Pannon Egyetem
University of Pannonia

Workplace Radiation Protection Regulation

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The Workplace Radiation Protection Regulation (hereinafter referred to as the "Regulation") issued by the University of Pannonia (hereinafter referred to as the "University") on the basis of the University's Organisational and Operational Rules (hereinafter referred to as: "OOR"), Part I Organisational and Operational Rules of Procedure (hereinafter referred to as: "OORP") approved by the Senate of the University of Pannonia and adopted by the Foundation for the University of Pannonia acting as the operator exercising founders' and ownership rights (hereinafter referred to as the "Operator") and on the basis of the resolution by the Board of Trustees on the rules of procedure for adopting the regulations of the University of Pannonia by the Board of Trustees is as follows:

I. **General provisions**

1. The purpose of the provisions of this Regulation is to ensure that the exposure of workers to ionising radiation at the University of Pannonia is kept at the "lowest reasonably achievable" level. Accordingly, atomic energy is used in such a way that it does not result in additional risks compared with other work activities. In order to protect themselves and their surroundings, employees are therefore required to be fully familiar with and comply with the provisions of this Workplace Radiation Protection Regulation.

2. To this end, this Regulation specifies the technical and safety conditions, procedures and rules of conduct necessary for the safe use of ionising radiation in the organisational units belonging to the Faculty of Engineering of the University of Pannonia.

3. All organisational units belonging to the Faculty of Engineering of the University of Pannonia consider all applicable standards relating to radiation protection to be binding on themselves and on their contractual partners.

4. The Workplace Radiation Protection Regulation has been drawn up on the basis of Decree 2/2022 (IV. 29.) issued by the Hungarian Atomic Energy Authority (HAEA), in accordance with Annex 8 thereto. Its chapters and numbering correspond to the requirements laid down in the Decree.

5. For correct use, please seek the assistance of the Radiation Protection Service.

1. The organisational structure of the Radiation Protection Service

1.1. Structure and duties of the Radiation Protection Organisation, duties of the Radiation Protection Officer(s)

1.1.1. Organisational structure of the Radiation Protection Service

The Company has established a Radiation Protection Organisation (RPO) for the direct management, performance and coordination of its radiation protection tasks.

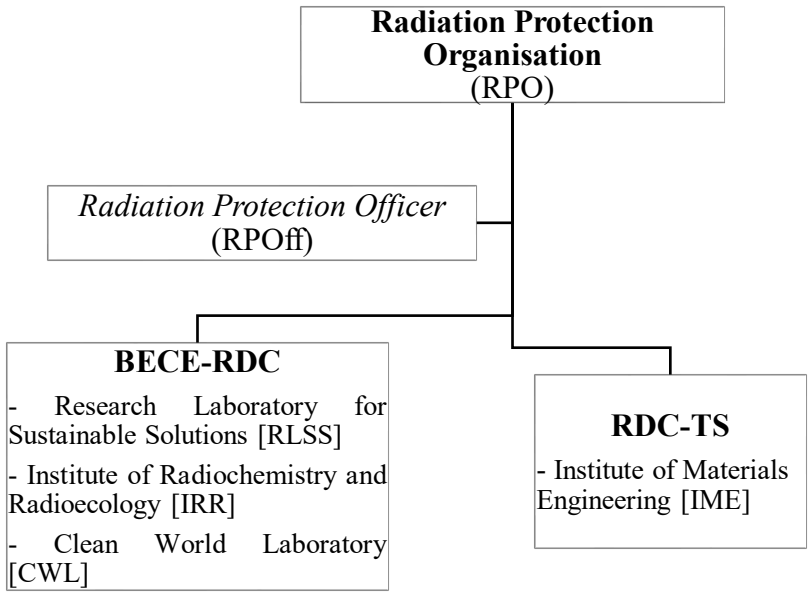
The Radiation Protection Organisation sets out in these Workplace Radiation Protection Regulation (WRPR) the rules to be followed in the course of the Company's operations, the respective areas of responsibility, and the duties and rights of the persons concerned. The technical and technological radiation protection specifications for the various equipment operated in the respective organisational units are set out in Radiation Protection Specifications (RPS).

The licence holder (UP-FE) carrying out radiation-hazardous activities shall appoint a central Radiation Protection Officer (RPOff), while the following organisational units:

- Bio-, Environmental and Chemical Engineering Research and Development Centre [**BECE-RDC**],
- Research and Development Centre for Technical Sciences [**RDC-TS**],

shall appoint a Deputy Radiation Protection Officer (DRPOff). The appointment of the DRPOff is the responsibility of the head of the organisational unit concerned.

The RPO is coordinated by the supervisor of the Radiation Protection Officer.



Facility where the work is carried out:

Name of facility: University of Pannonia – Faculty of Engineering

Campuses: lower campus: 8200 Veszprém, Egyetem utca 10., upper campus: 8200 Veszprém, Wartha Vince utca 1.

1.1.2. Description of the duties of the Head of Radiation Protection Service and the Radiation Protection Officer

The duties of the **Radiation Protection Officer** (RPOff) and their deputy are as follows:

The Radiation Protection Officer is the company-level coordinator of the Company's radiation protection tasks, the Company's liaison with the authorities, the person responsible for maintaining company-level records, and the inspector responsible for company-level activities. Their duties include:

- Preparing the Workplace Radiation Protection Regulation (WRPR), monitoring their implementation and drafting any necessary amendments. Liaising with the contracted expert.
- Monitoring and assessing changes to the Company's radiation protection regulations (WRPR and RPS). Informing the DRPOffs and monitoring implementation. Maintaining the Company regulations, organising and conducting audits. Checking the official licences of the individual organisational units.
- Liaising with the authorities, including licence application, renewal and revocation procedures (based on data provided by the organisational units).
- Organising official inspections and visits by the relevant authorities.
- Maintaining company-level records based on data provided by the DRPOffs.
- Determining training needs based on the requirements of the organisational units and communicating these to HR.
- Checking compliance with the applicable rules when purchasing new radiation-hazardous equipment and establishing such a workplace.
- Organising the verification of radiation measuring instruments, collecting and checking radiation protection measurement data, and maintaining company-

level records thereof.

- Liaising with the Company's Occupational Health Service, organising any necessary extraordinary medical examinations, taking immediate action in the event of an extraordinary occurrence, and notifying the HAEA.
- Preparing reports for management:

  The minimum required content of the reports is as follows:

  - Annual report: periodic tasks completed during the year and planned for the following year, in particular: renewal of licence(s), verification of measuring instruments, medical examinations, renewal of radiation protection qualifications, workplace training, evaluation of annual dosimetry data, inspections carried out by the Radiation Protection Officer and the results thereof.
  - Ad hoc reports: results of investigations into incidents and corrective measures.

The duties of the **Deputy Radiation Protection Officer (DRPOff)** are as follows

- Managing and carrying out the radiation protection tasks of the organisational unit.
- Preparing and obtaining approval for the financial and technical plans required for operations.
- Maintaining the records of the organisational unit and carrying out tasks arising from changes in legislation.
- Compiling the documentation required for licensing, renewal and revocation/termination procedures for the RPOff.
- Organising and managing official inspections and site visits at the organisational unit, and providing the necessary information.
- Supervising and training personnel who operate, maintain and repair radiation-hazardous equipment emitting ionising radiation.
- When purchasing new radiation-hazardous equipment and establishing such a workplace, developing radiation protection procedures, advising the project team leader and cooperating with the contracted expert.
- Referring employees working in radiation-hazardous positions for occupational medical fitness examinations and monitoring compliance therewith. Indicating the need for extraordinary medical examinations.
- Carrying out and recording monthly instrumental radiation protection inspections of radiation-hazardous equipment at the organisational unit.
- Taking the necessary measures in the event of an extraordinary occurrence at the organisational unit, immediately informing the RPOff and the contracted expert, and handling official matters on site.
- Providing the RPOff with the necessary information where a mandatory notification is required.
- Organising and recording the participation of employees working at radiation-hazardous workplaces in mandatory training, and coordinating the further training of employees at the prescribed intervals.
- Maintaining records of official licences, training and further training, as well as

other records. Checking that periodic medical examinations have been carried out.

1.1.3. Description of the duties of the Workplace Radiation Protection Organisation

The organisation's activities cover providing advice, conducting inspections, maintaining records, licensing, organising training, liaising with the authorities, ensuring compliance with the applicable requirements, and supervising all activities falling within the scope of this Regulation.

1.2. Duties of the licence holder relating to radiation protection

1.2.1. Description of the licence holder's duties relating to radiation protection

Ensures that the personnel and material requirements for carrying out the work are complied with. This Regulation sets out the monitoring and assessment of radiation exposure, the review of radiation protection procedures, and the management of emergency situations.

1.2.2. Description of the radiation protection duties and responsibilities of the managers of the organisation operating the facility

The managers of the organisational unit concerned shall work closely with the Head of the Radiation Protection Organisation and the Radiation Protection Officers of the organisational units, particularly in addressing radiation protection tasks that are beyond their respective areas of responsibility.

They shall ensure that the radiation protection requirements applicable to the workplace concerned are included in the Workplace Radiation Protection Regulation and shall check that the personnel and material requirements specified in the Regulation are met.

Upon commissioning a new facility or putting equipment and instruments into operation, as well as following major technical refurbishment, they shall ensure compliance with radiation protection requirements and fulfilment of data reporting obligations.

In the event of an extraordinary occurrence, they shall ensure that the Accident Prevention and Response Plan (APRP) set out in the Workplace Radiation Protection Regulation is followed.

They shall ensure that radiation protection measuring instruments (dose rate meters) with valid calibration certificates are available.

The managers of the organisational unit shall ensure within their respective areas that the qualifications required for carrying out radiation protection tasks are obtained and that warning devices are available and function properly.

1.3. List of areas of responsibility

1.3.1. Scope of the WRPR

The legal requirements relating to protection against ionising radiation are laid down in Decree 2/2022 (IV. 29.) issued by the HAEA in Section [1] on “Protection against Ionising Radiation and the Related Licensing, Reporting and Inspection System”. The scope of this Regulation extends to the entire operational area of the Faculty of Engineering of the University of Pannonia with regard to the following:

- The use of ionising radiation and the persons working with it.
- Personnel carrying out organisational and inspection tasks related to activities falling within the scope of this Regulation.

1.3.2. Responsibilities of the employer and the licence holder of a radiation-hazardous workplace

The Chancellor and Rector of the University of Pannonia shall appoint in writing the Radiation Protection Organisation (RPO) established by the University and designate the Head of the Organisation, the Radiation Protection Officer. The heads of the respective organisational units shall appoint the Deputy Radiation Protection Officer for the workplace.

The employer shall comply with and ensure compliance with the rules laid down in the Radiation Protection Decree [1] and in this Regulation.

1.3.3. Responsibilities of the management

The responsibilities of the licence holder include:

- providing workers with personal protective equipment,
- ensuring dosimetric monitoring of workers appropriate to the type of radiation, including:
    - on-site reading of personal dosimetry data, arranging for the evaluation of official dosimeters, and maintaining local records of personal dosimetry data,
    - checking the operational condition, calibration and verification of radiation protection instruments,
    - where justified, ensuring monitoring of extremity doses and internal

radiation exposure, and
    - carrying out workplace monitoring measurements where these are used to estimate radiation exposure,

- fulfilling the material and personnel requirements necessary to ensure radiation protection measures,
- applying and operating the necessary safety equipment and checking its effectiveness,
- establishing the organisational and regulatory framework necessary to ensure effective radiation protection measures,
- developing a radiation protection programme, a mandatory element of which is the preparation of the Workplace Radiation Protection Regulation (hereinafter referred to as the "WRPR") applicable to radiation-hazardous activities and radiation-hazardous workplaces, and ensuring compliance therewith,
- informing workers exposed to radiation about workplace risks, in particular:
    - the importance of reporting pregnancy as early as possible, and
    - in view of the risk of radiation exposure to a breastfed infant in the event of radionuclide intake or bodily contamination, the importance of reporting their intention to breastfeed as early as possible.

1.3.4. Responsibilities of the radiation protection organisation and the people performing radiation protection duties

- All persons responsible for radiation protection in the laboratory shall comply with and ensure compliance with the rules governing safe and healthy working conditions and shall actively participate in the prevention of accidents.
- Only persons who possess the prescribed professional qualifications, have reached the age of 18 and meet the health requirements may be employed to work with radioactive substances and preparations.
- A pregnant worker or a worker breastfeeding an infant may not be employed in a radiation-hazardous position from the date on which they notify the licence holder – or, in the case of an external worker, their employer – of this fact.

1.3.5. Responsibilities of external employers

External worker: a worker exposed to radiation, including trainees and students, who is not employed by the licence holder responsible for the radiation-hazardous workplace but who carries out radiation-hazardous activities under the supervision of the licence holder.

The licence holder shall be responsible for the radiation protection of external workers (workers sent by employment agencies) in connection with their activities by ensuring that the radiation protection and radiation safety system applied for this purpose provides external workers with protection equivalent to that provided to permanent workers. An external worker employed by the Company may only enter and carry out work at the workplace after receiving appropriate training. The Radiation Protection Officer shall be responsible for providing and documenting such training. External workers shall consider the knowledge and rules acquired during the training to be binding upon them. Where external workers are employed, a contract must be concluded with the external employer (employment agency), and external workers may only be employed on this basis, taking into account the provisions of Decree [1].

External workers are not employed at the workplace!

