in the fume hood are not permitted.

Fume hoods must be regularly inspected as safety equipment and their functionality must be checked and documented. The inspection must be carried out at least once a year. At the University of

Regensburg, this inspection is organised by Unit V/2 - Mechanical Engineering Systems of Department V Buildings and Technology. The dates will be publicised in advance.

### Drying Cabinets

Safety thermostats on drying cabinets must always be used. They must be checked regularly to ensure that they are functioning properly.

Products that can emit flammable gases or vapours during drying must not be dried in drying cabinets without explosion protection. No explosive atmosphere may form inside and no harmful substances may escape to the outside.

### Vacuum work / Rotary evaporators

Before each evacuation of glass containers, they must be visually inspected for damage that could jeopardise their stability, e.g. cracks, scratches, flaking or chips.

To protect against flying glass splinters due to implosions, the glass containers must be secured with e.g. shrink or adhesive film, protective cage, protective shield, protective curtains.

The same also applies to activities involving rotary evaporators. To reduce the risk in the event of a flashover or explosion of the rotary evaporator, the appliances must be completely enclosed or all glass parts must be encased in plastic. Lamellar protective curtains made of PVC have also proven their worth as splinter protection in the event of implosions and explosions, allowing manual intervention on the running appliance while at the same time protecting it from any splinters that may be released. Appropriate operating instructions must be drawn up for the operation of rotary evaporators

### Centrifuges / Ultracentrifuges

Laboratory and ultracentrifuges must be set up in such a way that they can be operated safely. A safe installation is deemed to exist, for example, if they are set up on a suitable, level surface and a clearance of at least 30 cm is maintained around the centrifuge.

Operating instructions must be drawn up for the operation of centrifuges. An operating log must also be kept for ultracentrifuges, in which operating times, instructed users, etc. must be entered.

The requirements arising from DGUV Rule 100-500 "Operation of work equipment", Chapter 2.11, Part 3, must be observed. The prescribed inspections and maintenance must be carried out.

### Cryogenic liquefied gases

When working with cryogenic liquefied gases, measures must be taken to prevent rapidly vaporising liquefied gas from posing a hazard. In particular, this may involve fire and explosion hazards, frostbite or hazards due to toxic properties (e.g. suffocation).

The necessary personal protective equipment must be worn when working with cryogenic liquefied gases, especially when filling and decanting. In particular, this includes a face shield, cold protection apron and liquid-tight cold protection gloves. Sufficient ventilation must be ensured.

Corresponding workplace-related operating instructions must be drawn up and observed. The information sheet on the use of cryogenic liquefied nitrogen in the buildings of the University of Regensburg must also be observed.

### Compressed gas cylinders

As a general rule, bottles should be as small as possible. Their number should be limited to the quantity absolutely necessary.

The storage of compressed gas cylinders in work rooms (laboratories, measuring rooms, etc.) is prohibited. The provision of spare cylinders is permitted.

Compressed gases must be taken from the connection points permanently installed at the workstations. The cylinders must be stored in permanently extracted safety cabinets in accordance with DIN EN 14470-2 ("Compressed gas cylinder cabinets") or taken to the storage area at the end of the working day. The gases must be supplied to the apparatus and devices in pipes that are technically leakproof in the long term. As a rule, special protective measures must be taken for installation in the laboratory, especially in laboratories with an increased fire risk. Here too, the gases must be supplied to the apparatus and equipment through permanently technically sealed, permanently installed pipework.

Compressed gas cylinders must be protected against mechanical impact, in particular against falling over, e.g. by chains, pipe clamps or adjusting devices. Brackets should grip the upper third of the cylinder, not the valve.

Compressed gas cylinders connected for removal must be checked for leaks (e.g. with a leak detection spray). Before starting work with gases that may pose a hazard, the equipment must also be checked to ensure that excess gas can only escape at the designated point.

