



RADIATION HAZARDS

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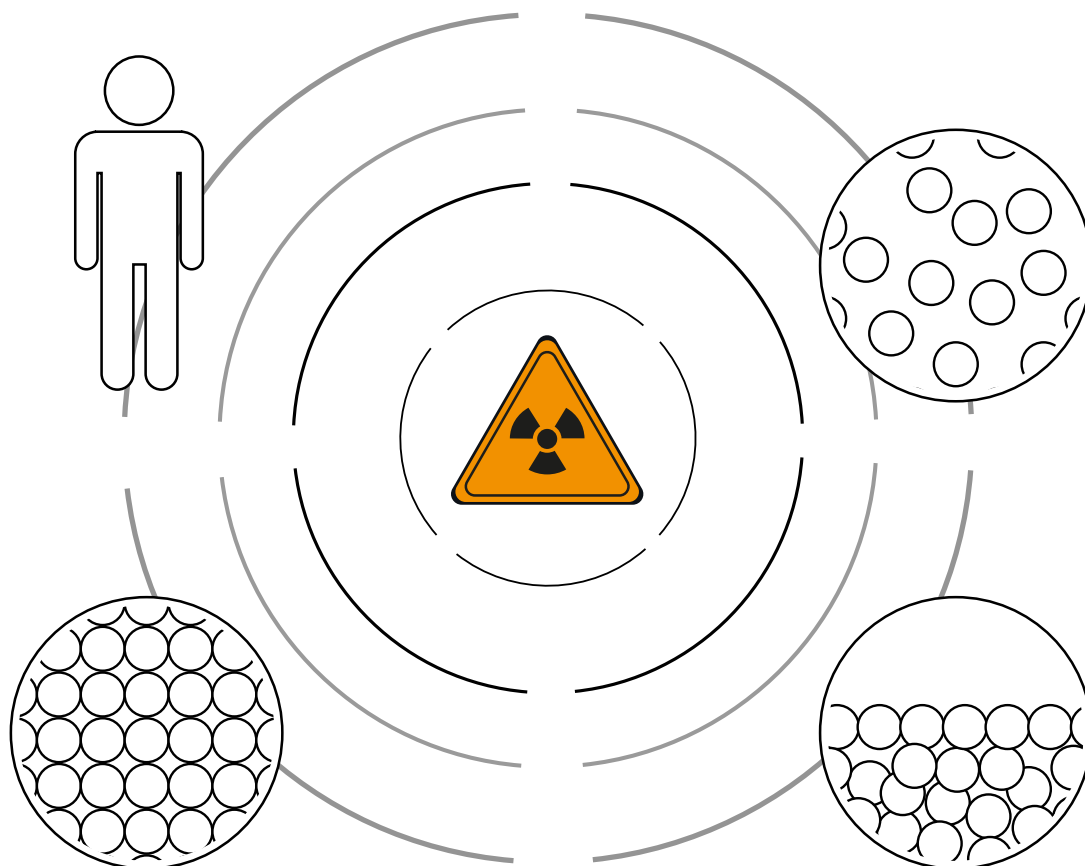
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1. Radiation hazard and radioactive contamination

What is a radiation emergency and a radioactive contamination?

A radiation emergency involves a source of ionising radiation and requires urgent measures to mitigate the adverse effects and limit the damage. It may be referred to in situations of breakdown, accident, deliberate release or threat to release potentially harmful radioactive materials.

Radioactive contamination is the unintentional or unwanted presence of a radioactive substance in solids, liquids or gases and inside or on the surface of the human body.

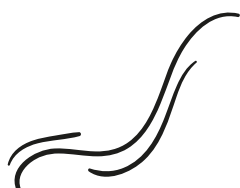


Radioactive materials used in production processes

Contrary to popular belief, radioactive materials are not only used in large nuclear power plants - we encounter them more often than most of us might think.

Ionising radiation is used, among other things, in the following:

- medical diagnostics and radiotherapy
- radiochemistry, analytical chemistry
- food preservation
- industrial radiography - creating meters for the measurement and control of production processes
- industrial material density meters
- sterilisation of medical equipment
- modification of polymers
- dyeing of textiles, glass, stones
- purification of gases from combustion plants
- detection of impurities in semiconductors
- creation of markers indicating the degree of use of materials
- geological research - prospecting for mineral deposits



2. Causes and types of radiological contamination

Radiological contamination can be caused by a breakdown, accident, or intentional action by an individual.