Where the licence holder engages an external service provider to carry out maintenance activities (servicing CT, X-ray or GC equipment), the external service provider must hold a licence for the radiation-hazardous activity concerned. An external service provider may only be engaged on the basis of such a licence. The external service provider shall provide the Radiation Protection Officer with prior notification of any activity falling within the scope of Decree [1].

1.4. Arrangements for occupational health services

1.4.1. Conditions for ensuring compliance with the legislation on occupational health services

Radiation health examinations are carried out with the assistance of a contracted occupational health service (see Annex 1 to this Regulation for contact details). Medical fitness examinations shall be carried out in accordance with Decree 33/1998 (VI. 24.) of the Ministry of National Economy.

Occupational health requirements:

Only a person who has the professional qualifications appropriate to the nature of the work to be performed, valid radiation protection training at the appropriate level, and a certificate of occupational medical fitness may carry out radiation-hazardous activities!

A worker who has been found by the occupational health service to be medically unfit for the position concerned may not be employed in a radiation-hazardous position.

1.4.2. Rules for organising radiation health examinations

In accordance with the requirements of Decree 33/1998 (VI. 24.) of the Ministry of National Economy, workers shall undergo a periodic fitness examination once a year. The Radiation Protection Officer shall supervise, administer and keep records of the completion of the medical examinations.

Pursuant to Section 7 of Decree 33/1998 (VI. 24.) of the Ministry of National Economy, an extraordinary fitness examination shall be carried out:

- if a change has occurred in the state of health of the worker, trainee, student or jobseeker that is presumably likely to render them unfit to perform the duties of the position concerned safely and without endangering their health, or to acquire or practise the profession;
- following an acute occupational disease, increased exposure, a work accident involving loss of consciousness, or a recurring occupational accident;
    - in cases of illness or indisposition of the worker, trainee or student, other than an acute occupational disease, which is presumably attributable to

workplace causes, or following 30 days of incapacity for work;

- if the worker is exposed as a result of an unforeseen event;
    - In the event of suspected radiation injury, the worker may not carry out activities involving ionising radiation. The designated manager shall reassign the work tasks for the duration of the investigation. The authority and the radiation protection expert shall decide on the worker's return to work.
- if the worker's employment is suspended for more than 6 months for reasons other than health-related reasons;
- if this is required for submitting an application for exemption from the obligation to pay the early-retirement contribution, as specified in separate legislation.

Pursuant to Section 8 of Decree 33/1998 (VI. 24.) of the Ministry of National Economy, a final fitness examination shall be carried out at the employer's initiative:

- upon termination of the activity or employment relationship following ten years of exposure to human carcinogens specified in separate legislation, or four years of exposure to benzene or ionising radiation;
- upon termination of work or a working environment involving a risk of chronic occupational disease, and where the employee has worked for at least four years in a position qualifying for early-retirement benefits;
- in the case of employment abroad, following the worker's permanent return home.

1.5.Procedure for reviewing the WRPR

1.5.1. Procedure for regular review

The Workplace Radiation Protection Regulation shall be reviewed regularly every two years.

1.5.2. Procedure for extraordinary review and events or circumstances necessitating such review

- six months before the expiry of the operating licence;

- in the event of changes to the Radiation Protection Specifications;
- within 14 days in the event of any other change occurring at the organisational units, including changes affecting their operation or data;
- within 8 days following any other triggering event.

The RPO shall prepare a record of the review(s).

2. Rules and requirements applicable to employees

2.1. Description of radiation-hazardous positions, classification of employees for radiation protection purposes, and rules and requirements applicable to employees at radiation-hazardous workplaces

2.1.1. Designation of radiation-hazardous occupational activities

- ***Occupational activity:***

Educational and research activities are carried out at the University of Pannonia, at the Faculty of Engineering, in the Research Laboratory for Sustainable Solutions [RLSS (BECE-RDC)], the Institute of Radiochemistry and Radioecology [IRR (BECE-RDC)], the Clean World Laboratory [CWL (BECE-RDC)], and the Institute of Materials Engineering [IME (RDC-TS)]. The minimum staffing requirement for each unit is 1 person.

2.1.2. Description of positions related to radiation-hazardous activities, and determination of the possible mode and extent of radiation exposure

- ***Position, required staffing***:

The laboratories are primarily staffed by researchers and lecturers who regularly carry out research and teaching activities. Temporary employment of university and PhD students is also possible. The minimum staffing required for carrying out the activities is specified in Section 2.1.4.

- ***Designation of work areas where activities are carried out:***

See the site plans and diagrams in the Radiation Protection Specifications applicable to the organisational unit concerned.

- ***Possible mode and extent of radiation exposure***:

Exposure is primarily due to dose from scattered and leakage radiation occurring during the operation of equipment and the use of radiation sources. Dose distribution maps prepared during the normal operation of the equipment can be found in the Radiation Protection Specifications applicable to the organisational unit concerned.

2.1.3. Designation of work areas for radiation-hazardous activities

Institute of Radiochemistry and Radioecology (Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-RDC])

Low radiation background laboratory

The laboratory consists of an anteroom (R02) and a measurement laboratory (R03), where gamma spectrometry measurements requiring a low radiation background and whole-body counting are carried out.

Environmental laboratory

It is a building unit consisting of two laboratories (R38 and R37) and a grinding and milling room (R39). The laboratory is used exclusively for the preparation and measurement of environmental samples.

Radiology

A building unit consisting of two laboratories (R22 and R21). Student measurements involving only low- and medium-activity sealed radioactive sources are carried out in the radiology unit.

The radioactive sources are stored in two storage safes (one with drawers and one with shelves) in the radiology unit. High-activity sources and isotopic neutron sources are stored in the isotope storage room of laboratory “B”.

“C”-level isotope laboratory

A unit located in the basement of Building “N”, consisting of the following rooms:

- student hot laboratory (R012),
- measurement room (R011),
- alpha spectrometry preparation room (R09) and measurement room (R08),
- radon calibration room (R07).

“B”-level isotope laboratory

A unit located on the ground floor of Building “N”, consisting of the following rooms:

- anteroom, black/white changing room (R30),
- washroom (R31), shower room (R32), white/white changing room (R36),
- 2 toilets (R33 and R34), corridor (R35), darkroom (R28),
- corridor of the inner group of rooms, 2 hot laboratories (R46–47 and R42), 2 measurement rooms (R45 and R41), radioactive waste storage room (R44), isotope storage room (R43).

Institute of Materials Engineering (Research and Development Centre for Technical Sciences [RDC-TS])

The CT equipment owned by the Department of Materials Engineering is located in Room 09 on the ground floor of Building J. The laboratory area is a controlled area.

Research Laboratory for Sustainable Solutions (Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-RDC])

The Research Laboratory for Sustainable Solutions is located on the second floor of Building C of the University.

Clean World Laboratory (Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-RDC])

The Clean World Laboratory is located in Building J of the University of Pannonia. A gas chromatograph is operated in Room J108 of the laboratory.

2.1.4. Staffing requirements by position for employees carrying out work at radiation-hazardous workplaces and employees responsible for radiation protection supervision, to ensure safe working practices

Personnel responsible for coordinating the supervision of radiation-hazardous workplaces:

Positions	Radiation protection classification	Number of staff [person]
- Radiation Protection Officer	B	1
	Total:	1

Deputies responsible for radiation protection supervision at the respective organisational units:

Organisational unit	Positions	Radiation protection classification	Number of staff [person]
- RLSS (BECE-RDC) - IRR (BECE-RDC) - CWL (BECE-RDC) - IME (RDC-TS)	- Deputy Radiation Protection Officer - Deputy Radiation Protection Officer - Deputy Radiation Protection Officer - Deputy Radiation Protection Officer	B A B B	1 1 1 1
		Total:	4

Personnel carrying out radiation-hazardous work at radiation-hazardous workplaces:

Research Laboratory for Sustainable Solutions [RLSS (BECE-RDC)]

Positions	**Radiation protection classification**	**Number of staff required to operate the equipment [person]**
- Senior Research Fellow	B	1
	Total:	1

Institute of Radiochemistry and Radioecology [IRR (BECE-RDC)]

Positions	**Radiation protection classification**	**Number of staff required to operate the equipment [person]**
- Research Associate	A	8
	Total:	8

Positions	**Radiation protection classification**	**Number of staff required to operate the equipment [person]**
- Associate Professor	B	1
	Total:	1

Institute of Materials Engineering [IME (RDC-TS)]

Positions	**Radiation protection classification**	**Number of staff required to operate the equipment [person]**
- Assistant Lecturer	B	1
	Total:	1

Total number of personnel carrying out radiation-hazardous activities at the Faculty of Engineering of the University of Pannonia: 11 persons [1+8+1+1]

2.1.5. Determination of which employees may carry out radiation-hazardous work alone

With the exception of the Institute of Radiochemistry and Radioecology [IRR (BECE-RDC)], employees may carry out radiation-hazardous work alone. At IRR, work may only be carried out in the presence of two persons working together.

Students may also carry out measurements in the relevant laboratories belonging to the Faculty of Engineering of the University of Pannonia. Radiation-hazardous work must be carried out in the simultaneous presence of at least two people, at least one of whom must hold the appropriate professional and radiation protection qualifications. In the case of laboratory work carried out by students, the person supervising the measurements must possess the necessary professional and radiation protection knowledge and, where necessary (if justified on the basis of the radiation protection plan), must wear an electronic personal dosimeter with a self-reading function.

In all cases, the employee(s) must hold a valid radiation protection qualification at least at the extended level.

An employee who does not hold a radiation protection qualification, or whose proof of qualification has expired, may carry out radiation-hazardous activities under the supervision of an employee holding a valid radiation protection qualification appropriate to the activity until the required qualification is obtained, but for no longer than one year.

2.1.6. Criteria for classifying employees according to the risk of radiation exposure, specifying their job roles

Pursuant to Paragraph (1) of Section 30 of Government Decree No. 487/2018, workers exposed to radiation shall be classified into the following categories for the purposes of dosimetric monitoring and radiation protection monitoring:

a) Category “A”: workers exposed to radiation whose exposure may exceed an effective dose of 6 mSv per year, or an equivalent dose of 15 mSv per year to the lens of the eye, or 150 mSv per year to the skin or extremities;

b) Category “B”: workers exposed to radiation who do not fall within Category “A”.

Organisational unit	Classification	Usage of dosimeters
Research Laboratory for Sustainable Solutions [RLSS (BECE-RDC)]	B	Employees do not wear personal dosimeters
Institute of Radiochemistry and Radioecology [IRR (BECE-RDC)]	A	Employees wear personal dosimeters while carrying out their activities
Clean World Laboratory [CWL (BECE-RDC)]	B	Employees do not wear personal dosimeters
Institute of Materials Engineering [IME (RDC-TS)]	B	Employees do not wear personal dosimeters

2.2. Radiation protection rights and obligations of employees working at radiation-hazardous workplaces

Employees shall have the right to:

- work in a radiation-hazardous role, provided that they meet the relevant requirements, primarily in terms of radiation protection qualifications and medical fitness examinations;
- conditions that ensure healthy and safe working practices;
- refuse to work if the working conditions and protective equipment specified in the WRPR are not provided to them;
- report any radiation protection deficiencies they identify to the Radiation Protection Officer.

Only persons who possess the prescribed professional qualifications, have reached the age of 18 and meet the health requirements may be employed to work with equipment emitting ionising radiation.

Employees working in areas where the equipment is located are obliged to:

- be familiar with the WRPR and comply with its provisions;
- use and store general protective equipment in accordance with the prescribed requirements;
- immediately report to the Radiation Protection Officer any radiation-related incidents requiring radiation protection measures;

- undergo preliminary and periodic occupational fitness examinations;
- attend occupational health and safety and radiation protection training. Employees are required to participate in the annual internal radiation protection training and to obtain the radiation protection qualification specified in Section 2.3.1;
- immediately report to the Radiation Protection Officer any radiation-related incidents requiring radiation protection measures.

An employee may refuse to work if the prescribed safety conditions are not in place.

2.3. Professional and radiation protection qualification requirements for employees working at radiation-hazardous workplaces, and arrangements for radiation protection training

2.3.1. Job roles of employees working at radiation-hazardous workplaces and the professional and radiation protection qualification requirements associated with each role

Employees carrying out radiation-hazardous activities within organisational units must obtain the following radiation protection qualifications to perform their duties:

Basic-level radiation protection qualification:

- Persons employed in roles associated with radiation-hazardous activities who do not work with radiation sources.
- Job role: cleaning staff [IRR (BECE-RDC)]

Extended-level radiation protection qualification:

- Persons who handle unsealed or sealed radiation sources, or supervise work involving such sources;
- Job roles: university lecturers [IRR (BECE-RDC)], researchers [IRR (BECE-RDC)], PhD students [IRR (BECE-RDC)].

Employees working in the other organisational units (lecturers, researchers and students) are not subject to radiation protection qualification requirements; however, attendance at local training is compulsory.

2.3.2. Job roles of personnel responsible for supervising employees working at radiation-hazardous workplaces and the professional and radiation protection qualification requirements associated with each role

The job roles and radiation protection qualification requirements for personnel responsible for supervision are as follows:

- Radiation Protection Officer (RPOff):

  Educational qualification: at least secondary school-leaving certificate and a relevant professional qualification

  Radiation protection qualification: extended-level radiation protection

qualification

- Deputy Radiation Protection Officer (DRPOff) within each organisational unit:

Educational qualification: at least secondary school-leaving certificate and a relevant professional qualification

Radiation protection qualification: extended-level radiation protection qualification

2.3.3. Professional and radiation protection qualification requirements for employees who do not carry out work involving radiation hazards, but who have independent access authorisation to supervised or controlled areas

Employees with independent access authorisation:

They must attend local radiation protection training (internal training on the contents of the WRPR and the RPS) and must comply with the provisions of this Regulation.

