Dose Reduction

Reduction of Exposure Indoors due to Radioactive Materials Released into the Environment

■ Studies on reduction of external exposure indoors

- ✓ From the results of measurements of ambient doses inside and outside of buildings, the reduction coefficient*1 in wooden and light-gauge steel houses is evaluated as 0.38 on the first floor and 0.49 on the second floor.

  (Source: N. Matsuda et al.: *J Environ Radioact* 166: 427-435, 2017.)

- ✓ From the results of measurements of ambient doses inside and outside of buildings, the median value of the reduction coefficient for wooden houses is evaluated as 0.43.

  (Source: H. Yoshida et al.: *SCIENTIFIC REPORTS* 4: 7541, 2014.)

■ Studies on reduction of internal exposure indoors

- ✓ From the results of measurements of radioactivity concentrations inside and outside of buildings, the decontamination factor*2 for radioactive materials in the air is evaluated as 0.64 for particulate I-131 and 0.58 for Cs-137.

  (Source: T. Ishikawa et al.: Environ Sci Technol 48:2430-2435, 2014.)

- ✓ As factors for internal exposure indoors, the natural ventilation rate, temperature differences between inside and outside of rooms, wind speed, and the total coverage and ages of buildings, etc. were set as parameters and were examined experimentally, thereby evaluating the coefficient of reduction of internal exposure (varying within the range of 0.1 to 1).

  (Source: J. Hirouchi et al.: *ASRAM2018-010*, 2018.)

*1: Ratio of a dose within a building when assuming the dose outdoors as 1
*2: Ratio of the concentration within a building when assuming the concentration outdoors as 1

When being indoors, radiation from radioactive materials released into the environment that are suspended in outdoor air or deposited on the ground surface, etc. is shielded by the building and the external exposure dose decreases. Additionally, the concentration of radioactive materials suspended in indoor air is lower than that outdoors thanks to the airtightness of the building, and the internal exposure dose through inhalation also decreases.

The value, 0.4, which is used as the coefficient of reduction of external exposure for typical Japanese wooden houses when considering radiological protection, is said to be based on the IAEA-TECDOC-225 (1979) (p.53 of Vol. 1, “Shielding and Reduction Coefficient”). As recent studies on the reduction of exposure indoors, the outcomes of studies concerning the coefficient of reduction of external exposure[1,2] are reported.

Additionally, as the effects of reducing internal exposure indoors, not only external exposure, the outcomes of studies concerning the effects of reducing radioactivity concentrations[3] and the coefficient of reduction of internal exposure[4] are also reported. It is reported that the effects of reducing internal exposure indoors vary by individual buildings’ ages, wind speed, temperature differences between inside and outside of rooms, and other factors.

1. N. Matsuda et al.: J Environ Radioact 166: 427-435, 2017.
2. H. Yoshida et al.: SCIENTIFIC REPORTS 4: 7541, 2014.
3. T. Ishikawa et al.: Environ Sci Technol 48:2430-2435, 2014.
4. J. Hirouchi et al.: ASRAM2018-010, 2018.

Included in this reference material on March 31, 2023