

**JAGIELLONIAN UNIVERSITY**  
**FACULTY OF CHEMISTRY**  
**KRAKOW, 2 GRONOSTAJOWA ST.**

**FIRE SAFETY**

# **INSTRUCTIONS**

**Krakow, October 2022**  
**(updated version)**

**EXTRACT FROM THE FIRE SAFETY INSTRUCTION MANUAL**  
**(ENGLISH-LANGUAGE VERSION OF SELECTED EXCERPTS)**

1. Characteristics of JU Department of Chemistry facility and fire safety conditions.
2. Principles of preventing the possibility of fire.
3. Tasks and duties of employees in regard to fire protection.
4. Principles of action in case of fire occurrence.
5. Abbreviated instruction on how to proceed in case of fire.
6. Rules for the use of fire extinguishers and hydrant.
7. Appendix to the Extract: "Rules of conduct in the event of the announcement of an evacuation alarm in the teaching facilities complex of the Faculty of Chemistry of the Jagiellonian University at 2 Gronostajowa Street in Cracow".
8. Appendix to the Extract: "Rules for evacuation of persons with special needs, including persons with disabilities from the facilities of the Jagiellonian University".
9. Appendix to the Extract: "Requirements for the use and storage of cylinders of technical gases (including, in particular, flammable gases) in the facilities of the Jagiellonian University".
10. Appendix to the Extract: "Basic rules for the use and storage of fire hazardous materials in the facilities of the Jagiellonian University".

## **I. CHARACTERISTICS OF THE JU FACULTY OF CHEMISTRY BUILDING AND FIRE PROTECTION CONDITIONS.**

### Location of the building and its fire and technical characteristics.

The complex of didactic buildings of the Faculty of Chemistry of the Jagiellonian University in Cracow is located on the territory of the Campus of the 600th Anniversary of the Rebirth of the Jagiellonian University at 2 Gronostajowa Street in Cracow.

The buildings and their segments have different heights and are connected functionally and physically by means of lacunas intended for internal communication between them located above and below ground level.

The buildings are divided into segments as follows:

- BUILDING I - consisting of segments marked with letters A, B, C, D, E and F.
- BUILDING II - segment G,
- BUILDING III - segment H.

The buildings were made in reinforced concrete construction with steel-framed elements and partial glazing of the facade. Ceilings and staircases are reinforced concrete. The roof structure is mostly reinforced concrete with a fire-retardant covering.

In the complex of teaching buildings, the fire road runs on one side of the complex - along Wawel Avenue, along segments A, C and E of building I, and through an internal road along segments B, D and F of building I and along building II and building III.

### The room assignments in the individual buildings are as follows:

#### **BUILDING I**

- **segment A** - a two-storey building, 12.20 m high, with an underground level housing only technical premises, containing amphitheatre lecture halls with a capacity of over 50 persons at a time, seminar and lecture rooms, scientific reading rooms and a book store, as well as a canteen,
- **segment B** - a three-storey building, 13.40 m high, with an underground level containing only technical rooms, teaching laboratories and lecture theatres, as well as conference rooms seating more than 50 people at a time,
- **segment C** - a four-storey building, 14.80 m high, with an underground level containing only technical premises, administrative premises for the Faculty authorities and research staff quarters,
- **segment D** - a four-storey building, 14.80 m high, with an underground floor containing only technical premises, comprising administrative offices for the faculty authorities and researchers,
- **segment E** - a four-storey building, 13.40 m high, with an underground floor containing only technical rooms, comprising laboratory and research rooms,
- **segment F** - a four-storey building, 13.40 m high, with an underground level containing only technical rooms, comprising laboratory and research rooms.

**BUILDING II (segment G):** a building with one overground storey, 4.50 m in height, with an underground storey containing exclusively chemical reagent storage and technical rooms, rooms for flammable materials (chemical reagents), rooms for the main switchboard and supply transformers, as well as storage and utility rooms. Non-flammable technical gas cylinders are stored in an open external annex.

**BUILDING III (segment H):** a single-storey open garage, 3.20 m high, with an additional level of uncovered parking spaces above the highest (first) storey of the garage. Under the exits are sheds made of steel grates encased in HPL panels.

Explosion hazard.

In the complex of buildings of the JU Faculty of Chemistry in building II (segment G) there is a room marked as - bottling plant of flammable materials.

Since, due to the positioning of the buildings on the plot of land, the conditions for the location of the bottling room cannot be met, measures were taken to eliminate the risk of explosion, i.e. conditions were developed to increase explosion and fire safety consisting in:

- a) eliminating or reducing the formation of explosive mixtures on such a scale that the pressure increase in the room does not exceed 5 kPa,
- b) classifying compact explosive atmospheres into appropriate danger zones appropriate to the expected danger,
- c) selection of electrical, technological and protective devices, etc. in a design corresponding to the requirements for individual explosion hazard zones,
- d) execution of wiring which is resistant to environmental conditions occurring in the given danger zone, e.g. chemical substances, moisture, mechanical influences,
- e) protection of electrical equipment and conductors against:
  - overcurrents,
  - atmospheric and switching overvoltages,
  - electric shock,
- f) protection of building structures and technological equipment outside the buildings against lightning discharges,
- g) protection of technological equipment and installations against static electricity discharges.