External employees (employment agency workers):

An external employee (employment agency worker) of the organisational units may only perform the tasks set out in their contract. An external employee who does not carry out work involving radiation hazards must not enter areas where radiation work is carried out. Before commencing their duties (and at specified intervals, in accordance with this Regulation), they must attend general training and must perform their duties in light of what was covered there.

They must attend local radiation protection training together with the company's permanent employees. The external employee shall regard the knowledge and rules received during the training (from the Radiation Protection Officer) as binding upon themselves.

Inspectors, visitors and persons working under supervision:

Local radiation protection training.

2.3.4. Training for new entrants: arrangements for WRPR training; radiation protection training

The employee must hand over the document certifying their radiation protection qualification, or a copy of it, to the Radiation Protection Officer, who shall keep a record of it. The need for radiation protection training shall be determined by the head of the radiation protection organisation or the radiation protection expert, depending on the work process concerned and the probability of radiation exposure.

Employees must attend internal workplace training on the contents of the WRPR once a year. The training shall be delivered by the Radiation Protection Officer or an appointed expert. The syllabus must cover the contents of the WRPR, as well as

radiation protection instructions and information relating to current changes or events. The training must include a practical demonstration and examples of accident situations.

The Radiation Protection Officer must keep a record of the fact that training has taken place, using the data sheet in Annex 8 of this Regulation.

The radiation protection qualification(s) specified in sub-sections 2.3.1 and 2.3.2 shall be valid for five years. Before a qualification expires, employees must attend refresher training (or, in the case of employees without a qualification, initial training) of the number of hours specified in Annex 4 of the Decree [1], following the syllabus laid down in the Decree.

2.3.5. Arrangements for training on new knowledge in the event of changes to working conditions involving radiation hazards and changes to the WRPR

Following changes to working conditions involving radiation hazards, and once changes arising from the review of the WRPR have been implemented, employees must receive training on the new knowledge within 30 days. The content of the training shall be reasonably tailored to the significance of the change.

3. Supervision of workplaces involving radiation hazards

3.1. Designation of controlled and supervised areas and the associated requirements (delimitation measures)

For workplaces involving radiation hazards, a distinction is made between supervised areas and, within them, controlled areas, on the basis of the assessment carried out of the expected annual doses and of the probability and magnitude of potential radiation exposures.

A work area shall be designated as a controlled area:

- where, as a result of the activity, the annual individual exposure may exceed an effective dose of 1 mSv, an equivalent dose of 15 mSv for the lens of the eye, or 10% of the specified equivalent dose limits for the skin and extremities; or
- where the spread of radioactive contamination, or the probability of potential radiation exposure, must be restricted.

Safety requirements in controlled areas:

- The boundaries of the controlled area must be clearly marked,
- The entry points (doors operated by chip card (IRR (BECE-RDC))) must be marked with the international radiation hazard symbol (trefoil) and the “Radiation Hazard” sign, together with the name of the workplace and the signs “Controlled Area” and “No entry without authorisation”. Access to the area must be monitored, and unauthorised access must be prevented. Only

persons who know the radiation protection rules applicable to the controlled area may enter it.

- Instrumental radiation protection monitoring of the work area (except for the installed X-ray laboratory) must be ensured.
- Only activities connected with the application of atomic energy may be carried out in the controlled area, and only the equipment or materials required for the activity may be kept there.
- Where external radiation exposure may exceed an effective dose of 6 mSv per year, it is also advisable to use a personal dosimeter that can be read on site; the employer shall arrange for these to be obtained.

Supervised area: an area where the special radiation protection measures and safety rules mentioned above are not required, but where regular radiation protection monitoring must still be carried out.

Safety requirements in a supervised area:

- The name of the workplace, the "Radiation Hazard" sign and the hazard symbol must be displayed here as well.
- In places within the supervised area intended for permanent occupancy, the dose equivalent rate, averaged over any two hours, must not exceed 2.5 µSv/h.

For both types of area, the name and contact details of the Radiation Protection Officer must be displayed in a visible place at the location of the equipment.

The surroundings of the equipment must be monitored (using a calibrated dose equivalent rate meter) at specified intervals (see sub-section 3.2.3.2 of this Regulation), at least at the following relevant measurement points: the operator's position, and the front, rear, and right and left sides of the equipment.

Within Level C and Level B isotope laboratories, work surfaces must be checked after each job. This check (using a calibrated dose equivalent rate meter and a surface contamination meter) must be carried out at specified intervals (see sub-section 3.2.3.2 of this Regulation).

3.1.1. Classification of workplaces involving radiation hazards (controlled and supervised work areas) according to the radiation exposure risk associated with the activities carried out in the area

Research Laboratory for Sustainability Solutions [RLSS (BECE-RDC)]

The room used for storing the equipment is a controlled area, while the corridor, which is the transport route of the portable X-ray fluorescence analyser, is a supervised area.

Institute of Radiochemistry and Radioecology [IRR (BECE-RDC)]

Controlled area:

Building N, Institute of Radiochemistry and Radioecology: Level B isotope laboratories

Building N, Institute of Radiochemistry and Radioecology: radiology laboratories

Building N, Institute of Radiochemistry and Radioecology: active effluent treatment plant

Building N, Institute of Radiochemistry and Radioecology: Level C hot laboratories

Supervised area:

Building N, Institute of Radiochemistry and Radioecology: environmental laboratories

Building N, Institute of Radiochemistry and Radioecology: Level C laboratories (excluding the hot laboratories)

Building N, Institute of Radiochemistry and Radioecology: low background radiation laboratory

Clean World Laboratory [CWL (BECE-RDC)]

The equipment used in the Clean World Laboratory of the University of Pannonia is housed in a laboratory that can be locked with a key. The area of the laboratory is a supervised area.

Institute of Materials Engineering [IME (RDC-TS)]

The equipment used in the Institute of Materials Engineering of the University of Pannonia is housed in a laboratory that can be locked with a key. The area of the laboratory is a supervised area.

3.1.2. Further classification of work areas within a controlled area, where relevant

The Faculty of Engineering of the University of Pannonia does not have such an area.

3.1.3. Delimitation of the individual areas: the method and signage of delimitation, description of access authorisations, description of radiation protection monitoring points

For workplaces involving radiation hazards, a distinction is made between supervised areas and, within them, controlled areas, on the basis of the assessment carried out of the expected annual doses and of the probability and magnitude of potential radiation exposures.

A work area shall be designated as a controlled area:

- where, as a result of the activity, the annual individual exposure may exceed an effective dose of 1 mSv, an equivalent dose of 15 mSv for the lens of the eye, or 10% of the specified equivalent dose limits for the skin and extremities; or
- where the spread of radioactive contamination, or the probability of potential radiation exposure, must be restricted.

Safety requirements in controlled areas:

- The boundaries of the controlled area must be clearly marked.
- Access must be monitored, and unauthorised persons must be prevented from entering.
- The entrance must be provided with a “Radiation Hazard” sign, a radiation hazard symbol and the name of the workplace.
- Instrumental radiation protection monitoring of the work area (except for the installed X-ray laboratory) must be ensured.

- Only activities connected with the application of atomic energy may be carried out in the controlled area, and only the equipment or materials required for the activity may be kept there.
- Where external radiation exposure may exceed an effective dose of 6 mSv per year, it is also advisable to use a personal dosimeter that can be read on site; the employer shall arrange for these to be obtained.

Supervised area: an area where the special radiation protection measures and safety rules mentioned above are not required, but where regular radiation protection monitoring must still be carried out.

Safety requirements in the supervised area:

- In addition to the name of the workplace, it is advisable to display the "Radiation Hazard" sign and the hazard symbol here as well.
- In places within the supervised area intended for permanent occupancy, the dose equivalent rate, averaged over any two hours, must not exceed 2.5 µSv/h.

3.1.4. Measures for the radiation protection supervision of the individual areas, in particular the method of monitoring individual radiation exposure, the method of monitoring working conditions (use of radiation protection monitoring systems), the permitted values of surface contamination, the permitted values of ambient dose equivalent rate, the permitted values of airborne activity concentration, and the conditions for ordering the use of personal protective equipment

Method of monitoring individual radiation exposure:

Regular instrumental measurement (radiation protection monitoring using a dose rate meter with valid calibration). The dose rate arising from X-rays, and from beta and gamma radiation, must be monitored with a calibrated dose rate meter suitable for measuring the relevant energy range.

Regular radiation safety checks for the monitoring of working conditions and the radiation protection supervision of the individual areas:

Within the framework of the radiation protection quality assurance programme, a documented radiation safety inspection must be carried out at least twice a year. It

must cover primarily the following: warning signs, warning notices, warning lights, the integrity of the equipment, and the presence of the radiation source and its indicators.

Carrying out and documenting the inspections is the responsibility of the Radiation Protection Officer. A record of the inspection must be drawn up.

Conditions for ordering the use of personal protective equipment:

Apart from the general protective clothing prescribed in the University of Pannonia's own regulations and policies, employees do not need to use personal protective equipment for radiation protection purposes.

The exception is the laboratories of the IRR (BECE-RDC), where protective clothing (laboratory coats), rubber gloves, shielding materials, and a contamination meter and dosimeter must be provided.

The use of personal protective equipment is mandatory in the laboratory. Its purpose is to prevent or reduce the risk of incorporation and of contamination of the body surface.

When working with unsealed isotopes in isotope laboratories, protective clothing (coat, trousers, shoes) must be worn, and disposable rubber gloves and safety goggles must be used, and in some cases an acrylic face shield. During work, any further protective equipment (e.g. a dust mask) that prevents radioactive materials from reaching the body surface or the mucous membranes of the eyes, or entering the body by inhalation, must be used.

Protective clothing used in isotope laboratories may be washed in the washing machine located in the Level B laboratory of the IRR (BECE-RDC) if instrumental testing has shown that it is not contaminated. Contaminated materials must be decontaminated on site. If the contamination cannot be removed, or if storage at the workplace until decay is not feasible, the items must be handled as radioactive waste.

A clearly labelled decontamination kit must be kept in an easily accessible place in isotope laboratories.

When working with isotopes in isotope laboratories, disposable equipment must be used, provided that this does not unreasonably increase the quantity of radioactive waste.

Eating, smoking and using cosmetic products are prohibited in isotope laboratories.

Controlled and supervised areas must be cleaned with separate (marked) equipment. Persons carrying out the cleaning must hold at least a basic-level radiation protection qualification.

The isotope work area may be left only if the hands, shoes, clothing and hair are not contaminated.

Every employee must take the greatest care, in their own interest, of the integrity and continued usability of this personal protective equipment, while the Radiation Protection Officer is obliged to check it. After use, it must be carefully cleaned and returned to its designated storage place. Everyone must know where the protective equipment is stored. The use of damaged protective equipment is prohibited. Personal protective equipment must not be taken out of the laboratories.

3.2. Requirements for monitoring the external and internal radiation exposure of employees, and their frequency and method

3.2.1. Presentation of the reference levels used to assess radiation exposure: dose limits, dose constraints and other optimisation values, monitoring and alarm levels for radiation exposure, derived limits

In a planned exposure situation, the sum of the doses received by a given person must not exceed the dose limits laid down for occupational exposure in the case of employment, or for public exposure in the case of members of the public.

The same values must also be applied when limiting the external and internal radiation exposure of university students (over 18 years of age) arising for educational purposes.

Persons under 18 years of age must not carry out work involving occupational radiation exposure. The exception is a learner aged 16 or over taking part in vocational training, for whom the dose limit is an effective dose of 6 mSv per year.
The more important values among the occupational dose limits for employees set out in the Government Decree [1] can be found in Annex 2 of this Regulation. The public limits are relevant for discharges and for laboratory environmental monitoring.

In accordance with the Decree [1]:

- **In justified cases,** the HAEA may, in a given year, authorise an effective dose greater than the values set out in Annex 1, but not exceeding 50 mSv, provided that the average annual dose over any five consecutive years, including the years in which the limit was exceeded, does not exceed 20 mSv.
- **In an emergency,** the dose limit for persons taking part in dealing with the consequences of an accident is an effective dose of 50 mSv. The exception is persons taking part in preventing significant radiation exposure of the population and in saving lives. The preparation of persons and the planning of their activities must be carried out so that their expected radiation exposure does not exceed an effective dose of 100 mSv, and the exposure of persons taking part in life-saving does not exceed an effective dose of 250 mSv. Women of childbearing potential, trainees and interns must not be involved in the response.

In addition to the limits in Annex 2 of this Regulation, the reference level for radon and radon progeny concentrations in the air of workplaces, as well as of dwellings and public buildings, is 300 Bq/m³.

3.2.2. Procedure for assessing radiation exposures and the remedial and corrective measures taken after the assessment

Following the monitoring carried out in accordance with Subsection 3.2.3.2 of this Regulation, **if the evaluation received from the dosimetry service provider shows more than 0.5 mSv per person per two months, the circumstances and causes must be investigated without delay.** Any deficiencies identified must be remedied in the shortest possible time. The process shall be carried out by the Radiation Protection Officer in cooperation with the appointed Radiation Protection Expert.

Outside working hours, and at the end of the day's work involving radiation hazards, the official personal dosimeter must be stored in a place where it is not exposed to additional radiation (that is, radiation not received while carrying out the occupation) above natural background radiation. The official personal dosimeter must not be damaged while being handled or worn, and unauthorised persons shall not have access to it.