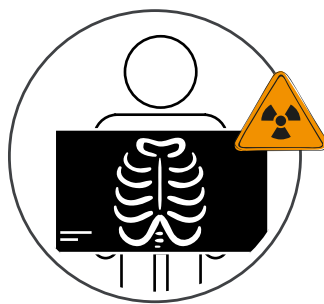
The most common causes of radiological contamination:

- inappropriate storage of radioactive sources and waste, as well as their use, processing and disposal
- transport emergency – accident
- terrorist activity
- failure to comply with laws and safety procedures
- improper technical safeguards used
- "dirty bomb" - the most common type of radiological dispersal device. It uses a traditional explosion to spread radioactive material. Its primary purpose is to disperse dangerous radioactive substances over as large an area as possible

Examples of radiological emergencies



Theft of a radioactive source from a hospital



Malfunction of the X-ray machine/accelerator - overexposure to excessive doses



Accident of a vehicle transporting radioactive materials



Detonation of a "dirty bomb" in a public place

The probability that any of these situations occurs is extremely low, but it still exists. If such situation does occur, those in the affected area will be informed of the hazard and recommended course of action.

Remember that the occurrence of any of these emergencies is not always an immediate threat to life!

3. The most common effects of radiation exposure

The term "radiation dose" is used to describe the amount of energy absorbed by a material from ionizing radiation passing through it. With the use of appropriate equipment, it is easy to detect - the services are equipped with devices (radiometers) that quickly and effectively determine the level and power of radiation exposure.

The health effects of radiation exposure depend on, among other things:

- duration of radiation exposure
- amount of radiation absorbed by the body
- external or internal exposure (after penetration through the skin - wounds, respiratory route, gastrointestinal route)
- type of radiation
- distance from the source and the radiation shielding used
- weather

At low levels, radiation does not cause immediate observable harm to people. However, it is believed that any exposure to radiation can increase the risk of developing cancer over one's further life and increases the risk of transmitting genetic diseases.

Some people exposed to radiation may experience acute radiation syndrome (ARS), which occurs after short-term exposure to high doses of radiation. The main signs and symptoms of ARS are:

- nausea
- vomiting
- diarrhoea
- possible fever and nervous system disorders
- reduced blood cell counts

Usually exposure to increased radiation does not cause immediate health effects. However, high-level radioactive sources can cause skin burns and the aforementioned symptoms in a fairly short period of time.

A radiation event also generates the risk of radioactive substances entering the environment. This in the medium and long term involves contamination of land, water and food. Radioactive material will spread with the speed and direction of the wind - the larger the area contaminated the lower its activity will be. A safe return to the contaminated area may even be possible after several up to a dozen weeks.

Hazards to people and the environment

- hazards to life and health - burns to the skin, damage to the gastrointestinal, cardiovascular or nervous systems, oncological diseases and even death
- contamination of soil, air, water
- restriction of access to food and drinking water
- periodic traffic obstructions - exclusion of the area
- general panic and disruption of public order
- negative impact on mental health

Hazards to the economy

- destruction of livestock and crops on farms
- increase in prices of food products
- contamination of water supply networks
- long-term blockage of traffic junctions - difficulties in transportation
- long-term decrease in the level of tourist traffic in the region
- difficulties in the operation of hospitals - a large number of people willing to be tested for possible radioactive contamination



4. Detection and monitoring

Measurements of the concentration of radioactive substances are carried out by the National Atomic Energy Agency and cooperating institutions. Monitoring is continuous and the data from the measuring stations are transmitted on an ongoing basis - 24 hours a day. Testing is carried out to ensure that the amount of radioactive material does not exceed specified safe levels.

Poland cooperates in the field of radiation monitoring with, among others, the International Atomic Energy Agency and the European Commission.



5. Safety rules - what to do in the event of a radiological emergency?

Not all radiological emergencies result in public exposure to radioactive substances. The emergency can be contained quickly and will not pose any hazard to people.

Nonetheless, it is a good idea to be prepared for such a situation and to keep yourself and your loved ones safe. How can you do this?