The flammable materials bottling room under consideration uses:

- mechanical exhaust ventilation with a capacity of at least 4 air exchanges per hour in high degree Ex execution and good availability,
- mechanical emergency exhaust ventilation with a capacity of at least 10 air changes per hour in high Ex execution and good disposition, activated by explosimeters,
- a system to control the vapour concentration of the substance having the lowest DGW (lower explosive limit). In the case under consideration, this substance is ethyl ether with DGW = 1.1% by volume (49 g/m<sup>3</sup>),
- inerting system in the room.

As a result of the safety measures described above, the room is not defined as a potentially explosive room, but only as an explosion risk zone:

- with the provision of mechanical ventilation - zone "2" with a radius of 5 m,
- with the provision of mechanical ventilation, explosimeters and inerting installation - zone "2" only in the vicinity of the power source.

## II. PRINCIPLES FOR PREVENTING THE POSSIBILITY OF FIRE.

1. In order to prevent a fire from starting and spreading, specific fire safety rules and regulations should be observed in every facility. This also applies to rescue and evacuation operations. Accordingly, it is prohibited to carry out activities on the premises that could cause a fire, its spread or impede rescue or evacuation operations.

In particular, it is prohibited to:

- 1) use open flames, smoke and use other agents that could initiate the ignition of the materials present:

- (a) in the area of explosion hazard, except for equipment designed for this purpose, meeting the requirements of the Regulation of the Minister of Development of 6 June 2016 on requirements for equipment and protective systems intended for use in potentially explosive atmospheres,

- (b) in areas where fire hazardous materials are present;

**Smoking is prohibited throughout the premises.**

- 2) using installations, equipment and tools which are technically inoperative or which are not in conformity with their intended use or with the conditions specified by the manufacturer, or which are not subject to periodic checks to the extent and frequency required by building regulations, if this may contribute to fire, explosion or spreading of fire;

- 3) garaging of motor vehicles in facilities and premises not intended for this purpose, if the vehicle's fuel tank has not been emptied and the vehicle's battery supply has not been permanently disconnected;

- 4) heating by means of open flame of tar and other materials within 5 m of a structure, adjacent storage yard or storage yard with combustible materials, it being permissible to do so on roofs with non-combustible construction and covering in structures under construction, and in others, if suitable dedicated heaters are used;

- 5) lighting fires, spilling hot ashes and cinders or burning the topsoil and grasses in a place where combustible materials or neighbouring objects can be ignited;

- 6) storing combustible materials, including plant residues, branches and brushwood, outside buildings within 4 m of the boundary of a neighbouring plot;

- 7) use electric heating appliances;

- 8) the storage of combustible materials and the use of interior decoration and furnishings made of combustible materials at a distance of less than 0.5 m from:

- (a) equipment and installations whose external surfaces may heat up to a temperature exceeding 373.15 K (100 °C),

- b) cable lines with a voltage of more than 1 kV, earthing conductors and the discharge conductors of the lightning protection system, as well as active electrical switchboards, electric power cables and power sockets with a voltage of more than 400 V;

- 9) the use of combustible materials for the covers of light points, with the exception of flame-retardant and non-combustible materials, if they are placed at a distance of at least 0.05 m from the bulb;

- 10) installing lighting fixtures and fittings of electrical installations, such as switches, switches, plug sockets, directly on a combustible substrate if their design does not protect the substrate from ignition;
- 11) storage of flammable materials in general traffic routes used for evacuation or placing objects in such routes in a manner reducing their width or height below the required values specified in the provisions of the Ordinance of the Minister of Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their location, hereinafter referred to as "technical and construction regulations";
- 12) storage of combustible materials in technical rooms, in unused attics and lofts, and in general traffic routes in basements;
- 13) storing full, incomplete and emptied flammable gas cylinders in non-utilised attics, lofts and basements;
- 14) locking escape doors in such a way that they cannot be used immediately in the event of a fire or other emergency necessitating evacuation;
- 15) locking fire doors and gates in such a way that they cannot close automatically in the event of a fire;
- 16) locating interior decoration elements, installations and devices in such a way as to reduce the dimensions of the escape route below the values required by the technical and construction regulations;
- 17) using an evacuation route from an auditorium or other similar use where there is a simultaneous exchange of audiences (users) as a waiting area to enter that auditorium;
- 18) preventing or restricting access to:
  - (a) fire extinguishers and fire-fighting equipment,
  - (b) anti-explosion relief devices,
  - (c) water sources for fire-fighting purposes,
  - (d) appliances for starting and controlling fire-extinguishing systems and other systems affecting the fire safety of the facility,
  - (e) emergency exits or windows for rescue teams,
  - (f) electricity switches and distribution boards and gas supply main taps,
  - (g) external grilles and shutters which, in accordance with building regulations, should open from the inside of the dwelling or room;
- 19) filling liquid gas cylinders at filling stations, liquid gas stations and other facilities not intended for this purpose.