The work area is monitored using a calibrated dose rate meter and a surface contamination meter. In the event of a deviation, the necessary steps shall be taken after consultation with the Radiation Protection Expert.

3.2.3. Monitoring of radiation exposure from external radiation:

3.2.3.1. List of monitoring methods appropriate to the type of exposure (gamma, neutron and beta radiation; whole-body dose, lens-of-the-eye dose, extremity dose)

Before work with radioactive material begins, a radiation protection plan must be submitted to the Radiation Protection Officer of the organisational unit concerned (IRR) (see Annex 3 of the IRR Radiation Protection Specifications), in which a dose estimate for the work process in question must be prepared. The radiation protection plan shall be approved by the Radiation Protection Officer on the basis of the expected dose values. In justified cases, e.g. work involving increased radiation exposure (opening of isotope containers; handling and packaging of radioactive waste; work with highly radioactive materials, etc.) and/or where the radiation exposure arising

from the work may exceed an annual effective dose of 6 mSv, or an annual equivalent dose to organs or tissues of 0.3 times the relevant limit, an individual direct-reading dosimeter must be worn. Their monitoring and documentation shall be carried out by the RPOff on the basis of a previously requested and approved authorisation.

After work with radioactive material, the body surface of the workers must be checked with a surface contamination meter. In the event of contamination, the Radiation Protection Officer must be notified without delay and the incident must be recorded.

Every Category 'A' employee of the University of Pannonia must be under central official personal dosimetry monitoring. The TLD dosimeters are replaced every two months. At the end of the work involving radiation hazards, the dosimeter must be stored in a place where it cannot be exposed to additional radiation above natural background radiation.

Category 'A' employees should also wear an individual direct-reading dosimeter for work involving increased radiation exposure; the Radiation Protection Officer determines whether this is justified when assessing the radiation protection plan.

For Category 'B' employees of the University of Pannonia, an electronic individual direct-reading dosimeter must be worn during the measurement operations concerned, where the nature of the task warrants it. At present, this is required when using the portable X-ray fluorescence analyser (Oxford Instruments) of the Research Laboratory for Sustainability Solutions. The Radiation Protection Officer of the unit concerned records the measured values after the work has been completed.

In the event of emergency radiation exposure, the TLD dosimeter must be withdrawn as a matter of priority (responsible person: the Radiation Protection Officer) and sent without delay, together with the record, to the competent authority (responsible person: the Radiation Protection Officer).

3.2.3.2. Technical means, frequency and duration of the monitoring required in the individual work areas

	After commencement of the authorised activity	Radiation protection measurements to be carried out periodically
Technical means of measurement	Official personal dosimeter (TLD)	Dose rate meter with valid calibration
Frequency of measurements / evaluations	Every 2 months	Once a month
Duration of measurements	Continuously during working hours in the vicinity of the equipment	At the relevant measurement points (see Chapter 3.1.3) in the vicinity of the given equipment, for at least two periods of 10 minutes each; a record must be drawn up.

Training: Training of employees on current changes, a list of radiation protection obligations, and information on dosimetry data. Oral training, without assessment (once a year). Mandatory basic/extended/comprehensive radiation protection training every 5 years.

3.2.3.3. Description of calculation methods (estimation, modelling, analysis) or reference to an appropriate source, and the frequency or triggering conditions for reviewing the calculations

No estimations, modelling or analyses are carried out. Where necessary, the radiation protection expert shall act on the basis of international recommendations and standards. Reliance must in principle be placed on actual measurement results.

3.2.3.4. Determination of which groups of employees and members of the public each monitoring method is applicable to

Public radiation exposures:	Members of the public: employees of the University of Pannonia entering workplaces that do not involve radiation hazards, visitors, maintenance staff for equipment and installations that do not involve radiation hazards, and students present in the laboratories for educational purposes. The probability of the public dose limit being exceeded at the university's workplaces is quite low (both in normal operation and during malfunctions and extraordinary events), because the equipment is located in a separate area, and the equipment may be handled and operated only by designated persons.
Occupational radiation exposures:	The radiation exposure of employees may arise from external X-ray radiation, as well as from alpha, beta and gamma radiation. Employees who do not operate the equipment but carry out their activities in the area containing it do not need to expect additional radiation exposure, because the equipment is located where no additional radiation exposure occurs. In addition, the equipment may be operated (and the work involving radiation hazards carried out) only by designated persons who hold the necessary authorisation and the qualifications required for their activities.

Students may also carry out measurements in the relevant laboratories of the University of Pannonia. For work involving radiation hazards, at least two people must be present at the same time, at least one of whom holds the appropriate professional and radiation protection qualifications. In the case of student laboratory work, the person supervising the measurements must have the necessary professional and radiation protection knowledge and, where necessary (where justified on the basis of

the radiation protection plan), must wear an electronic individual direct-reading dosimeter.

Public and occupational radiation exposures are monitored by dose rate measurements in the vicinity of the equipment (using a calibrated dose rate meter).

3.2.4. Monitoring of internal radiation exposure

Internal radiation exposure may arise in connection with the use of unsealed isotopes. Its prevention is ensured by the requirements applicable to the laboratory.

When work is carried out with unsealed isotopes, a risk assessment must be carried out, taking into account the safety factors in Annex 3. The risk assessment may be carried out on the basis of the following equation [3]:

$$d_j = \frac{A_j e(g)_{j,inh} f_{fs} f_{hs} f_{ps}}{0{,}001} \qquad (1)$$

where

A_j: is the annual activity used of radionuclide j (Bq),

$e(g)_{j,inh}$: is the inhalation dose coefficient for radionuclide *j* (Sv/Bq) [4],

0,001 is the "significant occupational radiation exposure" (Sv),

f_{fs}: is the safety factor depending on the physico-chemical form of the radionuclide; the default value is 0.01 (a value of 0.001 may be chosen in justified cases),

f_{hs}: is the operational safety factor,

f_{ps}: is the safety factor for the protection applied.

Fulfilment of the following criterion must be checked:

$$D = \sum_j d_j \geq 1 \qquad (2)$$

If the value of *D* reaches or exceeds 1, the Radiation Protection Expert must be consulted on the feasibility of monitoring internal radiation exposure. If the value is less than 1, no monitoring is necessary.

3.2.4.1. Description of laboratory testing methods

If incorporation is possible or suspected (an incident occurring during work with radioactive material), the following procedure must be followed:

- Treatment to reduce absorption and to accelerate the elimination of the incorporated radionuclides must be started immediately.

- Medical assistance must be arranged where necessary.
- In the case of a radiation accident occurring together with other injuries (bleeding, closed or open fractures, skin wounds, burns, etc.), saving life takes priority over treating the radiation injury. This must be done in accordance with the general rules of emergency care.
- Specialist care for persons injured by radiation is provided within the progressive patient care system, at regional (county) level in the internal medicine departments with a haematology profile.
- Persons injured by radiation are transported by the National Ambulance Service, telephone number 104; the central emergency number is 112.
- The accident must be reported without delay to the Radiation Protection Officer, who is obliged to report it to the Radiation Protection Officer. The incident must be reported to the HAEA (within 2 hours at most), the Public Health Department of the Veszprém County Government Office must be notified, and consultation must take place on carrying out the monitoring of internal radiation exposure.

Instrumental monitoring covers whole-body measurement and the measurement of excreta (urine, etc.). The specific examination is determined jointly by the radiation emitted by the nuclide used, the measurement options available, and the activity carried out.

3.2.4.2. Method of estimating internal radiation exposure from inhalation on the basis of air quality monitoring

The entire area of the laboratory is under continuous extraction during working hours, and work with unsealed radioactive material is permitted only in a fume cupboard, so the likelihood of an internal dose from inhalation arising is minimal.

Under Section 27 of the Decree [1], routine monitoring is not warranted, given the nature of the risks within the laboratory (a low background radiation environmental laboratory) and the annual use of unsealed isotopes. For every order of unsealed isotopes, a risk assessment must be carried out according to the activity to be purchased and the nature and rate of use, using the following formula [6]:

$$d_j = \frac{A_j e(g)_{j,inh} f_{fs} f_{hs} f_{ps}}{0{,}001}$$

where

A_j: is the annual activity used of radionuclide j (Bq),

$e(g)_{j,inh}$: is the inhalation dose coefficient for radionuclide *j* (Sv/Bq) [7],

0,001 is the “significant occupational radiation exposure” (Sv),

f_{fs}: is the safety factor depending on the physico-chemical form of the radionuclide; the default value is 0.01 (a value of 0.001 may be chosen in justified cases),

f_{hs}: is the operational safety factor,

f_{ps}: is the safety factor for the protection applied.

The required safety factors are given in the following table [7]:

Operation	f_{hs}
Storage	0.01
Simple wet operations	0.1
Ordinary chemical operations	1
Complex wet operations, with a risk of spillage	10
Simple dry operations	10
Handling of volatile substances	100
Dry operations involving dust generation	100
Protection	**f_{ps}**
No protection	1
Fume cupboard	0.1
Glove box (hermetically sealed)	0.01

Fulfilment of the following criterion must be checked:

$$D = \sum_j d_j \geq 1$$

If the value of *D* reaches or exceeds 1, the radiation protection expert must be notified and consulted on the feasibility of monitoring internal radiation exposure. If the value is less than 1, no monitoring is necessary.

3.2.4.3. Determination of which groups of employees and members of the public each monitoring method is applicable to

Public radiation exposures:	Members of the public: employees of the University of Pannonia entering workplaces that do not involve radiation hazards, visitors, and maintenance staff for equipment and installations that do not involve radiation hazards. The probability of the public dose limit being exceeded at the company's workplaces is quite low (both in normal operation and during malfunctions and extraordinary events), because the equipment is located in a separate area, and the equipment may be handled and operated only by designated persons.
Occupational radiation exposures:	The radiation exposure of employees may arise from external X-ray radiation, as well as from alpha, beta and gamma radiation. Employees who do not operate the equipment but carry out their activities in the area containing it do not need to expect additional radiation exposure, because the equipment is located where no additional radiation exposure occurs. In addition, the equipment may be operated (and the work involving radiation hazards carried out) only by designated persons who hold the necessary authorisation and the qualifications required for their activities.

Students may also carry out measurements in the relevant laboratories of the University of Pannonia. For work involving radiation hazards, at least two people must be present at the same time, at least one of whom holds the appropriate professional and radiation protection qualifications. In the case of student laboratory work, the person supervising the measurements must have the necessary professional and radiation protection knowledge and, where necessary (where justified on the basis of the radiation protection plan), must wear an electronic individual direct-reading dosimeter.

Public and occupational radiation exposures are monitored by dose rate measurements in the vicinity of the equipment (using a calibrated dose rate meter).

3.2.5. Where personal radiation exposures are estimated on the basis of personal measurements taken on other employees, description of the calculation methods used for the estimation:

N/A

3.2.5.1. Name and description of the calculation (estimation, modelling, analysis) methodology appropriate to the type of radiation exposure, or reference to an appropriate source

N/A

3.2.5.2. Job roles of the reference employees, and the nature, duration and method of monitoring of their radiation exposure

N/A

3.2.5.3. Frequency or triggering conditions for reviewing the calculations

N/A

3.3. Procedure for monitoring surface contamination

3.3.1. Name of the technical method of monitoring

Once a month, and more often where necessary (during the work in question), the places where sources are used, the surroundings of the isotope storage cabinet and the work surfaces of the hot laboratories must be checked with a surface contamination meter. Measured values must be recorded and logged where they deviate. If a measurement result exceeds the values given in Table 2 of Annex 3, the Radiation Protection Officer of the IRR (BECE-RDC) must be notified, and will take the necessary measures.

Surface monitoring may also be carried out by the Radiation Protection Officer and the officer's deputy.

3.3.2. Description of the (surface-dependent) parameters used to correct the measurement result (if any)

N/A

3.3.3. Regular frequency of monitoring or the conditions for ordering it; the job roles authorised to carry it out

The radiation protection officer also carries out spot checks and regular (monthly) checks of the cleanliness of the tables and floors, and records them in a report where a value above the recording level is found.

3.3.4. Methods for eliminating surface contamination and the type and quantity of the equipment to be used (decontamination kits), and the procedure for checking availability

The contents of the decontamination kit can be found in standard MSZ-62-7:2017 [8].

3.3.5. Process for ordering decontamination and arrangements for carrying it out

If a surface contamination check gives a result higher than the values in the table below, the surface must be decontaminated.

Surfaces	*Intervention levels [Bq/cm²]*		
	α emitters	*β emitters*	*^{3}H, ^{14}C, ^{99m}Tc*
Rooms and objects in the controlled area	*5*	*50*	*500*
Rooms and objects outside the controlled area; personal clothing	*0.5*	*5*	*50*
Outer surface of protective clothing	*5*	*50*	*500*
Inner surface of protective clothing	*0.5*	*5*	*50*
On skin	*0.5*	*5*	*50*

If activity above the intervention level is detected on the skin, this must be reported with immediate effect to the Radiation Protection Officer, who is obliged to investigate the incident and take the necessary steps.

3.3.6. Description of the location and use of radiation protection airlocks, and of the type of measuring instruments used to monitor body surface contamination and the quantities measured

Organisational unit	Type of instrument	Qty	Measured value
Institute of Radiochemistry and Radioecology [IRR (BECE-RDC)]	Berthold hand-foot monitor	1	Alpha-beta contamination (in cps)

Radiation protection instruments

See Annex 1 of this Regulation

3.3.7. Methods for eliminating skin surface contamination and the type and quantity of the equipment to be used (decontamination kits), and the procedure for checking availability

A decontamination kit must be placed in an easily accessible location in the isotope laboratories. The storage place must be labelled, and the staff working there must be trained in its use. The kit may be used only for decontamination.

