INTERNATIONAL ISO

Second edition
2023-08

Monitoring for inadvertent movement and illicit trafficking of radioactive material

Surveillance des mouvements non déclarés et des trafics illicites de matière radioactive

Reference number
ISO 22188:2023(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies and radiological protection,* Subcommittee SC 2, *Radiological protection*.

This second edition cancels and replaces the first edition (ISO 22188:2004), which has been technically revised.

The main changes are as follows:

— Update of the introduction, considering the continuous development of technology.

— Update of Clause 2.

— There were 14 terms and definitions listed in the first edition (ISO 22188:2004). According to related standards and IAEA technical documents,

  — the following terms have been deleted: 3.1 control of radioactive material, 3.9 non-proliferation, 3.10 physical protection, 3.12 response, 3.13 safeguards and 3.14 special nuclear material;

  — the following terms have been added: 3.1 check source, 3.2 competent authority, 3.3 computer security, 3.9 nuclear material, 3.10 radioactive contamination, 3.11 radioactive material, 3.12 radiological monitoring, 3.13 radionuclide, 3.15 threat, 3.16 threat assessment and 3.17 threshold level. Terms and definitions count updated to 17.

— According to the standard's title, "instruments" in the title of Clause 4 was deleted. Originally, there were 4 types of instruments categorized in the first edition (ISO 22188:2004); they were pocket-type instruments, hand-held instruments, installed instruments and radionuclide identifiers. In this second edition, the kinds of devices are updated to 7. Individually, they are personal radiation devices, hand-held instruments, hand-held radionuclide identification devices, installed radiation portal monitors, mobile systems, backpack-type radiation detectors, active interrogation and

imaging systems. For each instrument the general characteristics, operation, calibration and routine testing, minimum performance requirements and test methods are presented. References to the IEC standards covering the performance requirements for these types of instruments were added and the requirements listed in this document were removed.

— This document primarily covers radiological monitoring at borders from a technical and operational viewpoint. Whether, when or where to establish radiological monitoring at borders should be the result of a comprehensive national regulatory strategy for radioactive material control. Therefore, the training requirements for border agents, inspectors and first responders have been added (see 4.2).

— Radiation monitoring systems, particularly those which are networked, connected to the internet or use cloud services, are vulnerable to a range of cyber threats. The computer security of these systems seeks to maintain the integrity, accessibility, authenticity and, where required, the confidentiality of data and instrument control. Guidance from national authorities for computer security should be sought by end-users for maintaining business continuity and reliability of radiation monitoring services and systems. A new Clause 6 has been added to deal with this issue.

— Parts of Annex A, and all of Annex B and Annex C were integrated into the text of Clauses 4 and 5 of the revised document. Annex D was eliminated and references to applicable IEC standards were given for performance requirements and test methods. Annex A was rewritten and simplified as Alarms and threshold levels. A new Annex B was added to list the possible trafficked devices and radionuclides. Examples of naturally occurring radioactive material remain as Annex C.

— Update of the Bibliography.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The International Atomic Energy Agency (IAEA) Incident and Trafficking Database (ITDB) system has been recording incidents of inadvertent movement and illicit trafficking of nuclear and other radioactive materials since 1995. Although the numbers of reported incidents fluctuate over time, those related to trafficking or malicious use remain a concern. A small number of these reported incidents involve seizures of potentially weapons-usable nuclear material, but the majority involve unauthorized activities including stolen or missing radioactive material and the detection of contaminated manufactured goods. Examples include unintentional incorporation of radioactive materials into recycled steel, handling of lost radioactive sources by unsuspecting individuals, and deliberate theft of radioactive material.

The potential radiological hazard to workers, the general public and the environment caused by misappropriated radioactive materials adds an additional threat to inadvertent movement and illicit trafficking. There have been instances in which loss of control over radioactive materials has led to serious, even fatal, consequences. Detection of radioactive materials at border crossings as well as maritime ports, airports and inside countries, for example at check points, is therefore an important issue.

This document addresses the procedural aspects of detecting radioactive materials. The procedural aspects cover the techniques to search, locate and possibly identify radioactive substances. Guidelines for appropriate training programs and maintenance of equipment are also considered a relevant aspect. Instruments used in the process are characterized with respect to minimum requirements in order to make the recommended procedures applicable. These include personal radiation devices, hand-held instruments, hand-held radionuclide identification devices, installed radiation portal monitors, backpack-type radiation detectors, mobile systems, active interrogation, and imaging systems. Specifications for the minimum performance requirements and test methods for instrumentation are covered by other existing standards, which are listed in the normative references clause.

Due to advances continually being made in the field of border radiation monitoring equipment, it is assumed that it can represent a consensus on the minimum specifications presently achievable. It is assumed that this document will allow more efficient use and operation of existing equipment, enhance communication across borders, and encourage activities to detect and counteract inadvertent movement and illicit trafficking of radioactive materials. The benefits thus gained contribute towards the efforts to counter nuclear weapons proliferation and increase radiation protection. A lack of standardization can delay implementation of intended activities, specifically if certain parameters, for example threshold level, are not agreed upon internationally. Technical documents published by the IAEA in this subject area provide a set of technical specification that can be used in design testing, qualifying and purchasing border radiation monitoring equipment, they are the basis for recommending justifiable and agreed specifications and procedures, see References [1], [2], [3], [4], [5], [6] and [7].