Seasonal Measurements of Radon Concentration Level in the Period of Spring at Technical College of Applied Sciences in Zrenjanin

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Summary

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Radon

- Colorless, odorless, tasteless, radioactive, noble gas.
- Naturally occurring Radon –222 formed in the $^{238}\text{U}$ decay chain.
- Half–life 3.8 days.
- Emits alpha radiation, much like other alpha generating radiation sources, as plutonium.
Pathways of exposure

- Pores in soil,
- Cracks in geological structures,
- Formation (rocks,...),
- Water drainage systems.

- Flows from the soil into the air and homes.

- Ingestion, inhalation of the electrically charged atoms attached to dust particles.
How radon enters a house

- Soil: Radon in soil
- Bedrock: Fractured bedrock, Radon in well water
- Water table: Radon in groundwater
- Cracks
- Sump
- Drain
- Fittings
- Windows
- Shower

Health hazards

- Cell damages in the lungs and the disruption of DNA in lung cells thus causing lung cancer as the main hazard.
- Smokers are at higher risk.
The project

- Title of the project “Radon Level Measurement”.

- Cofinanced by the Provincial Secretariat for Higher Education and Scientific Research.

- Created at Technical College of Applied Sciences in Zrenjanin (TCAS) in 2022 and is still in the process of realization.
Radon detector

- Continuous monitoring.
- Capable of performing long-term measurements (up to 1 year) and also short-term measurements (1–7 days).
- Based on alpha spectrometry with passive diffusion chamber.
- Precision: 10% for short-term measurements and 5% for long-term measurements.
Measurements

- A quick test performed during spring 2022 at TCAS in the basement and the groundfloor (the surface of 4000m²) with labs, offices, storage spaces, classrooms, a printing press office and a heating system room.

- Short-term two-day-long (48h) measurements in rooms with no ventilation and with closed doors and windows all the time – worst case scenario. Rooms were also sealed for at least 12h (some rooms even much longer) before the start of the measurement and the heating system was not used.
Results

- Radon concentration level at TCAS ranged from $13 \pm 1$ to $42 \pm 4$ Bq m$^{-3}$.

During the measurements the temperature was about $T \approx 20$ °C and the relative humidity was 10%.
**Conclusion**

- Even a small percentage of radon is harmful.
- WHO recommendation: $<100 \text{ Bq m}^{-3}$.

- Many countries define their own National Reference Limits.
- The levels of indoor radon concentrations measured during spring 2022 at TCAS are within acceptable values, below our National Reference Limit (i.e. $200 \text{ Bq m}^{-3}$ for new buildings and $400 \text{ Bq m}^{-3}$ for old buildings).
Future plans

- Want to repeat all the measurements at TCAS during summer, autumn and winter 2022 (as radon fluctuates seasonally) and over longer period of time (as it fluctuates daily).

- Will also perform a long-term measurement in the room with the highest radon level.

- There is a plan to repeat the measurements at TCAS together with Institute for Nuclear Sciences VINCA by using charcoal canisters for the comparison of results.