

CONDITIONS FOR THE DISCHARGE OF RADIOACTIVE SUBSTANCES FROM CERTAIN WORKPLACES WITH POTENTIALLY INCREASED EXPOSURE TO NATURAL RADIATION IN THE CZECH REPUBLIC, *ATOMIC ACT*

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PSR - NORM Policy, Strategy and Regulations
IAEA-CN287-175

GENERAL INFORMATION

NORM is an abbreviation for naturally occurring radioactive material from English. Naturally occurring radioactive material include terrestrial radionuclides, especially K-40 and members of the natural conversion series, as well as cosmogenic radionuclides (C-14, H-3, Na-22, Be-7). Uranium (U-238) and thorium (Th-232) which present in all igneous rocks and minerals. For the designation of as NORM the material originates after human activity.

The Czech Republic is a country in central Europe with populations of 10 million with a specific geological subsoil, with higher levels of exposure of natural source in the world and with industrial production.

The supervision of the NORM materials in the Czech Republic provide the State Office for Nuclear Safety ("SONS").

The SONS are Central government authorities in the State administration of the Czech Republic for the area of use of nuclear energy and ionizing radiation. The Office is seated in Prague. The head of the Office is a chairperson, which is designated and recalled by the government; the Act on state services regulates selection, designation and recalling of the chairperson.

The responsibility of NORM is established on the Act No. 263/2016 of Coll., Atomic act and Decree No. 422/2016 of Coll., on radiation protection and security of a radioactive source.

The law was in force on 1st January 2017. These legal regulations replaced the previous law, which also included the NORM area. The new atomic law based on our acquired experience and at the same time adopts the of Europe union legislation.

The issue of NORM materials solves in cooperation with other authorities such as the Ministry of Industry and Trade, the Ministry of the Environment and in collaboration with the Radioactivity waste repository authority.

REGULATION NORM WORKPLACES OF PLANNED EXPOSURE SITUATIONS

The atomic Act defines file of workplaces with potentially increased exposure to a natural source of radiation, and duty.

Workplaces with potentially increased exposure to a natural source of radiation include

a) workplaces using a material with increased content of natural radionuclides.

Anyone who performs activities involving the operation of a workplace with potentially increased exposure to a natural source of radiation shall

- make measurements to determine workers' individual doses and keep a record of the results of the measurements and workers' individual doses,
- report to the Office information about the workplace, results of measurements and workers' individual doses,
- ensure optimization of radiation protection of the workers, if the set level is exceeded,
- ensure the protection of pregnant women as referred to in § 64(3), and
- inform the workers about
 - the potentially increased exposure to a natural source of radiation,
 - the results of the measurements in the workplace, individual doses established by the measurements and the related health detriments measures
 - taken to reduce exposure.

WORKPLACES HANDLING MATERIAL WITH INCREASED NATURAL RADIONUCLIDE CONTENT REFERS TO WORKPLACES WHERE THE FOLLOWING IS EXECUTED

- extraction, transport by pipelines or processing of crude oil and gas,
- coal extraction,
- ore extraction,
- processing of niobium or tantalum ore,
- processing of raw materials containing rare earth elements,
- primary iron output,
- smelting of tin, lead or copper,
- production of cement, including maintenance of clinker furnaces,
- production of phosphate fertilizers, production of phosphoric acid or thermal production of phosphorus,
- production of a titanium-dioxide-based pigment,
- processing of zircon or zirconium,
- production, processing or use of materials containing thorium and uranium,
- combustion of coal in an installation with thermal output exceeding 5 MW, including the maintenance of boilers,
- generation of geothermal energy,
- operation of a treatment plant to treat underground water or sludge resulting from a source of underground water,
- treatment of material in which it was discovered that its natural radionuclide content exceeds the clearance level or increases the spatial dose equivalent rate by more than 0.5 $\mu\text{Sv/h}$,
- mining activity,
- mining activity performed underground, or activity relating to mining waste treatment.

The operators of these workplaces are obliged to ensure the release of radioactive substances containing natural radionuclides from these workplaces only per the specified requirement which provide atomic Act and Decree.



