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**INDUSTRY STANDARD OF THE
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**Measuring method of radon injection coefficient of building
materials**

(English Translation)

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

Drafting organizations of this standard. Institute of Radiation Protection and Nuclear Safety Medicine, Chinese Center for Disease Control and Prevention, Hefei Cement Research and Design Institute, South China University learn.

1 Scope

This standard specifies the method for measuring the radon coefficient of building materials by circulating air.

This standard is applicable to the measurement of radon coefficient in building materials.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this document.

For undated references, the latest version (including all amendments) applies to this document.

GB 6566 Radionuclide limits for building materials GB/T 11743 Analytical method of radionuclides in soil by gamma energy spectrum GBZ/T 182 Indoor radon and its decay products measurement specification

3 Terms and definitions

The following terms and definitions apply to this document.

Radon concentration

The radioactivity of radon-222 per unit volume of air.

Radon Emission Coefficient in a unit time interval, the ratio of the concentration of radon released from building materials to the total concentration of radon formed in building materials at the same time, commonly used the symbol e indicates that its value varies from 0 to 1.

Ra specific activity the ratio of the radioactivity of the nuclide ^{226}Ra in a substance to the mass of the substance.

Measuring chamber

A regular container made of materials that are not easy to absorb radon, such as stainless steel or plexiglass, has good air tightness and has air inlets and outlets.

Measuring system radon leakage rate the rate of radon leakage in the loop of the entire measurement system due to the air tightness of the measurement chamber or leakage of the pipeline interface.

Note: The SI unit is h^{-1} .

4.1 Measurement system composition

The measuring system for building materials radon coefficient is mainly composed of continuous radon meter, measuring chamber and related connecting pipelines. Systematic See Appendix A for the schematic diagram.

4.2 General performance requirements of the measurement system

4.2.1

The radon leakage rate of the measuring system should be less than 0.0007 h^{-1} . The radon leakage rate can be determined with reference to 5.2.1 to 5.2.3.

4.2.2

The free gas volume in the measurement chamber is the difference between the internal volume of the measurement chamber and the sample volume. The volume should be larger than the sample, the radon meter the volume of the collection chamber and the volume of the gas path are more than 5 times the sum to ensure that all radon precipitated from the building material samples can be completely released into the measurement chamber.

4.2.3

During measurement, the temperature in the measurement chamber should be 20 °C ~ 22 °C, and the relative humidity should be 40% ~ 50%.

4.3 Radon meter

The radon concentration is measured by a continuous radon meter, and a continuous radon meter with a scintillation chamber, pulse ionization chamber or semiconductor as the detector should be used.

The detection limit of continuous radon meter should be within the valid period of verification or calibration.

5.1 Sample preparation

The building material samples used for the measurement of radon coefficient are commercially available products, and their dimensions should not be changed as much as possible before measurement, and they should be left standing at 20°C~ no less than 24 h in an environment of 22°C and 40%~50% relative humidity.

5.2 Measurement of radon leakage rate of measurement system

5.2.1

Fill the measurement chamber with a certain concentration of radon. Use continuous radon meter to measure radon in the chamber. Concentration changes, the measurement time is not less than 7 days. The reading period of continuous radon meter to measure radon concentration is 1 h~2 h.

5.2.2

The radon concentration at the moment of the initial radon concentration in the measurement system is regressed according to the exponential decay law, through formula (1) Obtain the effective attenuation rate of radon in the measurement system

5.2.3

The radon leakage rate of the measurement system is the difference between the effective radon attenuation rate of the measurement system eq and the physical radon attenuation rate, which can be calculated by formula (2).

5.3.1 Measuring the radon concentration in the chamber

Measure the background radon concentration C_b in the chamber before placing the sample, and the measurement time shall not be less than 1 h; put the building material sample into the measurement chamber, After the chamber is sealed, a continuous radon meter is used to measure the radon concentration in the chamber every 1 h to 3 h, and the

continuous measurement time is not less than 7 days. Building materials refer to Appendix A for the construction and pipeline connection of the radon emission coefficient measurement system. The measurement of radon concentration refers to GBZ/T 182.

5.3.2 Specific activity of building materials radionuclide ^{226}Ra

The measurement of the specific activity of the radionuclide ^{226}Ra in building materials samples is carried out with reference to GB 6566 and GB/T 11743.

5.3.3 The maximum radon concentration in the measurement chamber (C_{max}) Based on the continuous measurement data of radon concentration of no less than 7 d in the chamber, the maximum radon concentration in the chamber is obtained by the data fitting method according to formula (3)

5.3.4 Radon emission coefficient

5.3.4.1

After taking out the sample from the measuring chamber, dry it, weigh it at $105^{\circ}\text{C}\pm 5^{\circ}\text{C}$, dry it again, and weigh it again after 6 hours until Constant weight, obtain the sample mass m in the constant weight state.

5.3.4.2

According to formula (4), calculate the radon coefficient e of building materials.

6 Uncertainty requirements and evaluation

6.1

When reporting the test results, an evaluation of uncertainty should be given. Refer to Appendix B for the method.

6.2

The components of the evaluation uncertainty shall be given in the following categories.

- a) Type A evaluation of uncertainty. the uncertainty evaluated by the method of statistical analysis of the measured value of the repeatability condition;
- b) Type B evaluation of uncertainty. Uncertainty evaluated by non-statistical analysis method.

6.3

If this standard is complied with, under laboratory conditions, the relative expanded uncertainty of the measurement system for measuring the radon coefficient of building materials should be better than 35% Appendix A (Informative appendix) A brief schematic diagram of the measurement system for the radon coefficient of building materials refer to Figure A.1 for the construction and pipeline connection of the building material radon