Pressurised gas cylinders containing toxic, very toxic, carcinogenic, mutagenic or reprotoxic gases must be placed in fume hoods or safety cabinets with 120-fold air exchange in the laboratory for the performance of the activities. If very toxic and toxic gases are used, the test setup must also be set up under a fume hood.

Compressed gas cylinders may only be transported with the protective cap screwed on and with suitable aids (e.g. gas cylinder transport trolley). It is prohibited for persons to travel in the lift while compressed gas cylinders are being transported.

If cylinder valves cannot be opened by hand, the compressed gas cylinders must be taken out of service, labelled accordingly and returned. The use of pliers or other tools is prohibited.

### Laser

When operating lasers of laser classes 3R, 3B and 4, a laser safety officer with the necessary expertise must be appointed before commissioning.

The regulation on protection against artificial optical radiation (OStrV) and the associated technical rules for the occupational health and safety regulation on artificial optical radiation (TROS Laser Radiation) must be observed. Operating instructions must be drawn up and observed.

Laboratories in which class 3B, 3R or 4 lasers are operated may only be entered by appropriately instructed personnel. In consultation with the laser safety officer, laser safety goggles and any necessary protective clothing or protective gloves must be provided and used.

It must be ensured that unauthorised persons cannot enter the room during operation, for example by means of warning lights or illuminated signs indicating that the laser is in operation.

### Refrigerators and freezers

Flammable liquids may only be stored in refrigerators whose interior is free from ignition sources. These must be labelled accordingly: "Interior free of ignition sources only".

Refrigerators and freezers that are not suitable for storing flammable liquids must also be clearly labelled, e.g. "The storage of flammable liquids is prohibited in this refrigerator".

Care must be taken to ensure that the containers are placed upright and secured against falling over; stoppers, ground joint plugs and the like must be secured.

### Autoclaves and experimental autoclaves

Information on the operation and possible hazards when operating autoclaves can be found in the operating instructions and must be observed.

Experimental autoclaves for tests with unknown reaction processes must be set up in special chambers or behind protective walls. Further information to be observed and possible hazards can be found in the corresponding operating instructions.

The tests and maintenance required for the (experimental) autoclaves must be complied with to ensure safe operation. Important information on this can be found in the BG RCI checklist (and in the BetrSichV – Betriebssicherheitsverordnung).

### Hot air blowers

At up to 550 °C, hot air blowers (heat guns) reach almost the same temperatures as Bunsen burners. This also applies to the air outlet nozzle. It is therefore essential to ensure that hot air blowers are not operated in the vicinity of flammable objects, liquids or vapours and that they are not placed directly next to such materials.

Hot air blowers can severely disrupt the retention capacity of fume hoods due to the strong air flow. Always work with the sash as closed as possible.

To reduce the high risk of fire, hot air blowers should always be stored outside the fume hoods. Permanently mounted brackets directly at the workplace, such as horizontally mounted stand rings, have proven their worth.

### Ladders and steps

It may be necessary to use ladders and steps as aids for various activities in laboratories (e.g. setting up tall equipment or working outside the reach range). It should be noted that ladders and steps must be inspected regularly in accordance with DGUV Information 208-016: Instructions for handling ladders and steps. A checklist template for inspecting ladders and steps can be downloaded from the Safety unit website

### Electrical equipment

Electrical equipment must be in perfect technical condition.

A visual inspection of electrical equipment for damage must be carried out before starting work or before commissioning equipment. Defective or damaged equipment (e.g. with damaged cables, plugs or contacts) may no longer be used and must be reported to the laboratory supervisor.

Repairs to electrical equipment may only be carried out by a qualified electrician.

Electrical systems and equipment must be tested regularly in accordance with the requirements of DGUV regulation 3/4 "Electrical systems and equipment". At the University of Regensburg, this inspection is organised by Unit V/1 Electrical Engineering of Department V Buildings and Technology. The dates are publicised in advance.