### III. DUTIES AND RESPONSIBILITIES OF EMPLOYEES IN THE FIELD OF FIRE PROTECTION.

The duties of employees in the field of fire protection include:

- 1) participation in fire protection training,
- 2) knowledge of fire safety instructions,
- 3) observance of applicable fire safety regulations,
- 4) knowledge of the rules of conduct in case of fire,
- 5) knowledge of the rules of conduct in the event of the announcement of an evacuation alarm in the facility,
- 6) knowledge of the operation and use of portable extinguishing equipment,
- 7) performing the orders of superiors aimed at improving fire safety,
- 8) promptly informing superiors of the danger of fire hazard,
- 9) maintaining their workstations in a state that guarantees full fire safety during and after performing their official duties,
- 10) participating in rescue and firefighting actions and subordinating to the person in charge of the action.

### IV. RULES OF CONDUCT IN CASE OF FIRE.

In the event of a fire, the first most important action is to sound the alarm.

Anyone who first notices a fire or other danger is obliged to immediately alert:

- persons in the immediate vicinity,
- The State Fire Service,
- Dean of the Faculty of Chemistry,
- Administrator of the facility.

It is necessary to remain calm and prevent panic.

The fire alarm on the premises is announced automatically by sounders activated by the fire alarm system. This is a state-of-the-art system of fire detectors and buttons located throughout the complex connected to fire alarm panels. The installation is connected by a monitoring system to the Steering Station of the City Commander of the State Fire Service in Krakow.

The installation alarms as follows:

- preliminary alarm (1st degree) - informing the direct operation of the control panel about the occurrence of an abnormal phenomenon,
- global alarm (2nd degree), fire - alerting all people present in the building and external services (Fire Department), activating programmed controls.

Pressing the manual call point (ROP) will trigger the 2nd degree alarm without time delay.

The fire alarm control panel controls:

- 1) activation of smoke dampers removing smoke from stairwells and elevator shafts,
- 2) opening the supply of make-up air in the stairwell smoke removal system,
- 3) switching off air conditioning and supply and exhaust ventilation in the event of a fire in the fire zone,
- 4) closing fire dampers shutting off in ventilation and air conditioning ducts,
- 5) closing open fire doors dividing fire zones (release of electromagnets),

- 6) unlocking doors controlled by access control,
- 7) bringing passenger elevators to the first floor level and locking them in the open position,
- 8) emergency opening of the sliding entrance door on the first floor,
- 9) domestic water shut-off valve and control of shut-off valves and hydrophore,
- 10) checking the open/closed status on the shut-off valves mounted on the pipelines of the fire water supply system,
- 11) activation of the gas extinguishing system when a fire is detected in the extinguishing room.

Alerting the Fire Department of the resulting danger can also be done by telephone.

When reporting a fire by telephone to the Fire Department, the following information must be provided:

- the exact address, the name of the object or part of it where the fire originated,
- what is burning (e.g., there is a fire in the checkroom on the first floor),
- whether there is a threat to human life,
- your name and the telephone number from which you are calling. You can hang up only after receiving confirmation that the call has been received.

If necessary, you can alert other services - such as the Emergency Medical Service, the Police, the Emergency Electricity Service, etc.

The **emergency telephone number 112** should be used in the notification

#### Rescue and firefighting action.

At the same time as alarming the Fire Department, if the alarmist considers that his safety is not threatened, he may attempt to extinguish the fire using nearby fire extinguishers, fire blankets and hydrants. Such actions may also be taken by other employees, provided that they do not jeopardize their safety.

Until the arrival of the Fire Department, the rescue and firefighting action is managed by the Dean of the Faculty of Chemistry, his Deputy or a person authorized by him, or the most energetic, poised person, who will organize the initial rescue and firefighting activities consisting primarily of:

- saving endangered people's lives (ordering evacuation action),
- quick and proper activation of portable firefighting equipment to extinguish the fire,
- turning off the electricity supply to the rooms covered by the fire,
- removing from the reach of the fire all flammable materials, in particular, cylinders with flammable gases, compressed gases, vessels with flammable liquids, valuable objects, equipment, etc.
- not opening unnecessarily the doors, windows to the rooms where the fire originated, so that the air supply does not cause the spread of fire.

After the arrival of the Fire Department, the management of the action is taken over by its commander, to whom the person previously in charge should provide the necessary information about the situation and the actions taken.