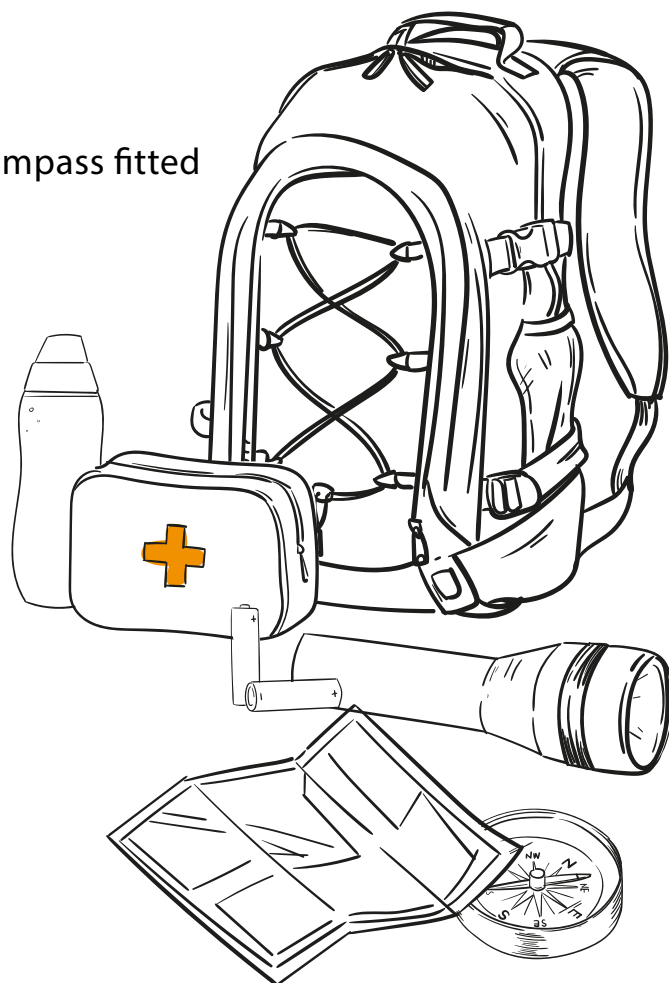
Before the emergency

Preventive measures play a key role in eliminating or reducing possible damage from unforeseen radiation hazards. It is important that we are prepared for the occurrence of such a situation. How can we do this?

1. Prepare an evacuation rucksack - to save time and to make sure you take everything you need in this or any other emergency, it is a good idea to make sure you prepare an evacuation kit in advance. It should include:



- battery radio + batteries
- torch + batteries
- essential documents
- lighter / matches
- breathing/protective masks
- map with local roads, compass, compass fitted to indicate the azimuth, GPS
- can opener
- meals for 2 days
- knife, pencil and notebook
- cutlery set
- rain coat
- first aid kit
- sleeping bag
- disposal bags
- spare clothes
- soap, disinfectant gel
- pliers, crowbar, multi-tool
- cash in small denominations
- filter bottle with a new filter
- rubber bands, string, cable ties



Each member of the household should have a separate rucksack ready and easy to put on. Since you do not know when you will need access to an evacuation kit, the most sensible solution is to have separate kits at home, work and car.

2. Prepare an emergency plan - identify the safest places to go

Think about the best shelter in the places you go to most often (work, school, home). The ideal place to hide from the negative effects of radiation is one with thick walls and no windows.

