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ILNAS-EN 17637:2022

Construction products: Assessment of release of dangerous substances - Dose assessment of emitted gamma radiation

Bauprodukte - Bewertung der
Freisetzung von gefährlichen Stoffen -
Verfahren zur Beurteilung von emittierter
Gammastrahlung

Produits de construction : Évaluation de
l'émission de substances dangereuses -
Évaluation de la dose de rayonnement
gamma émis

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National Foreword

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English Version

Construction products: Assessment of release of dangerous substances - Dose assessment of emitted gamma radiation

Produits de construction : Évaluation de l'émission de substances dangereuses - Évaluation de la dose de rayonnement gamma émis

Bauprodukte - Bewertung der Freisetzung von gefährlichen Stoffen - Verfahren zur Beurteilung von emittierter Gammastrahlung

This European Standard was approved by CEN on 13 June 2022.

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European foreword

This document (EN 17637:2022) has been prepared by Technical Committee CEN/TC 351 “Construction products: Assessment of release of dangerous substances”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2023, and conflicting national standards shall be withdrawn at the latest by May 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Introduction

In January 2014 the Basic Safety Standards Directive (2013/59/Euratom) [1], also named EU-BSS, was issued laying down basic safety standards for the protection against the danger arising from exposure to ionising radiation. The directive also sets requirements on the gamma radiation dose from the naturally occurring radionuclides (^{226}Ra , ^{232}Th and ^{40}K) in building materials and must be taken into account along with the 2011 EU regulation laying down harmonized conditions for the marketing of construction products (EU no 305/2011) [2], so called CPR. Both EU regulatory documents constitute a new basis for radiation protection regulation of building materials and are to be complemented by EU guidance and standards of which this document (EN 17637) is part.

Pivotal in the regulatory system of the EU-BSS and CPR is the dose assessment of building materials and its compliance against a reference level as defined under Article 75 of the EU-BSS. For this purpose, an activity concentration index is provided in the directive under Annex VIII. The index value is determined using the material's massic activities of ^{226}Ra , ^{232}Th and ^{40}K . As the index is proposed as a conservative screening tool provisions are put in place under Annex VIII to allow for more precise assessment of the dose if needed. This includes consideration of the material's density, thickness and other factors relating to the type of construction and the intended use. However, no method for a more refined dose assessment is provided in the directive, despite the fact that various EU member states allow for such refined assessment. This EN document serves as a harmonized standard under the CPR to address the provisions in the EU-BSS for a more refined assessment.

This document is an addition to the activity concentration index as formulated in the Annex VIII of the EU-BSS. The method describes a dose assessment that takes account of all factors stipulated under Annex VIII of the directive. In the method, important consideration is given to differentiate between the dose from the individual construction product and the assembly of products that result in the dose from the model building. In the EU-BSS dose requirements are expressed in terms of a dose from the building, while the CPR is intended to set product specific requirements. For this reason, the method provides for a calculation of dose from the individual product, followed by a calculation of the product assembly with subtraction of terrestrial background dose to enable assessment against the reference level defined in Article 75 of the EU-BSS.

The document provides the following structure:

- A normative instruction on the use of the assessment method with description of the equations and parameters to be used, followed by a list of information to be reported;
- An informative annex with a description of the dose assessment model, including explanation of the modelling principles, main assumptions, coefficients and conversion factors;
- An informative annex containing a series of examples on the use of the assessment method.

1 Scope

This document describes a calculation method to determine the indoor gamma dose from construction products. The method includes calculation of the indoor gamma dose from the individual construction product under its intended use, as well as the dose from the building taking consideration of multiple building materials where this is deemed necessary and any shielding from the terrestrial background.