Contents of the decontamination kit:

- 2 × 25 cm tweezers
- 2 × 15 cm tweezers
- 5 pairs of rubber gloves
- 5 pairs of foil overshoes (slip-on shoe covers)
- 1,000 g detergent (or washing-up liquid)
- 1,000 g cotton wool
- 500 ml 10% trisodium phosphate solution
- 1,000 ml 2% technical-grade Complexon III solution
- 10% hydrochloric acid (or nitric acid) for decontaminating objects
- 5 large bags (for waste)
- 1 eyewash cup
- 500 ml 0.9% saline solution
- (where applicable, 500 ml of a special decontamination agent, a cleaning agent such as ULTRADERM)

In the event of contamination, removing it is the task of the staff working there, under the direction of the Radiation Protection Officer.

Touching anything with contaminated hands is prohibited. Before protective gloves are removed, they must be checked for contamination, and if contaminated they must be cleaned before being removed. After work with radionuclides, surfaces must be checked for contamination. (Responsible person: the person carrying out the work.)

The Radiation Protection Officer also carries out spot checks and regular (monthly) checks of the cleanliness of the tables and floors, and records them in a report where a value above the recording level is found.

No equipment, objects, etc. may be taken out of a controlled and/or supervised area without checking that they are free of contamination. At the exit, checking persons for contamination is mandatory in every case, regardless of whether the person has been working with active or inactive materials.

Controlled and/or supervised areas must be cleaned with separate (marked) equipment. The person carrying out the cleaning must hold at least a basic-level radiation protection qualification.

4. Requirements for carrying out work

4.1. Requirements for the handling and wearing of safety systems, personal protective equipment, radiation protection instruments and personal dosimeters

4.1.1. Use of personal protective equipment, arrangements for the use of general work clothing, and arrangements for ordering the use of additional personal protective equipment

- Disposable equipment should be used in the laboratories wherever possible.
- The workplace must be provided with radiation protection work equipment, personal protective equipment, decontamination materials and radiation protection measuring instruments appropriate to the type and activity of the isotopes used. (That is, protective clothing, rubber gloves, shielding materials, and a contamination meter and dosimeter must be provided.)
- In a controlled area, it is prohibited to carry out any activity outside the scope of work with radioactive isotopes (e.g. inactive work), to eat, drink, smoke, or use cosmetic products, or to bring in any object unrelated to the work. Work with inactive materials connected with radioisotope work must be carried out in the supervised area.

4.1.2. Use of technical radiation protection shielding and the conditions for ordering it

Relevant to the IRR (BECE-RDC). The person carrying out the work process in question is responsible for the proper design of the radiation protection shielding, on the basis of the prior radiation protection plan. It must be designed and used in accordance with the RPS. If the technical radiation protection is damaged, work must be suspended until the conditions laid down in the RPS are met again. Following a modification, the relevant parts of the RPS and the WRPR must be updated and notified to the authority.

4.1.3. Specification of the types of personal dosimeters used, and the arrangements for reading, wearing and storing them

- 10 x DMC-2000-S: Hp(10) - X, γ: >60 keV, 10 µSv – 10 Sv
- 4 x Siemens Thermo EPD MK2.5: Hp(10) , Hp(0.07) - X, γ: 15 keV-10 MeV, β 250 keV – 1.5 MeV average energy, 0 µSv – 16 Sv

Requirements for wearing and storing the dosimeter:

- During working hours, it must be worn on the left side, in the area of the heart, on the outer surface of the work clothing, in the holder pouch designated for the purpose.
- Outside working hours, and at the end of the day's work involving radiation hazards, the official personal dosimeter must be stored in a place where it is not exposed to additional radiation (that is, radiation not received while carrying out the occupation) above natural background radiation. The official personal dosimeter must not be damaged while being handled or worn, and unauthorised persons must not have access to it.

Outside shifts, the dosimeters must be handed over to the Radiation Protection Officer, who shall arrange for their storage.

4.1.4. Types of hand-held or mobile instruments used, and the ordering of their use

The list of radiation protection equipment can be found in Annex 1.

Regular measurement using instruments

At the company's organisational units, instrumental monitoring must be carried out once a month in the vicinity of all thickness gauge equipment (taking into account the provisions of Subsection 3.2.3.2 of this Regulation). Monitoring may be carried out only with an instrument that has valid calibration.

The result of the monitoring must be recorded in a record based on **Annex 6**, and a register of these records must be kept.

Acceptable measurement results:

- Within the controlled area: below the limits in **Annex 3**.
- At the nearest operator position: of the order of, or close to, background radiation.

If the measured values exceed the dose limits, the operation of the equipment must be stopped immediately and the procedure for extraordinary events must be applied.

Measurements may be carried out only with a calibrated instrument. Radiation protection measuring instruments (radiation protection dosimeters) must be recalibrated every 2 years, and a register of the documentation relating to this must be kept.

4.2. All radiation protection knowledge that must be known locally for safe working

4.2.1. Arrangements for entering and leaving the supervised and controlled areas

The boundaries of the University and some of its internal facilities are protected by an electronic access control system. The access control system operates door locks at individual entry points. An electronic access card is required to use the entry points, and the arrangements for requesting it and the rules for its use are laid down in the university's policy.

The electronic access control system records entry and exit data, designates checks for the security staff, and prevents the use of expired access cards, or cards that are invalid for any other reason, at the entry points.

Specialist service engineers who maintain the equipment may be present in the controlled areas only under supervision.

4.2.2. Work permits, dose planning

Before work with radioactive material begins, a radiation protection plan must be submitted to the deputy radiation protection officer of the organisational unit

concerned (IRR) (see Annex 3 of the IRR RPS), in which a dose estimate for the work process in question must be prepared. The radiation protection plan shall be approved by the Radiation Protection Officer on the basis of the expected dose values. In justified cases, namely work involving increased radiation exposure (opening of isotope containers; handling and packaging of radioactive waste; work with highly radioactive materials, etc.) and/or where the radiation exposure arising from the work may exceed an annual effective dose of 6 mSv, or an annual equivalent dose to organs or tissues of 0.3 times the relevant limit, an individual direct-reading dosimeter must be worn. Their monitoring and documentation shall be carried out by the RPOff on the basis of a previously requested and approved authorisation.

4.2.3. General rules of conduct and personal hygiene

Work must be carried out in compliance with the rules of conduct and personal hygiene set out in the University's valid internal policies and regulations.

4.2.4. Rules for safe working

The equipment may be operated only with valid authorisations and under safe operating conditions.

- Persons must remain in the designated protected place.
- General protective equipment must be used for its intended purpose.
- Architectural requirements must be met, the equipment must be operated properly, periodic checking measurements must be made with a dosimeter, and calibration and checks by a specialist service must be carried out in accordance with the quality assurance programme.
- When work is finished, the equipment must be shut down (disconnecting the power supply, closing the shutter of the radiation source).
- The architectural requirements must be ensured, and condition-monitoring measurements relating to the proper operation of the equipment must be carried out by a specialist service every 2 years (other measurements must be carried out in accordance with the quality assurance programme).

- The operating instructions prepared by the manufacturer must be strictly followed when using the equipment (a short description or instructions for use in Hungarian must be available on site).
- The service life of the equipment is determined by the supervisory authority, and before it expires, the authorised use (the authorisation) must be renewed.
- The staff must ensure that unauthorised persons cannot operate the equipment and so cannot cause a dangerous situation.
- Workstations involving radiation hazards must be provided with warning signs.
- The name and contact details of the Radiation Protection Officer and of the officer's deputy must be displayed at the workplace.
- The manager must appoint the Radiation Protection Officer in writing, and the name of the Officer must be notified in writing to the supervisory authority and to the head of the institution.
- After major repairs or modification, the equipment may be put into use only after a documented radiation protection measurement (the cost of the measurement is borne by the operator of the instrument; responsible: RPO).
- After any change that may increase the absorbed dose rate of the radiation beam or alter the radiation protection system, the equipment must undergo radiation protection measurements before it is returned to normal use. This is the task of the party carrying out the modification, who shall make the record of it available to the licence holder (responsible: RPO). After the change, if necessary, new radiation protection requirements must be drawn up and the activity must be authorised again (responsible: RPOff, RPO).
- Deviating from the conditions set out in the technical radiation protection description and floor plan, installing a new device, or relocating or replacing an existing one is permitted only on the basis of authorisation from the HAEA.
- Examinations must be carried out so that, while the necessary information is obtained, the radiation exposure of the staff and the environment remains at the lowest reasonably achievable level.

- Regular local radiation protection training must be attended.

4.2.5. Consequences of violating the WRPR

A violation of the WRPR that causes serious or deliberate radiation exposure results in immediate release from work duties. Life must not be endangered by suspending a work activity. A violation of the WRPR through negligence or for reasons beyond the person's own fault does not result in release from work duties. The severity of the violation is determined by the Radiation Protection Officer, who orders corrective action and proposes an investigation of the incident.

4.3. Special rules for the use of sealed radiation sources

- Electronic administration must be carried out using the current version of the Radium programme.
- For an instrument operating with a sealed source or X-ray tube, operating instructions in Hungarian that take account of the valid radiation protection requirements are also required.
- After major repairs or modification, the equipment may be put into use only after a documented radiation protection measurement.
- After any change that may increase the absorbed dose rate of the radiation beam, or that alters the radiation protection interlock system or shielding, the X-ray equipment must undergo radiation protection measurements before it is returned to normal use. This is the task of the party carrying out the modification, who shall make the record of it available to the licence holder.
- If necessary, new radiation protection requirements must be drawn up and the activity must be authorised again.
- The technical certificate of a sealed radiation source, in Hungarian, must be kept until the final disposal of the source.
- After use, the source must be returned to its storage container, and this must be confirmed by a radiation measurement.

- A sealed source withdrawn from use must be transported to a final storage place. After the Radiation Protection Officer has reported it and the documents have been handed over, the Radiation Protection Officer arranges the removal. The costs are borne by the licence holder. The removal must be reported to the authority.
- The loss or disappearance of a sealed radioactive source must be reported without delay to the Radiation Protection Officer and to the HAEA.

4.3.1. Procedure for leak testing of sealed radiation sources

- The integrity (leak-tightness) of sealed radiation sources must be checked every 2 years by a person authorised to do so. The records of the leak tests must be kept and shown to the Radiation Protection Officer and/or the authority during inspections.
- The leak test may be carried out by a radiation protection expert or by a person holding an authorisation under Paragraph 4 of Section 53(1) of the Decree [1].

4.3.2. Storage and handling arrangements for radiation sources, description and marking of the storage place, and description and marking of the storage equipment (containers, safes, work containers)

Institute of Radiochemistry and Radioecology (Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-RDC])

Radiology

The activity of the individual radiation sources is typically a few hundred kBq or MBq. The individual activity of the alpha and beta sources is also of this order of magnitude. Radiation sources in this activity range are stored in the radiology laboratory, in 2 storage safes (1 with drawers, 1 with shelves).

Level B isotope laboratory

High-activity sources and isotopic neutron sources are stored in the isotope store of the Level B laboratory:

radioactive waste store (R44)

isotope store (R43).

In the isotope store room, in addition to the radioactive preparations to be used in the Level B laboratory, the neutron source belonging to the radiology laboratory is stored, and sealed gamma sources may also be stored. Some packaged preparations are also opened here.

Shielded storage container, safe

3 pcs in the isotope store

Research Laboratory for Sustainability Solutions (Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-DRC])

The Research Laboratory for Sustainability Solutions is located on the 2nd floor of the University's Building C. The equipment relevant here, as shown in Annex 1, is stored in the basement laboratory belonging to the Research Laboratory for Sustainability Solutions.

Clean World Laboratory (Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-RDC])

The equipment relevant here, as shown in Annex 1, is stored in room J108 of the laboratory. The gas chromatograph is used regularly, and the radiation source is not removed from the instrument.

4.3.3. Arrangements for removing and returning radiation sources, record keeping, and designation of authorised job roles

- Only the RPOff may remove or return a radiation source.
- The company's RPOff keeps a record of the transport of radiation sources into and out of the isotope store.

4.3.4. Permitted dose rate levels for the radiation source, the source holder, or the storage place and equipment

Radioactive materials must be kept locked away in the storage place when not in use. The ambient dose equivalent rate on the outer surface of the storage places must not exceed 20 μSv/h.

4.3.5. Requirements for the proper handling of sources no longer in use, including, where applicable, their transfer to the manufacturer, a supplier, another authorised undertaking, or a radioactive waste storage facility

- A source that has reached the end of its service life, or that is no longer intended to be used, must be disposed of by burial in an official procedure (at the Püspökszilágy RWPT site of RHK Kft., in compliance with the necessary requirements), and the necessary administration must be carried out.
- Administrative procedure for burial:
    - Under Paragraph (1) of Section 57 of Decree 2/2022 (IV. 29.) of the HAEA, the notification obligation must be met (a notification of the change concerning the sealed source must be sent to the HAEA at least 10 days before the planned operation begins).
    - Contact RHK Kft., complete the waste data sheet, and attach a valid leak test record.
    - Dismantle the sealed source from its housing (and draw up a record of the removal).
    - Hand over to the carrier, and draw up a handover record (a copy to be sent to the HAEA).
    - Complete the administration within the Radium programme (and, after the administration, send a change report to the HAEA).
- The original technical certificate of the buried sources, together with the associated record card, is removed from the sealed source records folder and then archived, together with a copy of the burial record. Destruction of the original documents is PROHIBITED.

