



**National Standard
of the People's Republic of China**

GB 6566-200x
Replaces GB6566_2001

**Limits of radionuclides
in building materials**

(Draft for approval)
(Draft completion date: 19 July 2008)

Issue Date: xxxx– xx – xx

Implementation Date: xxxx – xx – xx

**Issued by General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China**

Standardization Administration of the People's Republic of China

Foreword

Clause 3 of this standard is mandatory, whilst the others are articles are recommended.

This Standard replaces GB 6566-2001, Limits of Radionuclides in Building Materials.

The main changes to this Standard compared to GB 6566-2001 are:

- the application scope has been modified;
- the “inspection rules” have been deleted from the original Standard;
- uncertainty of measurement adopted the terms and definitions from the International Vocabulary of Basic and General Terms in Metrology;
- the sampling size of at least 3 kg per portion in the original Standard has been changed to at least 2 kg per portion in this Standard;
- in instrument carried out specification for balances, the sample weight should be accurate to 0.1g;
- result retention is calculated to one decimal;
- certain articles have been adjusted in accordance with the requirements for new Standards.

This Standard is proposed by the China Building Materials Federation.

This Standard is under the jurisdiction of the China Building Materials Federation.

The organisations responsible for the drafting of this Standard are:

China Building Materials Academy;

National Institute for Radiological Protection (NIRP);

China National Geological Exploration Centre of Building Materials Industry;

China University of Geosciences (Beijing);

China Building Materials Test & Certification Centre.

The organisations that participated in the drafting of this Standard are:

National Supervising & Testing Centre for Radioactivity & Harmful Substances of Building Material;

Fubei Fangyuan Measuring Instrument & Equipment Manufacture Co. Ltd;

Beijing Nuclear Instrument Factory.

The main drafters of this Standard are:

Ma Zhenzhu, Han Ying, Wang Nanping, Xue Cuihua, Wang Yuhe, Li Zengkuan, Zhang Yonggui.

This standard replaces the previously issued Standards:

- GB 6566-1986, GB 6566-2000, GB 6566-2001
- GB 6763-1986, GB 6763-2000

Limits of radionuclides in building materials

1 Scope

This Standard specifies the test methods for the limits of radionuclides and the specific activity of the natural radionuclides ^{226}Ra , ^{232}Th and ^{40}K in building materials.

This Standard applies to inorganic non-metallic type building materials which have the requirement for limits of radionuclides.

2 Terms and definitions

The following terms and definitions apply to this Standard.

2.1 Main materials for building

The building materials used to build the main structures of a building.

2.2 Decorative materials

The building materials used for indoor and outdoor decorations of a building.

2.3 Building

The buildings or indoor spaces, places which are used for humans to carry out production, working, living, or other activities. According to the different application purposes of buildings, this Standard divides buildings into two types as civil buildings and industrial buildings.

2.3.1 Civil building

The buildings used for humans to live in, work in, learn in, for entertainment or shopping, etc. This Standard divides civil buildings into Class I civil buildings¹ and Class II civil buildings².

2.3.2 Industrial building

The buildings used for humans to conduct production activities, such as production workshops, packaging workshops, maintenance shops and warehouses, etc.

2.4 Internal exposure index

The ratio between the specific activity of the natural radionuclide ^{226}Ra in building materials and the limiting value prescribed in this Standard.

2.5 External exposure index

The sum of the ratios between the individual specific activity of the natural radionuclides ^{226}Ra , ^{232}Th , ^{40}K , and, when they exist alone, the limiting value prescribed in this Standard.

1 Class I civil buildings include: residential properties, retirement flats, nurseries, hospitals, schools, office buildings and hotels, etc.

2 Class II civil buildings include: shopping centres, public entertainment places, book shops, libraries, museums, gymnasiums, public transport waiting rooms, restaurants and hairdressers, etc.

2.6 Specific activity

In a substance, the ratio between the radioactivity of a certain radionuclide and the mass of the substance.

$$\text{Formula: } C = \frac{A}{m}$$

In which:

C – specific activity, unit is Bq/Kg (Bq kg^{-1});

A – Radioactivity of radionuclide, unit is Bq (Bq);

m – Mass of substance, unit is kg (kg).

2.7 Uncertainty of measurement

Characterised dispersion which is reasonably given to the measured values, it is the relative parameter of the measured result.

2.8 Hole rate

The percentage between the whole volume of the hole building material product and the whole volume of the hole building material product.

3 Requirements

3.1 Main materials for building

The specific activities of the natural radionuclides ^{226}Ra , ^{232}Th , ^{40}K in the main materials for building should meet the requirements of $I_{\text{ra}} \leq 1.0$ and $I_{\text{r}} \leq 1.0$ at the same time.