**V. SUMMARY INSTRUCTION ON HOW TO PROCEED IN CASE OF FIRE.**

1. If you notice a fire or other danger, alert the security service/guardhouse employee (by voice, telephone or by pressing the manual fire alarm - ROP).
2. Alert people in the immediate vicinity, especially those in the danger area, of the existing danger.
3. If the fire is small and you consider that it does not pose a danger to you - you can attempt to extinguish it with the help of fire extinguisher/hydrant/extinguishing blanket available in the vicinity and report it to the security officer/porters.

**DO NOT EXTINGUISH WITH WATER  
LIVE ELECTRICAL INSTALLATIONS AND EQUIPMENT.**

4. If the fire is larger - alert the security officer/porter service and leave the endangered place by the nearest marked evacuation route.
5. If there is smoke on the evacuation route, when walking lean as low as possible - above the floor itself there is always more clean air and better visibility.
6. If the fire situation does not allow you to leave the room (e.g. thick smoke, fire) - go back, close the door and call for help through the window, or by phone. You can survive a fire in a closed room.

**REMAIN CALM AND DO NOT GIVE IN TO PANIC!**

**VI. RULES FOR THE USE OF FIRE EXTINGUISHERS AND HYDRANTS.**

The type of fire extinguishers should be adapted to extinguish those groups of fires that may occur in the facility:

- A - solid materials, usually of organic origin, whose normal combustion occurs with the formation of glowing coals;
- B - liquids and solid melting materials;
- C - gases;
- D - metals;
- F - fats and oils in cooking appliances.

**POWDER EXTINGUISHERS** - are characterized by the high extinguishing efficiency of powders, based primarily on their inhibiting (interrupting) effect on the combustion process, being a chemical reaction that delays the combustion reaction.



Powders are designed for extinguishing fires of organic solids (group A), flammable liquids (group B) and flammable gases (group C), as well as live electrical equipment.

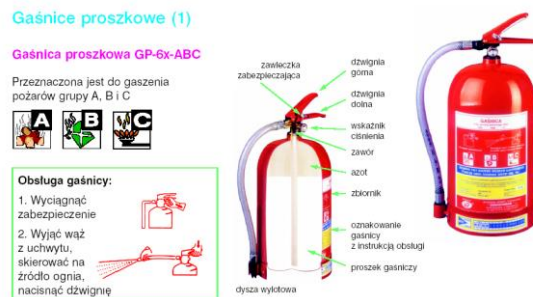
Powder extinguishers are used primarily where there is a fear of damage to materials and equipment of particular value, which when using other extinguishing agents, especially water and foam, may be destroyed. The use of powders is limited only in the case of precision apparatus and equipment, since powder can cause seizure of moving parts.

#### **How to use a powder extinguisher:**

- remove the extinguisher from the hanger and go with it to the place of fire.
- break the seal and remove the pin,
- activate the extinguisher with the lever and direct the powder jet into the fire focus,
- the operation of the extinguisher can be interrupted at any time by releasing the activating lever.
- due to its siphon structure, the extinguisher works properly only in the vertical position,
- after each use, the extinguisher should be subjected to workshop repair.

The use of the powder extinguisher is shown on the extinguisher label.

The appearance of the powder extinguisher is shown in the photograph below.



**SNOW EXTINGUISHERS** - the extinguishing action of carbon dioxide is to reduce the degree of saturation of the combustible mixture with oxygen and to cool the burning material.

They are designed to extinguish in the bud fires of flammable liquids (group B), flammable gases (group C) and fires of live electrical installations and equipment. When using snow extinguishers indoors, special care must be taken, as carbon dioxide concentrations above 5% are suffocating, and above 8% - poisonous. After an extinguishing action, the premises where the snow extinguisher was used should be thoroughly ventilated.

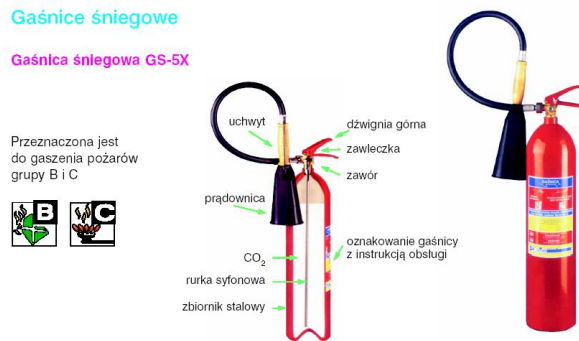
#### **How to use a snow extinguisher:**

- after delivering the extinguisher to the place of fire, break the seal and remove the pin,
- activate the extinguisher with the lever and direct the stream of carbon dioxide on the fire focus,
- the operation of the extinguisher can be interrupted at any time by releasing the activating lever.
- during the operation of the extinguisher should be held in the designated places, i.e. by the hose handle and the lever.

- snow extinguisher must not be used to extinguish clothing on a person, as carbon dioxide changing its state of aggregation from liquid to gas cools to a temperature of about  $-72\text{ }^{\circ}\text{C}$ ,
- after each use, the extinguisher should be subjected to workshop repair.