Fig.3. NORM workplace Water treatment plant of public swimming pool in reconstruction

CONDITIONS FOR DISCHARGING RADIOACTIVE SUBSTANCES FROM WORKPLACE

Anyone who discharges a radioactive substance from the workplace "NORM" shall

- prevent unjustified accumulation of radioactive substances discharged from the workplace,
 - ensure measurement and evaluation of the radionuclide content of the radioactive substance discharged from the workplace, including in cases where the radioactive substance being discharged is intended for reuse or recycling,
 - record and report to the Office the results of the measurements referred to in (b),
 - draw up and act in compliance with internal regulations for the management of radioactive substances discharged from the workplace, and
 - if the radioactive substance discharged from the workplace is to be used for the production of building materials, inform the manufacturer of the building material about the type and activity of the radioactive substance being discharged.
- Radioactive substance may be discharged from a NORM workplace without a license of the Office if clearance levels as stipulated by the implementing legislation are not exceeded.
- Radioactive substance may be discharged from a NORM workplace without a license of the Office also if the effective dose of each member of the public during a calendar year caused by a discharge is lower than 0.3 mSv.
- The measurement and evaluation pursuant to subsection 1 shall be performed for the first time upon the commencement of the workplace's operation and then upon any change which could affect the radionuclide content of radioactive substances, at least once every 12 months.

Clearance levels for a NORM workplace

1. The clearance levels for the clearance of solid materials including their disposal on waste dumps, clearance for reuse, recycling or combustion, are

- the activity weight concentration of natural radionuclides from the series 238U 1 kBq/kg,
- the activity weight concentration of natural radionuclides from the series 232Th 1 kBq/kg, or
- the activity weight concentration of 40K 10 kBq/kg.

2. The clearance levels, pursuant to subsection 1, are not regarded as exceeded if the average activity weight concentration of none of the radionuclides is greater than the value of the clearance level.

3. The clearance levels for discharge of waste water into surface water are

- the average total alpha activity volume concentration in all substances 0.5 Bq/l and
- the average total beta activity volume concentration after the deduction of the contribution of 40K in all substances 1 Bq/l.

4. The clearance levels, pursuant to subsection 3, are not regarded as exceeded if the average alpha activity volume concentration or the average beta activity volume concentration after the deduction of the contribution of 40K is not greater than the value of the clearance level.

5. The clearance levels for the discharge of wastewater into the wastewater disposal system for public need are

- the average total alpha activity volume concentration in all substances 50 Bq/l, and
- the average total beta activity volume concentration after the deduction of the contribution of 40K in all substances 100 Bq/l.

6. The clearance levels pursuant to subsection 5 are not regarded as exceeded if the average alpha activity volume concentration or the average beta activity volume concentration after the deduction of the contribution of 40K is not greater than the value of the clearance level.

7. The average values, pursuant to subsections 1, 3 and 5, apply to the quantity of materials subject to clearance in which it is possible to regard the activity weight concentration or the activity volume concentration as homogeneous.

Conclusion

The release of substances with increased content of natural radionuclides is solved conceptually in cooperation with producers of these substances, but also with the administrators of the waste dumps, incinerators and operators of reclamation areas. Each released material is approached individually. We are evaluating the measured levels and calculate a particular indicator.

The following indicators are assessed:

External irradiation; Inhalation; Internal controls; Dust inhalation; Dust ingestion; Inhalation of radon and products of its transformation; Skin contamination; Total effective dose per scenario

The NORM materials in which exceeded the clearance levels most often are sands, ionex fills, active coal, sludges from water treatment plants. We very often deal with iron pipes, which were part of a water conduit. We identify there sediments higher content of natural radionuclides. In cooperation with the state company of DIAMO, we have found a solution on how to handle ionex fill with exceed clearance levels set for natural radionuclides and similar materials. We are still looking for a suitable solution for disposal solid material, for example, iron pipes. An example of the NORM materials can be seen below Fig. 1, 2, 3.



FIG. 1. Iron pipes, part of a water conduit



FIG. 2. NORM materials – sand from the water treatment plant of the public swimming pool

Management of these NORM materials requires coordination of participating subjects. It has been heavy to find the best solution for NORM material management. The solution to NORM materials is and will still challenge.