With regard to the main materials for building, if the hole rate is greater than 25%, then the specific activities of the natural radionuclides ^{226}Ra , ^{232}Th , ^{40}K should meet the requirements of $I_{\text{ra}} \leq 1.0$ and $I_{\text{r}} \leq 1.3$ at the same time.

3.2 Decorative materials

This Standard divides decorative materials into three types on the basis of the radioactivity levels of the materials.

3.2.1 Class A decorative materials

If the specific activities of the natural radionuclides ^{226}Ra , ^{232}Th , ^{40}K in the decorative materials meet the requirements of $I_{\text{ra}} \leq 1.0$ and $I_{\text{r}} \leq 1.3$ at the same time, then these decorative materials are classified as Class A decorative materials. The production sales and application scope of Class A decorative materials are not restricted.

3.2.2 Class B decorative materials

If a decorative material does not meet the requirements for Class A decorative materials, but meets the requirements of $I_{\text{ra}} \leq 1.3$ and $I_{\text{r}} \leq 1.9$ at the same time, then this decorative material should be classified as a Class B decorative material. Class B decorative materials cannot be used for the internal surface decorating of Class I civil buildings, but can be used for the internal surface

decorating of Class II civil buildings and industrial buildings and for the external surface decorating of any buildings.

3.2.3 Class C decorative materials

With regard to decorative materials which do not meet the requirements for Class A or Class B decorative materials, but which meet the requirements of $I_r \leq 2.8$, then these decorative materials are classified as Class C decorative materials. Class C decorative materials can only be used for the external surface decorating of buildings and other outdoor applications.

4 Test methods

4.1 Instruments

4.1.1 Low background multi-channel gamma-ray Energy Disperse Spectroscopy

4.1.2 Balance (sensitivity 0.1 g)

4.2 Sampling and sample preparation

4.2.1 Sampling

Sample two portions of samples at random; each portion should not be less than 2 kg. One portion should be kept aside, and the other portion is used as the test sample.

4.2.2 Sample preparation

Crush the sample until the particle sizes are not larger than 0.16 mm. Place the sample in a sample box which has the same geometric shape of standard samples, weigh the sample (accurate to 0.1g), seal it and wait for measuring.

4.3 Measurement

When the decay rate of the natural radioactivity in the test sample is generally balanced, under the same measuring conditions as for standard samples, use the Low background multi-channel gamma-ray Energy Disperse Spectroscopy to carry out the specific activity measurements of ^{226}Ra , ^{232}Th , ^{40}K .

4.4 Calculation

4.4.1 Internal exposure index

The internal exposure index should be determined using formula (1):

$$I_{Ra} = \frac{C_{Ra}}{200}$$

In which:

I_{Ra} – Internal exposure index;

C_{Ra} - The specific activity of the natural radionuclide ^{226}Ra in the building materials; unit is

Bq per kg (Bq kg⁻¹);

200 – Considering internal exposure condition only, the specific activity limit of radionuclide ²²⁶R in the building materials prescribed in this Standard; unit is Bq per kg (Bq kg⁻¹).

4.4.2 External exposure index

The external exposure index should be determined using formula (2):

$$I_{\square} = \frac{C_{Ra}}{370} \square \frac{C_{Th}}{260} \square \frac{C_K}{4200}$$

In which:

I_r – External exposure index;

C_{Ra}, C_{Th}, C_K – The specific activity of natural radionuclides ²²⁶Ra, ²³²Th, ⁴⁰K in the building materials respectively; unit is Bq per kg (Bq kg⁻¹);

370, 260, 4200 - Considering external exposure condition respectively only, the limits of the radionuclides ²²⁶R, ²³²Th, ⁴⁰K in the building materials prescribed in this Standard when they are exciting alone; unit is Bq per kg (Bq kg⁻¹).

4.5 Uncertainty of measurement

When the sum of the specific activities of ²²⁶Ra, ²³²Th, ⁴⁰K is more than 37 Bq kg⁻¹, the test method specified in this Standard requires an uncertainty of measurement (expansion factor K=1) not greater than 20%.

4.6 The numerical value of the calculated result should be rounding off to retain one decimal.

5 Other

5.1 The manufacturers of the materials should indicate the radioactivity levels in the instruction book or on the packaging of the products in accordance with the requirements specified in Clause 4 of this Standard.

5.2 In the areas where the background of the natural radioactivity is relatively higher, if any local raw material is used to produce building materials only, when the specific activities are not greater than the average background level of the corresponding natural radionuclides in the local surface soil, then the materials can be used locally only.