4.3.6. Action plan for locating missing radioactive or nuclear material and placing it under control

Under section 3 of Decree 490/2015 (XII. 30.), if a radioactive source is lost, the guidance prepared by the MTA EK SBL is used as the basis.

In the event of the loss or disappearance of a radiation source, it is advisable to follow the search procedure below.

Search procedure:

- Make sure that the radiation source is really missing.
- Notify senior managers, colleagues, the armed site security guard, and the authorities.
- Prepare a search plan and assemble a search team.
- Collect the data and history of the source to be found from the digital archive (technical certificate, photograph, handover documents, isotope registers, etc.). If the source was sent for verification or calibration, enquire at the verifying or calibrating organisation; if it was lent out, enquire of the borrower.
- Determine the extent of the immediate or potential danger.
- Determine other data on the source to be found, for example the characteristic energies of beta radiation, calculate the expected dose rates at a given distance, and determine the possible risks during the search.
- Check the measuring instruments needed for the search (calibration, test measurement).
- Question the persons who have access to the supervised area and who typically use the source, and the person who last saw it physically.
- Delimit the source area where the source may be assumed to be (for example within the site: work area, store, waste bin, yard).
- Carry out background measurements.

- Divide and delimit the area, carry out checking measurements when leaving the designated area, and detect any contamination.
- It is advisable to divide the area into plots, mark them on a map and number the individual sectors, and to designate the sectors where the source is most likely to have been lost or to be found (for example where the source was used or stored, or near the usual transport route). The search is best started at these plots.

4.4. Methods of workplace and plant collection and handling of radioactive waste

4.4.1. For solid waste and preparations containing liquids and gases: operation of workplace collection points, the method of material handling within the site, the arrangements for storage at the central collection point, the method of marking collection containers and stores, the permitted waste quantities and radiological limits for operating workplace and central plant collection points, the method of classifying waste, and the arrangements for clearance

Radioactive waste means materials in which the concentration of the radioactive isotope reaches or exceeds the concentration value laid down for radioactive waste, whose total activity exceeds the quantity authorised for the use of exempt-level isotopes, and for which no further use is required. Radioactive waste arising in an isotope laboratory must be handled with due care and attention, collected in the manner set out in the standard [2], and stored until it has decayed or been removed. Solid radioactive waste must be collected in a container lined with a plastic bag and opened by a foot pedal. The solid waste must then be collected in bags, and the approximate quantity and activity of the materials placed in the bag must be noted on its surface. The bags are handed over and removed either directly or placed in 200-litre drums.

4.4.2. For liquid waste: the process of classifying material as waste, the operation of liquid waste collectors, the method of material handling/transfer within the site and the arrangements for storage at the central collection point, the method of marking collection tanks and their stores, the permitted waste quantities and radiological limits for operating workplace and central plant collection tanks, the method of classifying waste, and the arrangements for clearance and discharge

An unbreakable container must be used to collect liquid radioactive waste. At a workplace intended for permanent occupancy, the dose equivalent rate on the surface of waste collection containers must not exceed 20 μSv/h.

If the concentration of short-lived radionuclides exceeds the exemption level, they are stored until they have decayed to a value below the limit. After that, following

a further sampling and analysis, if the result is satisfactory they may be discharged into the public sewer.

For radionuclides with longer half-lives, dilution (or possibly removal) may be the solution, while observing the appropriate discharge limits. Before discharge, the radiological contamination of the diluted waste water must be checked again. The discharge conditions are set out in the decree currently in force.

Waste water of high radionuclide concentration arising in the isotope laboratories must be collected separately and, after neutralisation, handed over to the radiation protection officer together with an accompanying sheet that also states the radionuclide concentration and the quantity of other dissolved or suspended contaminants. The officer places it in the temporary waste store set up in the Level B isotope laboratory of the Department of Radiochemistry and Radioecology and stores it until removal. Organic radioactive waste produced must be absorbed into calcined diatomaceous earth filled into metal chambers.

4.4.3. Further handling, processing and conditioning of waste: the names of the technological equipment used and its approval/authorisation, the radiation protection operating limits of the equipment (waste quantity, radiological limits), and the characteristics of the radioactive waste arising after processing

Radioactive waste may be conditioned only in a manner agreed in advance with the technologist of RHK Kft., and by the method that the technologist proposes. Given the quantity and nature of the waste arising, developing and applying an in-house technology for forming waste is not justified.

4.4.4. Regulation of the traceability of radioactive waste until its handover to the external waste management organisation, and the arrangements for handing over waste between internal organisations and to external organisations

Radioactive waste must be handed over, accompanied by the relevant data (activity, chemical composition, etc.), to the radiation protection officer, who arranges

for temporary storage and then, in cooperation with the radiation protection officer, for its removal.

4.5. Requirements for the maintenance and calibration of safety systems, personal protective equipment, radiation protection instruments and personal dosimeters

4.5.1. Method and frequency of evaluation of the personal dosimeters used, handling of the measurement results, and, where reading or evaluation is carried out by an external organisation, the name of that organisation, together with the arrangements for the maintenance and calibration of personal dosimeters

In justified cases, i.e. work involving increased radiation exposure (opening of isotope containers; handling and packaging of radioactive waste; work with highly radioactive materials, etc.) and/or where the radiation exposure arising from the work may exceed an annual effective dose of 6 mSv, or an annual equivalent dose to organs or tissues of 0.3 times the relevant limit, an individual direct-reading dosimeter must be worn (e.g. DMC-2000-S or Siemens Thermo EPD). Their monitoring and documentation shall be carried out by the RPOff on the basis of a previously requested and approved authorisation.

After work with radioactive material, the body surface of the workers must be checked with a surface contamination meter. In the event of contamination, the radiation protection officer must be notified without delay and the incident must be recorded.

Every Category A employee of the University of Pannonia must be under central official personal dosimetry monitoring. The TLD dosimeters are replaced every two months. At the end of the work involving radiation hazards, the dosimeter must be stored in a place where it cannot be exposed to additional radiation above natural background radiation.

Category A employees should also wear an individual direct-reading dosimeter for work involving increased radiation exposure; the radiation protection officer and

the officer's deputy determine whether this is justified when assessing the radiation protection plan.

For Category B employees of the University of Pannonia, an electronic individual direct-reading dosimeter must be worn during the measurement operations concerned, where the nature of the task warrants it. At present, this is required when using the portable X-ray fluorescence analyser of the Research Laboratory for Sustainability Solutions. The Radiation Protection Officer of the unit concerned records the measured values after the work has been completed.

4.5.2. Rules for the maintenance, calibration and verification of the hand-held or mobile instruments and measuring equipment used

The radiation protection measuring instruments used by the Radiation Protection Organisation (see Annex 2 of this Regulation) are verified every 2 years by the Metrology and Technical Supervision Department of the Budapest Metropolitan Government Office. The instruments are maintained by their manufacturer (or its Hungarian representative).

4.5.3. Presentation of installed radiation protection monitoring systems, their measuring ranges and alarm levels, requirements for monitoring the system, and rules for the maintenance, calibration and verification of the measuring equipment

Institute of Radiochemistry and Radioecology (Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-RDC]), Level B isotope laboratory

In the vestibule of the controlled entrance, a contamination monitor carries out radiological monitoring of the movement of persons and materials. It is verified every 2 years by the Metrology and Technical Supervision Department of the Budapest Metropolitan Government Office. The instruments are maintained by their manufacturer (or its Hungarian representative).

4.5.4. Description of the procedures for operating the discharge monitoring system

Department of Radiochemistry and Radioecology (Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-RDC]), Level B isotope laboratory

Waste water from the sinks and drains of the Level B isotope laboratory of the Department of Radiochemistry and Radiology goes into collection tanks in the basement, from which samples are taken when they are full. The samples taken are then subjected to radioanalytical testing to determine their radionuclide activity concentration. If the concentration is below the exemption level, the waste water may be discharged into the sewer.

4.5.5. Description of the procedures for operating the environmental monitoring system, in the case of high-priority facilities

The University is not a high-priority facility.

4.6. Tasks required under the radiation protection quality assurance programme, including the checks and measurements to be carried out on equipment that produces ionising radiation, and the method and frequency of carrying them out

4.6.1. Identification of radiation protection quality assurance processes

Part of the radiation protection programme	Tasks	Method of carrying out the task	Frequency
Inspection	Daily inspection of the equipment	Before starting work, the person operating the equipment checks that it is in working order, usable and intact (taking into account point 4.1 of this Regulation). If this is not the case, they report the fault to the RPOff and the specialist service is notified.	Daily, per shift
	Regular maintenance of equipment	Maintenance contract with the manufacturer; regular maintenance and inspection each	In accordance with the technical specification of

		year by the Radiation Protection Organisation.	the equipment; the time of periodic maintenance is determined by the specialist service.
	Regular radiation safety inspection	In accordance with Section 3.1.4 of this Regulation	On every piece of equipment, twice a year
	Radiation protection inspection	Unannounced inspection by the Radiation Protection Organisation, covering the entire radiation protection system, including the use of protective equipment and safe operation	Spot checks, or where abnormal operation is suspected
Radiation protection measurements	Monitoring of occupational and public radiation exposures	Measurements carried out with a dose rate meter verified by the Metrology and Technical Supervision Department of the Budapest Metropolitan Government Office, in protected places where a higher dose rate may reasonably occur (at the relevant measurement points)	Once a month for each piece of equipment
Training	Training of employees, list of radiation protection obligations, information on dosimetry data	Local oral radiation protection training, with no assessment. A training attendance list must be kept, and the RPOff retains it. Training records must be kept. Mandatory basic/extended-level radiation protection training every 5 years	Once a year
Medical fitness examination	Valid medical fitness must be in place	Medical examination carried out by the occupational health service	Once a year, or immediately where radiation sickness is suspected

4.6.2. Procurement of equipment, acceptance tests

Procurement: equipment involving radiation hazards may be procured only with the permission of the Radiation Protection Officer.

A given item of equipment may be put into operation only with a marketing authorisation and a valid operating licence. The list of authorised equipment can be found on the HAEA website.

4.6.3. Arrangements for the periodic full condition assessment (condition testing) of equipment by independent organisations

Test, inspection, review	Applicable decrees/standards	Tests and the bodies carrying them out	Documentation
Inspection of general protective equipment	As laid down in the relevant University policy or regulation	Monthly, by the RPOff or a designated person	Record, or local administrative method
Radiation protection measurement and periodic review	Decree 2/2022. (IV.29.) of the HAEA	Checking radiation protection measurements, by the appointed Radiation Protection Expert (at least once a year)	Expert opinion, records

4.6.4. Arrangements, methods and frequency of regular (daily, weekly, monthly, annual) quality control testing of equipment

As detailed in Sections 4.6.1 and 4.6.3 of this Regulation

4.6.5. Arrangements, methods and frequency of regular (daily, weekly, monthly, annual) quality control testing of safety systems, personal protective equipment, radiation protection instruments and personal dosimeters

As detailed in Section 4.6.1 of this Regulation

4.6.6. For medical and industrial radiology workplaces, a description of the radiation protection monitoring and measurement programme aimed at checking compliance with the standards for setting up a workplace involving radiation hazards

As detailed in Section 4.6.1 of this Regulation

5. Management of records and reports

5.1. Arrangements for keeping radiation protection records and retaining documents, and for meeting the obligation to notify the authorities

5.1.1. Description of the records kept (personal dose measurements, training, medical examinations, radiation protection inspections and assessments, records of radiation sources and waste)

Local records must be kept of the following data:

Subject matter of the record	Person responsible for managing the record
Certificates attesting to employees' professional qualifications and radiation protection qualifications	Radiation Protection Officer
Training of employees	Radiation Protection Officer
Medical fitness examinations	Radiation Protection Officer
Maintenance/quality assurance of equipment (unless another person is designated for this task), but a copy of the documentation must be kept: maintenance records, technical certificates (verification/calibration certificates issued by the Metrology and Technical Supervision Department of the Budapest Metropolitan Government Office)	Radiation Protection Officer
Equipment data	Radiation Protection Officer
Official authorisations	Radiation Protection Officer
Inventory of radioactive materials, in accordance with Subsection 5.1.3 of this Regulation	Radiation Protection Officer
External workers and their training	Radiation Protection Officer
Records of radiation protection measurements	Radiation Protection Officer
Records and reports on the investigation of extraordinary events	Radiation Protection Officer
Information or plans relating to architectural radiation protection conditions	Radiation Protection Officer

5.1.2. Arrangements for managing the records

The records are managed by the persons responsible given in Section 5.1.1, in accordance with the Radiation Protection Regulation. The Radiation Protection Officer provides information on changes.

5.1.3. Arrangements for regular data reporting to the nuclear safety authority (frequency, method and content of communication, responsible person, deadline)

It is the task of the workplace Radiation Protection Officer to collect the documentation and records relating to the operation of the isotope laboratory, to store them securely, and to meet the obligations to notify the authorities.

Radioactive materials that come into the ownership of the University of Pannonia must be reported to the central register, providing the data required by the decree in force. A local record must also be kept of radioactive materials owned or held. It must contain the authorised maximum inventory of the radioactive material, the current inventory, the type, the activity, the intended purpose, the storage place, and the manner of application (use).