How to use a snow extinguisher is shown on the extinguisher label.

The appearance of the snow extinguisher is shown in the photograph below.



**INTERNAL HYDRANTS** - these are fire-fighting devices that allow the delivery of a stream of extinguishing water to the fire source, usually supplied from an external water supply system. A typical hydrant is equipped with a shut-off valve, a hose section and a water nozzle located in a recessed so-called hydrant cabinet.

They are used to extinguish organic solids (group A) and to cool or protect the surfaces of objects near the source of fire.

**In order to activate the internal hydrant it is necessary to:**

- open the cabinet,
- unroll the discharge hose terminated with a nozzle,
- open (unscrew) the hydrant valve (to the left),
- open (unscrew) the nozzle valve (left or right, depending on what kind of water stream you want)
- direct the water stream to the source of the fire.

**Do not use hydrants to extinguish fires within consumer electronics and live electrical systems and equipment (due to the destructive effect of water and the possibility of electrocution).**

In addition, water must not be used to extinguish:

- bodies that react chemically with water (e.g., carbide, sodium, potassium),
- glowing bodies with very high glow temperatures,
- flammable liquids lighter than water (e.g., gasoline, oil, solvents).

Therefore, the full use of the hydrant to extinguish a possible fire can only occur as a last resort (e.g., after using available fire extinguishers).

**There is an internal hydrant network (hydrant cabinets equipped with firefighting hoses and water nozzles) on the premises of the JU Faculty of Chemistry building.**

The appearance of the hydrants used is shown in the photographs below.



**RULES**  
**of conduct to be followed in the event of an evacuation alarm**  
**in the complex of didactic facilities**  
**Faculty of Chemistry, Jagiellonian University**  
**at 2 Gronostajowa St. in Cracow.**

1. The decision to evacuate shall be made by the Dean of the Faculty of Chemistry, his/her Deputy or a person authorized by him/her, and in their absence by the most energetic and composed person.
2. In the event of activation of the level II alarm in the fire alarm system, the evacuation alarm is announced automatically by sounders.
3. After the activation of the evacuation alarm, functional persons shall put on reflective vests and make sure that all persons have left the premises and report this fact to the person in charge of the evacuation operation. Any injured persons should also be reported.
4. All employees secure their workplaces (turn off electrical appliances, including heating, close windows) and, taking their personal belongings, leave the facility. Doors to the premises should be closed (do not lock the doors).
5. Lecturers and other instructors shall interrupt classes and direct students to the evacuation route.
6. Students shall take personal belongings and leave the building immediately.
7. On the staircases it is prohibited to run down the stairs.
8. During the evacuation, designated functionaries shall secure the entrances to the building to prevent any outsider from entering the premises, and in the event of the arrival of the Fire Department unit, they are required to indicate the location of the fire.
9. Evacuation of people should begin from the rooms, floors where the fire or other local danger originated or which are located in the direction of the spread of fire and then adjacent rooms, floors above and below, as well as rooms and floors from which exit or access to safe escape routes may be prevented by fire or smoke.
10. Evacuated people shall be directed to the horizontal escape routes in accordance with the directions specified by the escape signs located on the walls and doors of the building to the exit to the outside of the building.
11. The place of assembly of evacuees - the square in front of segment AB of BUILDING I.

12. It is necessary to ensure that among the evacuees in the first place are people with reduced mobility for various reasons.
13. During the evacuation, elevators should not be used - the elevator should be brought to the first floor, opened and locked.
14. Injured people with limited mobility should be evacuated using wheelchairs, stretchers or carried on hands.
15. If the evacuation routes are blocked, the evacuation supervisor should be notified immediately using available means of information (telephone, voice, etc.). People who were prevented from leaving by smoke or fire, and who are in the danger zone, should be gathered in a room as far away from the fire as possible and, depending on available resources and existing conditions (window, balcony) be evacuated outside with the help of rescue equipment of the incoming rescue units of the State Fire Service and others.
16. With heavy smoke in the evacuation routes, one should move in a bent position, trying to keep the head as low as possible due to the lower temperature and smoke in the lower parts of the rooms and corridors. If possible, one should cover the mouth and airway with a handkerchief soaked in water to facilitate breathing. When moving through smoky sections of evacuation routes, one should move along the walls so as not to lose track of the direction of movement.
17. In the event of the arrival of firefighting units in the course of the evacuation action, the person in charge of the course of the action is obliged to give a brief information on the course of the evacuation and then one must obey the instructions of the commander of the arriving firefighting unit.

**Annex to the extract from the Fire Safety Instructions**

Annex to Order No. 94 of the Rector of the Jagiellonian University of 19 September 2023.