During the emergency

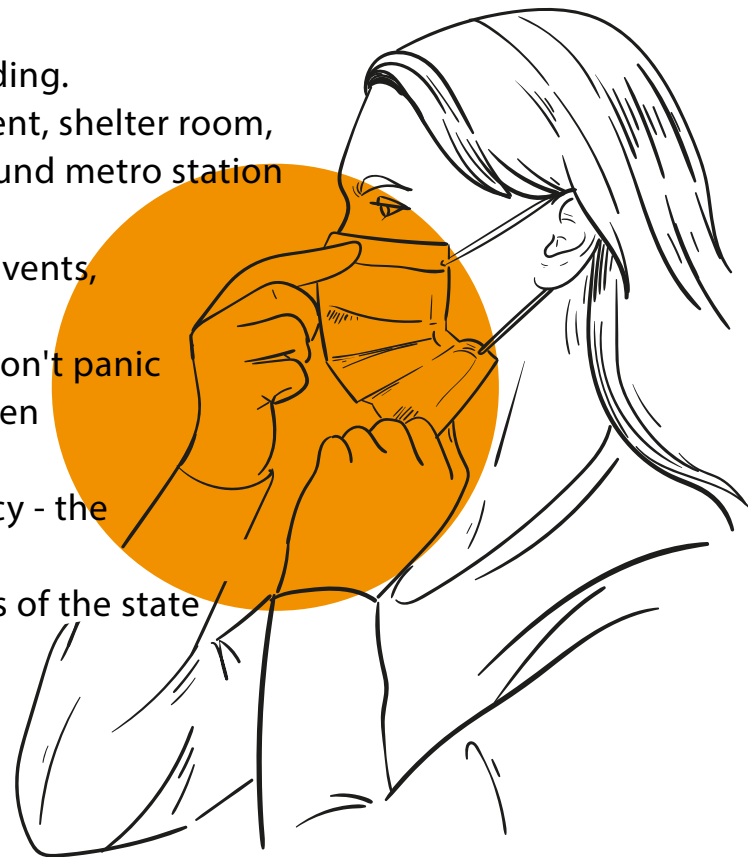
If you are warned of an impending emergency (e.g. announcement by state services, RCB ALERT), enter the nearest building immediately and move away from windows. Try to stay in the centre of the room - radiation decreases with increasing distance from the source. This will help provide protection from the explosion and radiation.

If you are in the open air at the time of the emergency (e.g. detonation of a "dirty bomb"), then:

- hide from the explosion behind anything that can provide protection
- lie face down to protect yourself from the heat and falling debris
- avoid clouds of dust

If information reaches you after the event has already occurred:

- cover your nose and mouth and move away from the scene as quickly as possible
- enter the nearest undamaged building.
If possible, take shelter in a basement, shelter room, underground car park or underground metro station
- move away from external walls
- close and seal windows, doors and vents, turn off air conditioning
- keep your emotions in check and don't panic
- you will reduce unnecessary oxygen consumption in a closed room
- use the phone only in an emergency - the network will be at risk of overload
- listen to and follow the instructions of the state services



All in all it is a good idea to be prepared for such an eventuality and to ensure the safety of yourself and your loved ones. How can you do this?

After the emergency

After finding safe shelter:

- take off your clothes and put them in a plastic bag and put them outside
- take a shower - wash yourself thoroughly with soap and water
- if you cannot wash or shower, wipe your skin and hair with a clean damp cloth
- treat any wounds
- do not eat or drink anything that may have been exposed to radiation
- close and seal windows, doors and vents, turn off the air conditioning
- stay inside the building until you are notified by the services that there is no hazard.

6. Under what circumstances the services shall be called and when to make an emergency call?

If you have information about the possibility of a radiological emergency - notify the state services immediately.

Call 112 and give details of the emergency (e.g. a truck accident involving truck labelled for radioactive substances).



7. Legislation

The most important legislative documents in reference to radiation issues are as follows:

- The Act of 29 November 2000 - Atomic Law (Polish Journal of Laws of 2021, item 1941)
- Treaty establishing the European Atomic Energy Community, signed in Rome on 25 March 1957 (consolidated version Official Journal of the EU of 2016 C 203 p.1, as amended)
- Regulation of the Council of Ministers of 11 February 2013 on requirements for the commissioning and operation of nuclear facilities (Polish Journal of Laws 2013, item 281)
- Regulation of the Council of Ministers on emergency response plans in case of radiation emergency (Polish Journal of Laws of 2021, item 1086)
- Regulation of the Council of Ministers on intervention levels for various intervention measures and criteria for cancelling intervention measures (Polish Journal of Laws of 2004, item 987)
- Regulation of the Council of Ministers on the types of intervention measures introduced in the external zone and the values of operational intervention levels constituting the basis for the implementation of these measures in the external zone (Polish Journal of Laws of 2020, item 2247)
- Regulation of the Council of Ministers on the stations for early detection of radioactive contamination and on the units that conduct measurements of radioactive contamination (Polish Journal of Laws of 2002, item 2030)
- Council Directive 2013/59/EURATOM of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom
- Council Directive 2009/7/EURATOM of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations
- Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent nuclear fuel and radioactive waste

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