Separate records must be kept of sealed sources, unsealed sources and radioactive waste. Every change in the inventory of radioactive material, its use or application (and any interruption of this), its decay below the exemption level, its complete use, and its classification as waste must be entered without delay. For sealed sources, the purpose, date and place of application must also be recorded. The record must also include the name of the person obliged to keep records and of the Radiation Protection Officer.

For radioactive waste, the local record must contain the name and address of the owner/holder, the class of the radioactive waste, the basis of classification (short or long half-life; low or intermediate activity on the basis of the exemption levels), the nature of storage, the waste form, the packaging, the quantity, the type of radionuclide, the activity (with the date it relates to), the method of determining the activity, the date of classification as waste, the record number, and the name and address of the person who carried out the classification.

Radioactive materials must be inventoried every year.

5.1.4. Arrangements for ad hoc notifications to the nuclear safety authority (triggering conditions, method and content of communication, responsible person, deadline)

The University of Pannonia's Radiation Protection Officer notifies the HAEA (through the ASDS system) of the following:

- In the case of radioactive material and equipment emitting ionising radiation:
    - the start of the authorised activity involving its application, at least 30 days before the planned start of the activity;
    - the cessation of its application or operation, no later than 8 days after the cessation;
    - the acquisition of ownership, or the conclusion of a contract or placing of an order aimed at acquiring ownership, and any change in the name of the owner, within 8 days. For equipment producing ionising radiation, the equipment data sheet under Annex 11 of Decree 2/2022 (IV. 29.) of the HAEA must be sent;
    - the transfer of ownership or use under any title, within 8 days.
- Any change in the data specified in Annex 1 of this authorised WRPR, no later than 15 days after the change.
- The Radiation Protection Officer must provide data to the Authority within 15 days of a change in their name or address, or of a change in the person obliged to keep records.
- The Radiation Protection Officer must provide data to the Authority within 15 days of every change in the inventory of registered radiation sources, in the electronic form supported by the central register.
- The Radiation Protection Officer must provide data to the Authority without delay in the event of any shortage or surplus found when radioactive materials are inventoried.

6. Handling of malfunctions and extraordinary events

6.1. Handling of malfunction events that fall outside normal operating processes but are not extraordinary

6.1.1. Range of malfunction or reportable events that fall outside normal operating processes but are not extraordinary, and the arrangements for investigating them

Malfunction events include in particular:

a) operating equipment containing a radioactive source other than in accordance with the operating documentation (unless this takes place as planned in advance, in the manner regulated in the WRPR);

b) a fault in equipment containing a radioactive source;

c) unauthorised operation of a radiation source.

The contracted radiation protection expert is responsible for investigating a malfunction event, and the company's managing director is responsible for ordering the measures taken. The Radiation Protection Officer documents the investigation of the event and keeps the record, and makes the notification in the form requested by the HAEA. The Radiation Protection Officer trains the employees on the corrective measures, and draws up and keeps a training attendance sheet for this.

6.1.2. Organisational measures that take effect when malfunctions occur

In the event of a malfunction, the Radiation Protection Officer makes a proposal to the manager for dealing with the malfunction.

6.1.3. Measures applied when the occupational dose constraint is exceeded

If the value of the fixed dose constraint is exceeded, the Radiation Protection Officer must be notified (the equipment is switched off and shut down) and the event must be investigated.

A workplace investigation must be carried out and corrective measures must be taken to avoid a recurrence of the incident, for example working time restrictions and training.

The Radiation Protection Officer is responsible for documenting the investigation.

6.1.4. Handling of unplanned discharges

Because of the small quantity of radioactive material held by the University, and intended to be held in future, an unplanned discharge above the limit is not possible.

6.2. Arrangements for handling extraordinary events

6.2.1. Plan for handling an extraordinary event, and its minimum content

6.2.1.1. Determination of the range of extraordinary events

- Any event, including fires, human errors, physical protection events, equipment failures and other malfunctions, as a result of which:
    - a radiation source and its work holder are damaged and/or a fault occurs;
    - the operating conditions and limits are breached.

Dose limit exceeded	If this occurs, the incident must be investigated and the authority informed; responsible: Radiation Protection Officer. Given the technologies used, this is an event that is very unlikely to occur at the workplaces.
Dose constraint exceeded	Given the technologies used, this is an event that is very unlikely to occur at the workplaces.
Public dose limit exceeded	In the case of the public dose limit (1 mSv), the incident must be investigated with measurements, the data must be recorded in a record, and corrective measures must be taken. The competent authority must be informed of the incident. (The probability of exceeding the public dose limit at the company's workplaces is quite low.)
Permanent decommissioning of equipment, and replacement of equipment	It must be reported to the HAEA and work must be suspended

Radiation accident	Given the technologies used, this is an event that does not occur at the workplaces.
Crime, damage to shielding	Suspension of the activity until safe operating conditions are restored; report to the Budapest Police Headquarters.

Possible locations and occurrences:

The area around the equipment used (see Annex 2).

Possibility of occurrence:

- Fire, explosion, mechanical impact or natural disaster, resulting unexpectedly in prolonged thermal loading of the radiation source and the equipment, or obvious mechanical damage to them.

6.2.1.2. Organisational measures that take effect when an extraordinary event occurs, and, where there is a separate accident response organisation, its structure, tasks and alerting

In the event of any extraordinary radiation protection event at the University's workplaces, those in the immediate vicinity must be notified first, and then the person exercising radiation protection supervision (the Radiation Protection Officer and/or the Officer's deputy).

In the case of an alert by telephone or in any other form, the authenticity of the alert must be verified by calling back and checking. The decision on an external alert is taken by the professionally competent person (the Radiation Protection Officer). If that person cannot be reached, the employees working in the area may notify the external authorities.

The arrangements for the options for action and the obligations in dealing with and managing extraordinary events that may arise in connection with the use of ionising radiation (see Section 6.2.1.1 of this Regulation) are contained in the **Accident Response and Action Plans (ARAP).** The ARAPs relating to the individual organisational units can be found in **Annex 3**. One copy of each ARAP must be made available on site to everyone concerned. The content of the ARAPs must be taught once a year to all employees concerned.

<u>Documentation:</u>

Unless the authority specifies otherwise, the accident documentation must be compiled in the form of a report after the response. The report is drawn up by the Radiation Protection Officer or by the Deputy Radiation Protection Officer delegated by the Officer. It must be kept in the company's records archive in accordance with the company's documentation rules, and at the Radiation Protection Organisation (the Organisation keeps the documentation for at least 10 years).

6.2.1.3. Handling of events involving unplanned radiation exposure

An event involving unplanned radiation exposure is reported by the RPOff of the business unit concerned to the head of the Radiation Protection Organisation. The Organisation investigates it and, depending on the severity of the case, decides on further measures.

6.2.1.3.1. **Measures to be taken if the occupational dose limit is exceeded**

See the table in Section 6.2.1.1 of this Regulation.

6.2.1.3.2. Measures to be taken if the public dose constraint or dose limit is exceeded

See the table in Section 6.2.1.1 of this Regulation.

6.2.1.3.3. Measures to be taken in the event of intake of radionuclides (inhalation, ingestion, contamination of damaged skin)

After the location and the event have been mapped out, proceed in accordance with the ARAP in Annex 3.

6.2.1.3.4. Treatment of injuries where the wound is contaminated with radioactive material

After the location and the event have been mapped out, proceed in accordance with the ARAP in Annex 3.

6.2.1.3.5. On-site medical care for persons injured by radiation or suspected of being so

A person injured by radiation, or diagnosed as injured with suspected radiation injury, must be given primary care on site (securing the airway, maintaining circulation,

controlling bleeding, maintaining vital functions) and then transported to the following location. The incident must be reported to the competent body:

Csolnoky Ferenc County Hospital, Veszprém

6.2.1.4. Measures to be taken when surface contamination or airborne activity concentration exceeding the operating conditions and limits is detected, and arrangements for monitoring and assessing radiation conditions

After the location and the event have been mapped out, proceed in accordance with the ARAP in Annex 8.

6.2.1.5. Measures to be taken if the integrity of a sealed source is lost or sources are damaged

After the location and the event have been mapped out, proceed in accordance with the ARAP in Annex 8.

6.2.1.6. Measures to be taken in the event of loss or unauthorised use of a radiation source

After the location and the event have been mapped out, proceed in accordance with the ARAP in Annex 8. Account must also be taken of the provisions of Subsection 4.3.6 of this Regulation.

6.2.1.7. Action to be taken if the systems serving the safe handling of radioactive sources or equipment producing ionising radiation are damaged

See the table in Section 6.2.1.1 of this Regulation.

6.2.1.8. Measures to be taken if radioactive isotopes enter the environment without authorisation or above the limit

After the location and the event have been mapped out, proceed in accordance with the ARAP in Annex 8. Account must also be taken of the provisions of Subsection 4.3.6 of this Regulation.

6.2.1.9. Arrangements for training and exercises in preparation for handling extraordinary events

The training is delivered by the head of the radiation protection organisation, the Radiation Protection Officer of the institute concerned, or an appointed expert. The syllabus must cover the contents of the radiation protection policies (WRPR, RPS) and

the radiation protection instructions and information relating to current changes or events. The training must include a practical demonstration and examples of accident situations and the handling of extraordinary events (ARAPs).

7. Contact details of persons and organisations competent in radiation protection

7.1. The following contact details of persons and organisations competent in radiation protection must be attached to the WRPR:

7.1.1. Name, contact details (telephone, e-mail, room, address) and job title of the Radiation Protection Officer

Name: Dr. Anita Csordás

Mobile telephone number: +36305856140

E-mail address: csordas.anita@mk.uni-pannon.hu

Address: 8200 Veszprém, Egyetem utca 10. Building N, Room R26

Job title: Associate Professor

Professional qualification: Environmental Engineer

Radiation protection qualification (certificate number): comprehensive-level radiation protection knowledge (Á-64/2020, Somos Foundation)

7.1.2. Name, contact details (telephone, e-mail, room, address) and job title of the Deputy Radiation Protection Officer

Institute of Radiochemistry and Radioecology (Bio-, Environmental and Chemical Engineering Research and Development Centre [IRR_BECE-RDC]):

Name: Dr. Edit Tóth-Bodrogi

Mobile telephone number: +36203261585

E-mail address: toth-bodrogi.edit@mk.uni-pannon.hu

Address: 8200 Veszprém, Egyetem utca 10., Building N, Room R25

Job title: Associate Professor

Professional qualification: Environmental Engineer

Radiation protection qualification (certificate number): comprehensive-level radiation protection knowledge (ÁT-24/2024 Somos Foundation)

Institute of Radiochemistry and Radioecology (Bio-, Environmental and Chemical Engineering Research and Development Centre [IRR_BECE-RDC]):

Name: Dr. Kovács Tibor

Mobile telephone number: +36-20/335-5303

E-mail address: kovacs.tibor@mk.uni-pannon.hu

Address: 8200 Veszprém, Egyetem utca 10., Building N, Room R10

Job title: Associate Professor

Professional qualification: Chemical Engineer

Radiation protection qualification (certificate number): comprehensive-level radiation protection knowledge (SOMOS-ÁT-5/2023)

Institute of Materials Engineering (Research and Development Centre for Technical Sciences [IME_RDC-TS]):

Name: Dr. András Kovács

Mobile telephone number: +36306176884

E-mail address: kovacs.andras@mk.uni-pannon.hu

Address: 8200 Veszprém, Egyetem utca 10., Building C, Room 335

Job title: Assistant Professor

Professional qualification: Materials Engineer

Radiation protection qualification (certificate number): extended-level radiation protection knowledge (RTTSZ-B 26/2021)

(Bio-, Environmental and Chemical Engineering Research and Development Centre [BECE-RDC]):

Name: Dr. Mónika Meiczinger

Mobile telephone number: +3630/2461002

E-mail address: meiczinger.monika@mk.uni-pannon.hu

Address: 8200 Veszprém, Egyetem utca 10., Building C, Office 436

Job title: Senior Research Fellow

Professional qualification: Chemical Engineer

Radiation protection qualification (certificate number): extended-level radiation protection knowledge (RTTSZ-B 27/2021)

7.1.3. Contact details of the occupational health service provider (telephone, address)

Name and address of the appointed occupational health service:

FOURMED Egészségügyi Szolgáltató Kft.,

8200 Veszprém, Egyetem u. 5.

Tel.: +3688/624107

Radiation health examinations must be carried out every year for persons working at workplaces involving radiation hazards.

7.1.4. Contact details of the dosimetry service provider (telephone, address)

NNGYK National Personal Dosimetry Service

Address: 1097 Budapest, Albert Flórián út 2-6.

Postal address: 1437 Budapest, Pf. 777

Phone: (06-1)-896-0119

7.1.5. Name and contact details (telephone, e-mail, address) of the radiation protection expert(s)

Name: Gergő Bátor (SVR-HA12835)

Mobile phone number: +36704167334

E-mail address: bator.gergo@hotmail.com

Address: 8442 Hárskút, Kinizsi Pál utca 17.

7.1.6. Contact details (telephone, e-mail, address) of the authorities to be notified in the event of an extraordinary event

In the event of an extraordinary event, the Hungarian Atomic Energy Authority (OAH) must always be notified. The authority's contact details are:

Hungarian Atomic Energy Authority

24-hour emergency telephone number: 06-20-547-5656
Central phone number: 06-1-436-4800
Fax: 06-1-436-4843
E-mail: haea@haea.gov.hu
Address: 1036 Budapest, Fényes Adolf utca 4.
Postal address: 1539 Budapest, PF. 676.