The calculation method builds on existing modelling principles for photon emission and absorption. Parameters of the modelling that are not product specific, such as room geometry, exposure coefficients, and conversion factors are predefined and form the underlying basis for the method in this EN. The choice for pre-defined model parameters is essential from a harmonization perspective, despite the fact that such parameters can vary considerably for every homeowner, building type, region or country. Typical examples are the exposure time, the location of exposure in the building, the terrestrial background radiation and the amounts and way the building materials are used in the building. The parameters are selected on the basis of international consensus, as laid down in ICRP, UNSCEAR, EU RP guidelines and other renowned publications. Product specific parameters such as density and thickness are specified in accordance with the product's intended use. In addition, the product's massic activities of ^{226}Ra , ^{232}Th and ^{40}K are specified and obtained according to prEN 17216¹ [3]. The method provides a tiered approach with a basic approach intended for assessing individual construction products, followed by a more refined approach to assess a complete building design. The former approach assumes an identical structure of building materials on all six surfaces of the model room, and where needed complemented with other building materials that form an intrinsic part of the product's intended use. The latter approach enables evaluation of a known building design. Here the user can specify the applied construction product to walls, floor or ceiling separately in accordance with the product's intended use.

The indoor gamma dose from the individual construction product as well as the building is expressed in terms of an annual effective dose from gamma radiation in the indoor environment. The formulation of the indoor gamma dose in the building is consistent with the dose for indoor external exposure as stated under Article 75 of the Basic Safety Standards Directive. As a result, the described method enables assessment of the calculated annual dose of the building against the reference level as defined in the Basic Safety Standards Directive².

The method is designed for assessment of mineral based building materials applied in bulk or superficially and used as a construction product in buildings. This includes any building materials that have been identified by EU member states as being of concern from a radiation protection point of view. The method is envisaged for use by producers of building materials, architects and building constructors as well as authorities.

NOTE It is important to state that following the calculation of dose, any subsequent regulatory classification falls explicitly outside the scope of this method and is the responsibility of the relevant authorities.

2 Normative references

There are no normative references in this document.

¹ Under preparation. Stage at the time of publication: prEN 17216:2022. Based on CEN/TS 17216:2018.

² In exceptional cases, this document can permit massic activities in the construction product that for its manufacturing, distribution and handling could be identified as a practice referred to in Article 23 of the EU-BSS [1]. In accordance with Article 24 of the Directive, such practice shall be notified and may be subject to further regulatory requirements in accordance with national provisions implementing the EU-BSS.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

background subtraction

mathematical operation to subtract the dose from terrestrial background gamma radiation from the external dose from gamma radiation emitted by building materials

Note 1 to entry: The subtraction takes account of the building materials' ability to shield the indoor environment from terrestrial background gamma radiation, and is required to obtain the indoor external dose from gamma radiation emitted by building materials, in addition to the outdoor external exposure, as described in Article 75 of the EU-BSS [1]. For the terrestrial background gamma radiation, a European surface area weighted average value of 60 nGy/h, which corresponds to 0,29 mSv per year for an occupancy time of 7 000 h, is assumed. The average background gamma radiation was calculated from data taken from the UNSCEAR 1988 and 2008 reports ([4], [5]).

Note 2 to entry: The principle of the dose criteria and subtraction of the terrestrial background gamma radiation in compliance with the EU-BSS [1] is illustrated in Figure 1.

3.2

building material

any construction product for incorporation in a permanent manner in a building or parts thereof and the performance of which has an effect on the performance of the building with regard to exposure of its occupants to ionizing radiation

[SOURCE: 2013/59/EURATOM, chapter II, Article 4, (9) [1]]

3.3

building structure

structure consisting of one or more building materials with either vertical or horizontal orientation or a combination of both, that separate the indoor space from the outdoor space or one space from another space in the building

3.4

bulk material

building material not being a superficial material

3.5

default material

building material with an assumed massic activity of 40 Bq/kg ²²⁶Ra, 30 Bq/kg ²³²Th and 400 Bq/kg ⁴⁰K

3.6

dose point

geometrical point located in the centre of the room and the location for compliance of the effective dose