**Rules for evacuation of persons with special needs, including persons with disabilities from Jagiellonian University facilities**

1. The following arrangements and procedures for the evacuation of persons with special needs, including persons with disabilities, from the facilities of the Jagiellonian University are in place in the event of an emergency or the need to carry out a practical check of the organisation and conditions of the evacuation.
2. The evacuation of persons with special needs, including persons with disabilities, must not restrictively affect the organisation of the evacuation of other persons from the facility.
3. The responsibility for the evacuation of persons with special needs, including persons with disabilities, shall be borne:
  - 1) in the case of an employee – by the employee's immediate supervisor, and if the immediate supervisor is a person with a disability, by his/her deputy or designated functional person,
  - 2) in the case of a student/doctoral student attending a class - by the person teaching the class, and if the teacher is a person with a disability - by his/her deputy or a designated functional person,
  - 3) in the case of a third party resident in the facility at risk - by the designated functional person.
4. The person responsible for the evacuation of persons with disabilities referred to in paragraph (3) shall:
  - 1) direct an evacuated disabled person in a wheelchair to a separate fire zone in the building or
  - 2) transport the person to the first floor of the facility via an evacuation staircase, heading for the exit to the outside (without lowering the trolley), or carry to an evacuation staircase (if it is a safe, fire and smoke-separated area), leaving one person to assist and reports this to the person in charge of the evacuation.
5. When evacuating persons with special needs, including persons with disabilities, specialised equipment and facilities (such as an evacuation chair and mattress) may be used. The need for the use of appropriate equipment or facilities is decided by the person in charge of the evacuation.
6. Deans, directors of institutes, head of the Property Administration Department, head of the Administration Department of the JU 600th Anniversary Renewal Campus and administrators of autonomous facilities, in consultation with the director of the JU Accessibility Centre, appoint functional persons responsible for the evacuation of persons with special needs, including persons with disabilities.
7. The managers of the units referred to in paragraph (6) and the administrators of the independent facilities shall be obliged to organise and conduct at least once per calendar year a periodic training for functional persons on the evacuation of persons with special needs, including persons with disabilities.
8. The evacuation of a person for whom an Individual Evacuation Plan has been developed shall be carried out in accordance with the principles set out in this Ordinance, taking into account the solutions and procedures contained in the Individual Evacuation Plan.

## REQUIREMENTS FOR THE USE AND STORAGE OF CYLINDERS OF TECHNICAL GASES (flammable gases in particular) IN THE FACILITIES OF THE JAGIELLONIAN UNIVERSITY.

### I. BASIC TERMS AND DEFINITIONS.

**Industrial gases** - include a range of gases (as well as their mixtures) having a variety of industrial and research applications.

Industrial gases include:

- combustible gases such as acetylene, methane, propane, ammonia, hydrogen, hydrogen sulphide, carbon monoxide, ethylene oxide, etc.
- non-flammable gases: nitrogen, carbon dioxide, helium, noble gases,
- non-flammable gases with the ability to stoke a fire (oxidising): oxygen, compressed air, liquid air.

**Flammable gases** are gases which at a temperature of 20°C, at a normal pressure of 101.3 kPa, are flammable if their concentration in a mixture with air is 13% by volume or less or have a flammability range in air of at least 12 percentage points, regardless of the lower flammability limit. The temperature at which a gas can undergo a combustion reaction under the influence of additional factors is called the flash point. The temperature at which a gas starts to burn spontaneously is called the auto-ignition temperature.

**A flammable gas** is defined as a gas or mixture of gases in the flammable range in air at 20°C and a normal pressure of 101.3 kPa.

**A pyrophoric flammable gas** is defined as a gas susceptible to spontaneous combustion at 54 degrees or below.

**Flammable gas chemically unstable** refers to a gas capable of reacting explosively even without contact with air or oxygen.

**Non-flammable gases** - also called inert gases - are those gases that do not react with the fuel and do not promote combustion.

**Oxidising gases** - these are gases that can cause or enhance the combustion of other materials significantly more than air. This group includes both pure gases and gas mixtures with an oxidising capacity of more than 23.5%, which is determined on the basis of the method indicated in the standard [5].

**Fire-hazardous materials** - the term used to describe, among other things, flammable gases according to the regulation [1].