## 4. Behaviour in the event of danger

If hazardous situations occur (e.g. fire, uncontrolled release of hazardous gases/vapours, uncontrolled release of hazardous liquids), the following must be observed:

- Keep calm and avoid rash, ill-considered action.
- Personal protection comes before property protection.
- Ensure adequate personal protection and use the necessary personal protective equipment
- Warn people at risk and ask them to leave the room if necessary.
- Inform the person responsible for the laboratory.
- If possible, shut down running experiments or bring them to a safe state, switch off gas, electricity and, if necessary, water (cooling water or inert gas supply must continue to run).
- In the event of accidents that have led to injuries, discomfort or skin reactions, especially in the case of hazardous substances that can cause long-term damage, always consult a doctor immediately - provide information for the doctor (safety data sheet, operating instructions, extract from the GESTIS substance database, information from the LabSafe hazardous substance management system of the UR, etc.).
- In the event of fire, the regulations laid down in the fire safety regulations of the University of Regensburg must be observed, in particular:
  - Activate the nearest manual call point to alert the fire brigade (see combined appendix of the UR "Behaviour in the event of fire")
  - Keep windows and doors (fire and smoke protection doors) closed
  - Do not use lifts, as a power failure is to be expected in the event of a fire
  - In the event of a building alarm, leave the building as quickly as possible and go to the assembly point
  - Do not escape into smoky areas
  - People familiar with the area must help injured and helpless persons and check whether any persons are left behind
  - In the case of small incipient fires, try to extinguish the fire with several people at the same time if possible. Use a portable fire extinguisher
- If hazardous gases escape, close valves and ensure good ventilation if possible without endangering yourself. In the case of flammable gases, avoid ignition sources and do not actuate the electrical switch. If available, actuate the emergency stop (gas/electric).
- If hazardous liquids leak, they must be absorbed using suitable binding agents. Information on this must be included in the relevant hazardous substances operating instructions. These must then be disposed of in accordance with university regulations.
- If flammable liquids are leaking, avoid ignition sources, do not operate electrical switches and ensure good ventilation as far as this is possible without personal danger. If available, actuate the electrical emergency stop. Absorb with a suitable binding agent (see associated hazardous substance operating instructions) and take outside or use a tightly sealed collection container. These must then be disposed of in accordance with university regulations.



- In the event of leakage of corrosive liquids, ensure good ventilation and absorb the liquid with a suitable binding agent (see associated hazardous substances operating instructions) and then dispose of it in accordance with university regulations.

## 5. Principles of First Aid

- **Personal protection comes before property protection!**

- Keep calm and avoid rash, ill-considered action.
- Rescue the injured person from the danger zone. Take care to protect yourself so as not to endanger yourself, use the necessary personal protective equipment (protective gloves, respiratory protection, etc.) and provide first aid immediately.
- Inform first aiders in the work area and call on them for support. A list of first aiders is displayed in the laboratory (see: [List of first aiders at the UR](#)).
- If necessary, alert the rescue service ((09)-112 - see the combined appendix of the UR "Behaviour in an emergency"). Do not leave the injured person alone until the rescue service arrives. Wait for the rescue service at the rescue meeting point and guide them to the injured person.
- In the case of injuries with non-restricted mobility that require medical assistance, a transit doctor (D-doctor: doctor authorised to provide treatment for the employers' liability insurance association) must be consulted.

The emergency departments in hospitals are authorised for the treatment of an injured person due to an accident at work or commuting accident. D-doctors are available and present here. The DGUV offers a special search mask on its website to find D-doctors: <https://diva-online.dguv.de/diva-online/>.

