BS EN ISO 20553:2025

BSI Standards Publication

Radiation protection — Monitoring of workers occupationally exposed to a risk of internal contamination with radioactive material

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The UK participation in its preparation was entrusted to Technical Committee NCE/2, Radiation protection and measurement.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Radiation protection - Monitoring of workers occupationally exposed to a risk of internal contamination with radioactive material (ISO 20553:2025)

Radioprotection - Surveillance professionnelle des travailleurs exposés à un risque de contamination interne par des matériaux radioactifs (ISO 20553:2025)

Strahlenschutz - Überwachung von beruflich strahlenexponierten Personen, bei denen ein Risiko der Kontamination mit radioaktiven Stoffen besteht (ISO 20553:2025)

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European foreword

This document (EN ISO 20553:2025) has been prepared by Technical Committee ISO/TC 85 "Nuclear energy, nuclear technologies, and radiological protection" in collaboration with Technical Committee CEN/TC 430 “Nuclear energy, nuclear technologies, and radiological protection” the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by July 2025, and conflicting national standards shall be withdrawn at the latest by July 2025.

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Endorsement notice

The text of ISO 20553:2025 has been approved by CEN as EN ISO 20553:2025 without any modification.

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 2, *Radiological protection,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 430, *Nuclear energy, nuclear technologies, and radiological protection,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 20553:2006), which has been technically revised.

The main changes are as follows:

— the reference to the recent publication of ICRP Occupational Intakes of Radionuclides (OIR) series, instead of ICRP publications 66 and 78, to calculate the maximum time intervals for routine monitoring programmes.

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Introduction

In the course of employment, individuals may work with radioactive materials that could be taken into the body. Minimising the risks to workers from incorporated radionuclides requires the monitoring of potential or actual intakes. The requirements for such a monitoring programme and the selection of methods and frequencies of monitoring depend upon the applicable legislation or regulatory body, the purpose of the radiation protection programme, the probability of potential intakes, and the characteristics of the materials handled.

This document offers guidance for making a decision whether a monitoring programme is required, in the absence of any value set by regulations, and proposes the methodology for setting up a monitoring program, as well as its design. Its intention is to optimise the efforts for such a monitoring programme consistent with legal requirements and with the purpose of the radiation protection programme. Recommendations of international expert bodies and international experience with the practical application of these recommendations in radiation protection programmes have been considered in the development of this document. Its application facilitates the exchanges of information between authorities, supervisory institutions and employers. This document is not a substitute for legal requirements.

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Radiation protection — Monitoring of workers occupationally exposed to a risk of internal contamination with radioactive material

1 Scope

This document specifies the minimum requirements for the design of programmes to monitor workers exposed to the risk of internal contamination by radioactive material and establishes principles for the development of compatible goals and requirements for monitoring programmes.

This document specifies the

a) purposes of monitoring and monitoring programmes,

b) description of the different categories of monitoring programmes,

c) quantitative criteria for conducting monitoring programmes,

d) suitable monitoring methods and criteria for their selection,

e) information that has to be collected for the design of a monitoring programme,

f) general requirements for monitoring programmes (e.g. detection limits, tolerated uncertainties),

g) frequencies of measurements calculated using the ICRP Occupational Intakes of Radionuclides (OIR) series,

h) individual monitoring in specific cases (intake of actinides, intake via a wound and intake through the intact skin),

i) quality assurance, and

j) documentation, reporting and record-keeping.

This document does not apply to

— the monitoring of exposure to radon and its radioactive decay products,

— detailed descriptions of measuring methods and techniques,

— detailed procedures for in vivo measurements and in vitro analysis,

— interpretation of measurements results in terms of dose,

— biokinetic data and mathematical models for converting measured activities into absorbed dose, equivalent dose and effective dose,

— the investigation of the causes or implications of an exposure or intake.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15189, *Medical laboratories — Requirements for quality and competence*

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ISO 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 23588, *Radiological protection — General requirements for proficiency tests for in vivo radiobioassay*

ISO 28218, *Radiation protection — Performance criteria for radiobioassay*

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 https://www.electropedia.org/