## II. STORAGE OF COMPRESSED GAS CYLINDERS.

1. Each steel cylinder should have an embossed serial number, be stamped with the seal and date of the next legalisation, a sticker with product, safety and gas transport information, and a barcode so that we can trace the circulation of the cylinder.
2. The storage of compressed gas cylinders is prohibited:
  - in basements,
  - in stairwells,
  - in corridors,
  - in narrow courtyards,
  - in and near pedestrian passageways and crossings;
  - in vehicle garages,
  - on working platforms of equipment and other installations,
  - in premises intended for permanent human habitation (i.e. more than 4 hours a day).
3. Premises and storage areas for compressed gas cylinders, both full and empty, must be marked with warning signs according to the Polish Standards, containing:
  - identification of the type of danger posed by the gases (flammable, toxic, etc.),
  - ban on unauthorised access,
  - no smoking.
4. When storing gases under pressure, the storage conditions described in the safety data sheets must be complied with.
5. The closing valves of stored pressure cylinders shall be effectively protected by a cap, collar or protective structure to prevent damage which could cause gas escape from the cylinder.
6. Pressure cylinders in storage shall be secured to prevent accidental tipping or slipping.
7. Floors in both closed and open storage areas should be level, with a non-slippery surface, made of material that does not produce sparks on impact.
8. Enclosed storage areas for cylinders of gases should be ventilated to prevent dangerous concentrations of gases - if fans driven by electric motors are used, the motors should be explosion-proof.
9. The electrical lighting installation for the storage of flammable gas cylinders shall comply with the applicable standards for explosion-hazardous rooms, i.e. the electrical installations and equipment shall also be of an explosion-proof design.
10. Compressed gas cylinder storage rooms may only be heated by radiators supplied with water or steam from external sources.
11. The storage room for cylinders of flammable gases shall be protected from being heated to a temperature in excess of 308,15 K (35°C).
12. Storage rooms for storage of compressed gas cylinders shall be equipped with fire-fighting equipment in accordance with fire protection regulations.

## III. STORAGE OF COMPRESSED GAS CYLINDERS WITH FLAMMABLE AND OXIDISING GASES.

1. The instructions in regulations [1] and [7] shall be followed when using or storing fire hazardous materials.
2. Safety considerations dictate that compressed gas cylinders with flammable gases should be kept outside the working area and that the gas should be supplied to the working area by



means of special pipe lines made of suitable materials (copper, stainless steel, plastic), tightly connected.

3. Compressed gas cylinders with flammable gases must be stored in rooms designed exclusively for this purpose or in special safety cabinets designed for type 90 gas cylinders which meet the standard [6]. Gas cylinder cabinets temporarily protect gas cylinders from overheating in the event of a fire, thereby increasing the time required to evacuate employees and bystanders on site. The cabinet should be provided with a fire ventilation system. Cabinets may store cylinders full or empty. It is forbidden to store flammable gases with incompatible substances, e.g. oxidising gases with flammable or aggressive gases.
4. Storage facilities for flammable gases must meet the requirements set out for potentially explosive areas.
5. Cylinders for flammable gases containing liquefied petroleum gas shall be kept at least 3 m away from the nearest manholes or other depressions in the ground and from openings to rooms with floors below the adjacent ground.
6. Cylinders for the storage and transport of flammable gases shall be marked in accordance with the Polish Standards.
7. Cylinders of flammable gases and non-flammable, non-poisonous gases may be stored in a single room (or safety cabinet) with the exception of oxidising and aggressive gases.
8. Empty cylinders may be stored with cylinders filled with flammable gases in the same room, provided they are arranged separately.
9. Cylinders of flammable gases, full or empty, with feet, should be stacked vertically in a single layer, segregating them according to their contents.
10. Cylinders of flammable gases without feet should be stored horizontally in wooden frames and stacked up to 1.5 m high.
11. Cylinders should be secured against falling using barriers, partitions or other protective measures.

#### **IV. LIST OF LEGAL ACTS.**

[1] Regulation of the Minister of Internal Affairs and Administration of 07 June 2010 on fire protection of buildings, other building structures and areas (Journal of Laws No. 107, item 917, as amended).

[2] Regulation of the Minister of Economy of 6 September 1999 on occupational safety and health in the storage, filling and distribution of liquefied gases ( Journal of Laws Dz. No. 75, item 846, of 2000, No. 29, item 366 and of 2004. No. 43, item 395).

[3] Regulation of the Minister of Economy, Labour and Social Policy of 23 December 2003 on safety and hygiene in the production and storage of gases, filling of tanks with pesticides and use and storage of carbide (Journal of Laws of 2004, No. 7, item 59).

[4] Commission Regulation (EU) 2019/521 of 27 March 2019 amending, for the purposes of its adaptation to scientific and technical progress, Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures.

[5] the PN-EN ISO 10156:2017 - 12 standard 'Gas cylinders - Gases and gas mixtures - Determination of flammability and oxidising capacity when selecting gas cylinder inlet valves'.

[6] PN EN 14470-2:2007 'Fire resistant storage cabinets - Safety cabinets for compressed gas cylinders'.

[7] Fire safety instructions.

## **BASIC RULES ON THE USE AND STORAGE OF FIRE-HAZARDOUS MATERIALS IN THE FACILITIES OF THE JAGIELLONIAN UNIVERSITY.**

### **I. BASIC TERMS AND DEFINITIONS.**

**Fire hazardous materials**, as defined in regulation [1], are:

- 1) flammable gases,
- 2) flammable liquids with a flash point below 328.15 K (55 °C),
- 3) materials producing flammable gases in contact with water,
- 4) materials that ignite spontaneously in air,
- 5) explosives and pyrotechnics,
- 6) materials which spontaneously decompose or polymerise,
- 7) materials prone to spontaneous combustion,
- 8) materials other than those mentioned above, if the way they are stored, processed or otherwise used may cause a fire.