- Every injury (including minor injuries) must be reported to the responsible laboratory manager. All first aid measures must be documented in the first aid log.
- Extinguish clothing fires. Preferably use an emergency body shower and/or fire extinguisher. Cool burns with water until the pain subsides. Cover burns with an aseptic dressing.
- In case of contamination with chemicals: Remove wetted clothing and wash skin. Use emergency showers if necessary. Clean uninjured skin with soap and water, in the case of poorly water-soluble substances, wash these off the skin with polyethylene glycol and rinse with water (do not use petrol or solvents).
- When working with hazardous chemical substances, such as hydrofluoric acid, hydrocyanic acid, phenol or respiratory corrosives and irritants, antidotes or means of limiting the effects must be kept ready in consultation with the company doctor. Precise specifications must be included in the operating instructions.
- In case of eye burns, rinse the eyes from the inside (root of the nose) to the outside with the eyelid spread apart for at least 10 minutes or longer, either with the eye shower installed in the laboratory connected to the drinking water, a mobile eye shower or with tap water. Always consult an ophthalmologist.
- Check level of consciousness (reaction to speech, touch). Check and monitor breathing (respiratory movement, respiratory burst) and circulation (pulse, skin colour).
- If the victim is conscious, place objects under the legs (elevation 20-30°) to create a shock position if necessary.
- If unconscious and breathing is adequate, place in the recovery position on the side and hold the head up.

- If not breathing, clear and maintain airway. Start cardiopulmonary resuscitation. When giving artificial respiration, be aware of possible danger to yourself due to inhalation poisoning.
- Have a defibrillator collected and use it, see the overview list of locations under: <https://www.uni-regensburg.de/index.php?eID=dumpFile&t=f&f=87057&token=e33aa0f39ea0b901e0b322fd02195311a357cac4> .
- Stop any bleeding, apply dressings, using disposable gloves.
- Provide information for the doctor. Specify the chemicals, safety data sheet, operating instructions, if possible with information for the doctor, e.g. from the GESTIS substance database. If necessary, secure vomit and chemicals.
- Always consult a doctor in the event of electrical accidents.

## 6. Disposal

Waste disposal at the University of Regensburg is organised and carried out by Unit V/5 Environmental Protection and Logistics of Department V Buildings and Technology. The regulations and acceptance conditions for waste and hazardous waste can be found at: <https://www.uni-regensburg.de/technische-zentrale/abteilung-referate/umwelt-logistik-v-5/sonderabfallentsorgung/index.html>

The quantities of chemicals and solvents used must be minimised. Contamination of waste water with substances hazardous to water must be prevented. Information on disposal must be described in the operating instructions.

Only containers issued by the University of Regensburg will be accepted. These must be labelled in accordance with university regulations. Care must be taken to ensure that the collection containers are not completely filled, but that approximately 10% residual volume remains.

Highly reactive substances such as explosives or organic peroxides must be chemically inactivated before being added to hazardous waste.

The following groups of substances cannot be accepted or can only be accepted under certain conditions:

- Explosive materials (explosives)
- Gas cylinders
- Organic peroxides
- Radioactive materials
- Infectious materials

If you wish to dispose of such materials, please contact Unit V/5 Environmental Protection and Logistics of Department V Buildings and Technology.

Pointed, sharp or fragile objects may only be placed in puncture-proof and dimensionally stable containers. Special needle disposal containers must be used for needles and syringes.

Depending on the material to be disposed of, the filled or partially filled disposal canisters may also have to be stored in a suctioned-off location (e.g. in the case of solvent waste) in an appropriately designed collection tray. It must be ensured that the storage of the collection containers does not interfere with normal laboratory work or lead to a hazard.

The depositing of waste or chemicals in the corridors, escape balconies or roof terraces is prohibited.

## 7. Entry into force

These laboratory regulations were adopted by the Faculty Council of the Faculty of Physics at its meeting on 10 July 2024 and enter into force on 10 July 2024.

The laboratory regulations are part of the Faculty's house rules. They replace the previous laboratory regulations dated 13 December 2015.

The laboratory regulations must be kept easily accessible or posted in the respective laboratory. Access to the laboratory regulations can also be ensured electronically.

It must be adapted or supplemented by each institute / chair / working group / or each operating unit with location- and activity-related instructions for the workplaces and work procedures to the respective circumstances, whereby the additions must not fall short of the protection objectives of the general laboratory regulations.