In addition to the HAEA, the territorially competent environmental protection authorities must also be notified. In the event of an extraordinary event in the laboratory, the Veszprém County Government Office must be notified. Its contact details are:

Veszprém District Office of the Veszprém County Government Office

Phone: (88) 550-507, (88) 550-508

E-mail: veszprem.jaras@veszprem.gov.hu

Address: 8200 Veszprém, Mindszenty József utca 3–5.

8. References (standards and requirements taken into account)

[1] Decree 2/2022 (IV. 29.) issued by the HAEA on protection against ionising radiation and the related system of authorisation, reporting and monitoring.
[2] Government Decree 490/2015 (XII. 30.) on notifications and measures concerning missing, found and seized nuclear and other radioactive materials, and on measures following other notifications concerning nuclear and other radioactive materials.
[3] MSZ 62-7:2017: Protection against ionising radiation. Part 7: Radiation protection when using unsealed radioactive materials.

9. Definitions

Job roles connected with activities involving radiation hazards: the group of persons who operate the technological equipment, and who take part in its maintenance, where equipment involving radiation hazards (radiation sources) is installed.

Other radiation protection terms and definitions used in this Regulation are contained in **Decree 2/2022 (IV. 29.) of the HAEA**.

10. Annexes

- Annex 1 to the WRPR: List of equipment
- Annex 2 to the WRPR: Individual dose limits
- Annex 3 to the WRPR: Accident Response and Action Plans (ARAPs)
- Annex 4 to the WRPR: Training Attendance Sheet

II. **Implementation and final provisions**

1. The University promulgates and publishes this Policy on its website (www.uni-pannon.hu).
2. This Regulation was adopted by the Senate by Resolution No. 45/2025 (II.27.).
3. This Regulation enters into force on 01.04.2025 and remains valid until revoked.

Dated in Veszprém, on 27.02.2025

Dr. János Abonyi	Zsolt Csillag
Rector	Chancellor

Annex 1 to the WRPR – List of equipment and radiation sources

I. Equipment

Radiation protection instruments

Personal dosimeters

- DMC-2000-S: Hp(10) - X, γ: >60 keV, 10 µSv – 10 Sv
- Siemens Thermo EPD MK2,5: Hp(10) , Hp(0,07) - X, γ: 15 keV-10 MeV, β 250 keV – 1.5 MeV average energy, 0 µSv – 16 Sv

Dose and dose rate meters

- Installed:
  - BITT Gammameter RS+3/X: 10 nSv/h – 10 Sv/h, 60 keV – 1.5
- Portable:
  - Thermo-Eberline FH40G-L10: 10 nSv/h – 100 mSv/h, 30 keV- 3 MeV
  - Automess 6150 ADB: 10 nSv/h – 100 µSv/h, 20 keV- 7 MeV temperature- and dark-current-compensated, plastic scintillation
  - FieldSPEC: NaI detector dose rate meter (cannot be calibrated) and analyser
  - VF PAM170 (combined surface contamination meter and dose rate meter)

Contamination meters:

- Installed:
  - Berthold hand-foot monitor
- Portable:
  - Thermo RADEYE AB100: alpha-beta contamination meter
  - Eberline CONTAMAT FHT 111M: alpha-beta contamination meter

- MTA Isotope Research Institute, AUTOCONT PCM 86: beta contamination meter

Measuring equipment

Gross alpha/beta activity measurement

- Eurisys Mini 20: low-background gas-flow alpha/beta activity counter
- Gamma NDI intelligent detector: gross alpha/beta activity counter

Scintillation gamma spectrometer

- Ortec digiBASETM: integrated NaI scintillation multichannel analyser unit

Semiconductor detector gamma spectrometers

- EURISYS EGNC 20-190-R HPGe detector (22%, resolution 1.86), OXFORD PCA Multiport MR 8K analyser, in a 5 cm thick lead shield
- ORTEC GMX 40-76 HPGe detector (40%, resolution 1.95) Ortec Dspec 8K analyser unit, in a 10 cm thick lead shield

Semiconductor (PIPS) detector alpha spectrometers

- Tennelec TC 256 alpha chamber,
- Eurisys 7184 alpha chamber,
- Canberra 7401 alpha chamber,
- ORTEC Soloist alpha chamber,
- With Ortec and Canberra PIPS detectors and a Silena 9302 8K analyser

Liquid scintillation counting systems:

- TriCarb 3170 TR/SL Super Low Level LSC: liquid scintillation counting system
- TriCarb 5110 TR LSC: liquid scintillation counting system

Radon and radon progeny measuring equipment

- Airborne radon monitors
    - PYLON AB5 scintillation radon monitor
    - Radim2, Radim 2p, Radim 3: semiconductor detector radon monitors
    - Alphaquard: ionisation chamber radon monitor

    - Integrating radon concentration measurement system
- Airborne radon progeny monitors
    - PYLON WLX monitor: working level meter for radon and thoron progeny
    - SARAD EQF 3220: radon and thoron progeny monitor
- Radon-in-water monitor
    - Radim 3W: continuous and sampling radon-in-water monitor

Gas analysis equipment

- Fisons (Carlo Erba) gas chromatograph (type GC-8340-00)
- OMTKI-AD-01 ionisation aerosol density meter (MUTUKI)
- GC-14A (Shimadzu) gas chromatograph
- GC-2010 (Shimadzu) gas chromatograph

Material structure analysis

- XMET5100 portable X-ray fluorescence analyser
- NIKON XT H 225 ST industrial CT X-ray system

II. Radiation sources

Storage of sealed radiation sources:

No.	Nuclide	Qty	Max. activity	Activity	Storage
1.	Cs-137	1	5 GBq	Storage (storage for hire)	B-level laboratory isotope store
2.	Co-60	1	5 GBq	Storage (storage for hire)	B-level laboratory isotope store

Details of sealed radiation source(s) used for instrument calibration:

Nuclide	Qty	Maximum activity	Physical form
Am-241	4	370 MBq	solid
Cf-252	1	110 MBq	solid
Co-60	2	360 MBq	solid
Cs-137	5	370 MBq	solid
Ra-226	3	50 MBq	solid
Sr-90	1	40 kBq	solid

Use and storage of unsealed radioactive materials:

Radioactive materials	Activity	Storage
Isotope types required for the production of standards and for calibration, in the B-level isotope laboratory, up to the authorised activity	Ordinary chemical operations, in compliance with clauses 4.6 and 4.7 of standard MSZ 62-7:2017	B-level laboratory safe
Isotope types required for the production of standards and for calibration, in the C-level isotope laboratory,	Ordinary chemical operations, in compliance with clauses 4.6 and 4.7 of standard MSZ 62-7:2017	C-level laboratory safe

up to the authorised activity		

Liquid scintillation counters containing a radioactive source:

Equipment						
Qty	**Manufacturer, type**	**Built-in source**				
		Qty	Nuclide	Activity	Activity date	Serial number
1	Perkinelmer, **TriCarb 3170 TR/SL**	1	Ba-133	37 kBq	01.07.2007	HO34
1	Perkinelmer, **TriCarb 5110 TR**	1	Ba-133	695,6 kBq	15.05.2020	BAM335

Gas chromatography instruments containing a radioactive source:

Equipment						
Qty	**Manufacturer, type**	**Built-in source**				
		Qty	Nuclide	Activity	Activity date	Serial number
1	Shimadzu, **GC-14A**	1	Ni-63	370 MBq	19.11.1999	8385BZ
1	Shimadzu, **GC-2010**	1	Ni-63	370 MBq	28.11.2008	ECD-2010/00979
1	Fisons, **GC-8340-00**	1	Ni-63	370 MBq	19.11.1999	8340-00

Aerosol density meter containing a radioactive source:

Equipment						
Qty	**Manufacturer, type**	**Built-in source**				
		Qty	Nuclide	Activity	Activity date	Serial number
1	MUTUKI, **OMTKI -AD-01**	8	Am-241	55.5 kBq (total: 444 kBq)	01.01.1987	AD-01

Annex 2 of the WRPR – Individual dose limits

Table 1: Individual dose limits in workplaces and for the public [1]

Dose type	**Dose limit**		
	Occupational	**Students, interns aged 16–18**	**Public**
Effective dose	20 mSv/year Under justified circumstances, the HAEA may authorise up to 50 mSv/year, but the average over 5 years must not exceed 20 mSv/year.	6 mSv/year	1 mSv/year. A higher dose is permitted only if the annual average over 5 years does not exceed 1 mSv.
Equivalent dose	**Dose limit**		
lens of the eye	20 mSv/year	15 mSv/year	15 mSv/year
skin, averaged over any 1 cm²	500 mSv/year	150 mSv/year	50 mSv/year
extremities	500 mSv/year	150 mSv/year	--

Values of dose constraints:

For employees: The dose constraint must be harmonised with the frequency at which the **employee** performs the work, so that the effective dose (personal dose equivalent) received during the task does not exceed 2 mSv/2 months or – spreading the 2 mSv dose constraint over a year – 40 μSv/week.

For the public: For the **public** category, the action level is 3/10 of the dose limit: 0.3 mSv/year, i.e. an effective dose of 6 μSv/week. Owing to the nature of the work, the probability of this is also fairly low.

Table 2: Intervention levels for surface contamination [2]

Surfaces	Intervention levels [Bq/cm^2]		
	α-emitters	**β-emitters**	**^{3}H, ^{14}C, ^{99}mTc**
Rooms and objects within the controlled area	5	50	500
Surfaces of rooms and objects outside the controlled area, personal clothing	0.5	5	50
Outer surface of protective clothing	5	50	500
Inner surface of protective clothing	0.5	5	50
Skin	0.5	5	50

Annex 3 of the WRPR – Accident Response and Action Plans (ARAPs)

In the event of a radiation accident, the following persons must be notified immediately:

Radiation Protection Officer: Dr. Anita Csordás

Deputy Radiation Protection Officer: Dr. Edit Tóth-Bodrogi

Head of the institute: Zsolt Csillag (Chancellor), Dr. János Abonyi (Rector)

A radiation accident is any extraordinary event involving a radiation source in which one or more persons receive a radiation exposure exceeding the following limits, or a corresponding radioactive contamination occurs: total exposure from external and internal radiation sources of 50 mSv effective dose per year, 500 mSv to the skin and extremities, and 150 mSv/year to the lens of the eye.

In implementing accident response measures, the guiding principle must be that the reduction in radiation-induced health damage is sufficient to justify the harm and costs arising from the intervention. Among the most important accident response measures is sheltering, which is very simple to carry out and can significantly reduce both external exposure and internal exposure from inhalation.

Closing off a contaminated area means restricting or prohibiting entry to and exit from a given contaminated area. Its aim is to minimise the number of persons exposed to radiation and to prevent contaminated materials from being carried into clean areas. This may mean locking a room or even fencing off large areas and placing them under police control.

In the event of an extraordinary event, the Radiation Protection Officer must be notified first; it falls within their authority to decide whether the Veszprém

County Police Headquarters, the ambulance service, the fire brigade and the Public Health Department of the Veszprém County Government Office must be notified.

Individual accident response measures:

We can protect ourselves against an increase in our own radiation exposure by simple and effective means. Against an external radiation source, the most basic protective measures are time, distance and shielding. Their meaning is self-evident: the shorter the time we spend in the increased radiation field, the lower the absorbed dose, which is directly proportional to time; the further we are from the radiation source, the lower the dose rate, which decreases with the square of the distance; and the thicker the radiation-shielding material placed between ourselves and the source, the lower the exposure. Reducing the time of exposure requires careful planning of work procedures, preparation of equipment, and rehearsal of the procedures without radiation. Lead, iron or concrete are excellent shielding materials for X-rays and gamma radiation.

The most effective protection against radioactive materials on the skin is immediate showering, changing clothes, washing and cutting the hair, and rinsing the eyes, mouth and nose.

In the early stage of a radiation accident, protection against inhalation is the most important. Simple household items can be used for this purpose with good efficiency. A terry towel pressed over the mouth can reduce the radioactivity of the inhaled air to about one quarter, and cotton fabric to about one third on average.

3 radiation hazard signs and 25 m of yellow tape must be kept in an accessible place for closing off an area contaminated with radioactive materials.

A person who has received an exposure exceeding 250 mSv effective dose,

or is suspected of having done so, must be given a medical examination as a matter of urgency and, if necessary, treated. Specialist care for a person injured by radiation, or suspected of being so, is provided in the healthcare institution specified in Annex 12 of the Decree [6].

When dealing with an extraordinary event involving radioactive material, under Government Decree 490/2015 (XII. 30.) the HAEA must be informed without delay. In the case of a missing radiation source, if the measures taken do not produce results, the HAEA must be informed; it will carry out an on-site inspection. If the inspection requires further instrumental examination that cannot be carried out with the HAEA's own equipment, the HAEA will, with the involvement of the Centre for Energy Research of the Hungarian Academy of Sciences in the case of nuclear material, or the National Public Health Institute (hereinafter referred to as the NPHI) in the case of other radioactive material, review the results of the search carried out by the licensee within the site and, if necessary, extend the search beyond the site, informing the competent regional body of the professional disaster management authority [7].

In an emergency, the exposure of a person involved in dealing with the consequences of the accident must not exceed an effective dose of 50 mSv. An exception to this is a person involved in preventing significant exposure of the population and in saving lives.

Annex 4 of the WRPR – Training Attendance Sheet

Training topics:	**Training delivered by:**
- - -	Name: Position: Date: Signature:

I have understood and acknowledged what was covered in the training, and I will comply with it in my work.			
NAME	**EMPLOYER**	**DATE**	**SIGNATURE**