AS/NZS 2243.4:2018

Australian/New Zealand Standard™

Safety in laboratories

Part 4: Ionizing radiations

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The following are represented on Committee CH-026:

Association of Biosafety for Australia and New Zealand
Australian Chamber of Commerce and Industry
Australian Industry Group
Australian Institute of Occupational Hygienists
Australian Nuclear Science and Technology Organisation
Bureau of Steel Manufacturers of Australia
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Australian Radiation Protection and Nuclear Safety Agency
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Australian/New Zealand Standard™

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CH-026, Safety in Laboratories, to supersede AS 2243.4—1998.

The objective of this Standard is to promote safe work practices and to prevent unnecessary exposure of persons working in laboratories containing sources of ionizing radiation.

This Standard does not include non-ionizing radiation, which is covered in AS 2243.5, *Safety in laboratories*, Part 5: *Non-ionizing radiations—Electromagnetic, sound and ultrasound*.

This Standard was prepared after consideration of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), *Fundamentals for Protection Against Ionising Radiation* RPS F1 (2014) and *Code for Radiation Protection in Planned Exposure Situations* RPS C1 (2016), the most recent recommendations of the International Commission on Radiological Protection (ICRP), and the International Atomic Energy Agency (IAEA). Where necessary, future relevant publications of ARPANSA, the ICRP and the IAEA should be consulted as they become available.

The sections of this Standard dealing with dose limits, accident and emergency procedures and the requirements for radiological laboratories have been further refined since the 1998 edition. For more detailed information, the referenced source documents should be consulted.

This Standard is Part 4 in the AS/NZS 2243 series. The series is as follows:

AS
2243 Safety in laboratories
2243.1 Part 1: Planning and operational aspects
2243.2 Part 2: Chemical aspects
2243.3 Part 3: Microbiological safety and containment
2243.4 Part 4: Ionizing radiations (this Standard)
2243.5 Part 5: Non-ionizing radiations—Electromagnetic, sound and ultrasound
2243.6 Part 6: Plant and equipment aspects
2243.8 Part 8: Fume cupboards
2243.9 Part 9: Recirculating fume cabinets
2243.10 Part 10: Storage of chemicals

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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FOREWORD

Radiation is the emission of energy, in the form of rays, wave motion or particles, from a source. The various kinds of radiation can be subdivided broadly as follows:

(a) *Ionizing radiations*—radiations that by have the potential to cause ionization when interacting with matter. This involves removing or adding electrons from or to the atoms of materials through which the radiations pass, including those that comprise the human organism. Sufficiently energetic radiation may also cause changes in the nuclei of the atoms in the material. Ionizing radiations comprises X-rays, gamma rays, alpha particles, beta particles (i.e. high energy electrons), neutrons, protons and other nuclear particles. Ultraviolet radiation of wavelength less than 100 nm will also cause ionization in air.

(b) *Non-ionizing radiations*—radiations that do not cause ionization or nuclear changes, but can harm the human body in other ways. Potentially harmful non-ionizing radiations are propagated as electromagnetic waves (in particular, when the wavelength is between about 100 nm and 1 km), and acoustic noise (i.e. unwanted sound).

This Standard does not deal with non-ionizing radiation, which is covered in AS/NZS 2243.5, *Safety in laboratories*, Part 5: *Non-ionizing radiations*.

NOTES:

1 Although referred to in Item (a), ultraviolet radiation is generally classified as non-ionizing radiation and is therefore considered in AS 2243.5.

2 Radiation protection is concerned with the protection of individuals, their progeny, the human race as a whole and the environment, while still allowing necessary activities from which radiation exposure may result.

3 Various forms of high voltage apparatus may produce ionizing radiations.

4 Various chemicals and minerals may be radioactive by virtue of the fact that they contain traces of naturally occurring radioactive elements.

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements for the protection of people, non-human biota and the environment from the harmful effects of ionizing radiation used in, or as a result of any use within, or in connection with a laboratory.

This Standard also sets out the important characteristics of ionizing radiation-producing materials and apparatus, the nature of the hazards, laboratory design requirements, and other essential radiation protection information.

This Standard applies to the protection against ionizing radiation only, and does not specifically address the control of non-radiological aspects of health, safety and the environment, which are addressed in the relevant Parts of the AS/NZS 2243 series, even though these aspects also need to be considered.

NOTE: The protection from harmful effects of non-ionizing radiation is covered in AS/NZS 2243.5.

This Standard does not apply to exposures incurred during the course of medical or dental diagnosis or treatment and exposure to volunteers as part of a program of biomedical research.

NOTE: See Appendix G, Paragraph G3, [4] and [6].

Where requirements given in this Standard differ from requirements under jurisdictional legislation, the legislation takes precedence.

NOTE: For certain facilities, operations and activities (for example, nuclear installations, transport of radioactive material and radioactive waste management) other requirements apply.

1.2 APPLICATION

This Standard shall be implemented in all laboratories in which—

(a) radioactive materials are used, processed or stored; or

(b) ionizing radiation apparatus is used.

1.3 REFERENCED DOCUMENTS

A list of referenced documents and other related publications is provided in Appendix G.

1.4 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.4.1 Absorbed dose

The energy absorbed by matter from ionizing radiation per unit mass of irradiated material.

NOTE: The SI unit of absorbed dose is the joule per kilogram (J/kg), termed the gray (Gy). For radiation protection purposes, the absorbed dose is averaged over a tissue or organ.