3.1
absorption type
type of material, classified according to its rate of absorption from the respiratory tract into blood

3.1.1
absorption type V
type V
deposited materials that, for dosimetric purposes, are assumed to be instantaneously absorbed into blood from the respiratory tract (only certain gases and vapours; very fast absorption)

[SOURCE: ICRP publication 130]

3.1.2
absorption type F
type F
deposited materials that are readily absorbed into blood from the respiratory tract (fast absorption)

[SOURCE: ICRP publication 130]

3.1.3
absorption type M
type M
deposited materials that have intermediate rates of absorption into blood from the respiratory tract (moderate absorption)

[SOURCE: ICRP publication 130]

3.1.4
absorption type S
type S
deposited materials that are relatively insoluble in the respiratory tract (slow absorption)

[SOURCE: ICRP publication 130]

3.2
activity
quotient of $-\mathrm{d}N$ by $\mathrm{d}t$, where $\mathrm{d}N$ is the change in the number of radioactive nuclei, at a particular energy state and at a given time, due to spontaneous nuclear transformations in the time interval $\mathrm{d}t$

Note 1 to entry: It is expressed as $A = -\mathrm{d}N/\mathrm{d}t$. Activity can be calculated as $A = \lambda N$, where λ is the decay constant and N is the number of present radioactive nuclei.

Note 2 to entry: The special name for the unit of activity in the International System of Units is becquerel (Bq), One Bq equals one transformation per second (1 Bq = 1 s^{-1}). The use of the former unit curie (1 Ci = 3,7 x 10^{10} Bq), is also accepted in many countries and by the Bureau International des Poids et Mesures.

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[SOURCE: ISO 12749-1:2020, 3.1.2, modified – By removing the capital letter from the word "Curie" and adding “One Bq equals one transformation per second”]

3.3
activity median aerodynamic diameter
AMAD
value of aerodynamic diameter such that 50 % of the airborne *activity* (3.2) in a specified aerosol is associated with particles smaller than the AMAD, and 50 % of the *activity* (3.2) is associated with particles larger than the AMAD

Note 1 to entry: The aerodynamic diameter of an airborne particle is the diameter of a unit density sphere that has the same terminal settling velocity in air as the particle of interest.

3.4
clearance
net effect of the biological processes by which radionuclides are removed from the body or from a tissue, organ or region of the body

Note 1 to entry: The clearance rate is the rate at which this occurs.

3.5
radioactive contamination
contamination
radioactive substances on surfaces, or within solids, liquids or gases, including the human body, where their presence is unintended or undesirable, or the process giving rise to their presence in such places

[SOURCE: ISO 12749-2:2022, 3.1.5]

3.6
committed effective dose
quantity $E(\tau)$, defined as:

$$E(\tau)=\sum_{T} w_T \cdot H_T(\tau)$$

where $H_{\mathrm{T}}(\tau)$ is the committed equivalent dose to tissue or organ T over the integration time τ elapsed after an *intake* (3.12) of radioactive substances and w_{T} is the tissue weighting factor for tissue or organ T.

Note 1 to entry: The committed equivalent dose to an organ or tissue is the time integral of the equivalent dose rate to that organ or tissue after an *intake* (3.12) of radioactive substances.

Note 2 to entry: Where τ is not specified, it is taken to be 50 years for adults and the time to the age of 70 years for *intakes* (3.12) by children. For workers, the integration time to calculate committed equivalent doses is 50 years.

[SOURCE: ISO 12749-2:2022, 3.1.19, modified by adding Note 1 and “For workers, the integration time to calculate committed equivalent doses is 50 years” in Note 2]

3.7
annual committed dose
committed effective dose (3.6) from *intakes* (3.12) of radionuclides in one year

3.8
dose coefficient
committed effective dose (3.6) per unit *intake* (3.13), e(50), where 50 is the dose-commitment period in years over which the dose is calculated

3.9
retention function
function *m*(*t*) representing the activity of a radionuclide in the whole body or in an organ, at a time t after a unit acute *intake* (3.12) as predicted by a reference biokinetic model

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