**A fire zone** is a building or part thereof separated from other buildings or other parts of a building by fire separation elements as referred to in § 232(4) of regulation [2] or by strips of open land with a width of not less than the permissible distances from other buildings as specified in § 271(1) to (7) of regulation [2].

**A safety data sheet for a substance/mixture** is a document containing a description of the hazards that a particular chemical substance or mixture may present, as well as basic physical and chemical data about it. Its primary purpose is to provide information on the potential hazards of a substance (mixture), the methods of preventing them and the procedures to be followed in the event of contamination of the substance (mixture) described.

### **II. RULES FOR STORING FIRE HAZARDOUS MATERIALS.**

1. Materials hazardous to fire should be stored in premises meeting the conditions specified in the technical and construction and fire protection regulations while observing all precautions.
2. A room intended for the storage of dangerous substances and preparations should be:
  - 1) marked with warning signs, in accordance with the regulations [3],
  - 2) equipped with exhaust, gravitational and mechanical ventilation,
  - 3) equipped with the appropriate amount and type of fire-fighting equipment according to regulation [1].
3. When storing hazardous materials inside buildings, the individual characteristics of each material, such as flammability, toxicity or possibility of water contamination, should be taken into account.
4. Hazardous materials shall be stored in such a way that no fire or explosion is caused by the storage process or by interaction.

5. Storage conditions must be in compliance with applicable regulations - including the requirements specified in the 'Safety Data Sheet for the substance/mixture' drawn up in accordance with the relevant regulations [5] by its manufacturer.
6. Fire hazardous materials must not be stored in basements, attics and lofts, within staircases and corridors and other publicly accessible areas as well as on terraces, balconies and loggias.
7. Hazardous substances and preparations should be stored in appropriate, original packaging and be labelled with original labels according to regulations [3] and [4].
8. Fire hazardous materials may be stored in fire resistant safety cabinets manufactured in accordance with PN-EN 14470-1:2010 Fire resistant storage cabinets - Part 1: Safety cabinets for flammable liquids.
9. The primary function of the safety cabinet is to protect the materials stored in it from a rise in temperature should a fire occur in the room in which the cabinet is located. During a fire, the safety cabinet door (if open) must close automatically when the temperature inside the cabinet exceeds 50°C and the rubber seals swell, filling all spaces between the doors tightly. The layered construction of the cabinets protects the stored substances from overheating and fire. In addition, the cabinets have a separate ventilation system to prevent the formation of dangerous vapours from flammable liquids. In the event of a fire, the supply and exhaust vents must close automatically if they are exposed to a temperature of 70°C.
10. Safety cabinets for the storage of hazardous substances shall be marked with warning signs.
11. the person responsible for the storage of dangerous substances and preparations should have access to their "Safety data sheets for substances/mixtures" in hard copy or electronically.

### **III. USE OF FIRE HAZARDOUS MATERIALS.**

1. Flammable substances and materials may be kept in laboratory premises only in quantities not exceeding the daily requirements.
2. Stocks of hazardous materials in excess of daily requirements shall be stored in a separate storeroom suitable for the purpose.
3. Liquids with a flash point below 55°C shall be stored only in containers, devices and installations designed for the purpose, made of non-combustible materials, dissipating static electricity, fitted with leak-proof closures and protected against breakage.
4. The quantities of stored fire-hazardous materials must not exceed the values specified in the fire regulations, i.e. in one fire zone classified as a human hazard category (except for residential and commercial buildings) there may be (in total):
  - 1) up to 10 dm<sup>3</sup> of liquids with a flashpoint below 21 °C,
  - 2) up to 50 dm<sup>3</sup> of liquids with a flash point of 21-55 °C.NOTE: Laboratory rooms do not constitute separate fire zones.
5. Each laboratory should have an up-to-date list of fire hazardous substances and materials including the name of the substance, quantity and flash point.

### **IV. LIST OF LEGAL ACTS.**

[1] Regulation of the Minister of Internal Affairs and Administration of 07 June 2010 on fire protection of buildings, other building structures and areas (Journal of Laws No. 107, item 917, as amended).

[2] Regulation of the Minister of Infrastructure of 12 April 2002 on technical conditions to be met by buildings and their location (Journal of Laws of 2022, item 1225, item 917 as amended)

[3] Regulation of the Minister of Health of 25 August 2015 on the method of labelling places, pipelines and containers and tanks used for storing or containing hazardous substances or hazardous mixtures (Journal of Laws of 2015, item 1368)

[4] Regulation of the Minister of Health of 9 November 2004 amending the regulation on the labelling of packaging of hazardous substances and hazardous preparations (Journal of Laws No. 260, item 2595)

[5] Commission Regulation (EU) 2020/878 of 18 June 2020 amending Annex II to Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

[6] EN 14470-1:2010 Fire resistant storage cabinets - Part 1: Secure storage cabinets for flammable liquids

[7] Fire safety instructions.

