

Australian/New Zealand Standard™

Safety of machinery

Part 1801: Safety distances to prevent danger zones being reached by upper and lower limbs



AS/NZS 4024.1801:2014

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee SF-041, General Principles for the Guarding of Machinery. It was approved on behalf of the Council of Standards Australia on 5 June 2014 and on behalf of the Council of Standards New Zealand on 24 April 2014. This Standard was published on 30 June 2014.

The following are represented on Committee SF-041:

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Australian Manufacturing Workers Union
Department of Mines and Petroleum, WA
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Part 1801: Safety distances to prevent danger zones being reached by upper and lower limbs

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF-041, General Principles for the Guarding of Machinery, to supersede AS 4024.1801—2006, *Safety of machinery, Part 1801: Safety distances to prevent danger zones being reached by the upper limbs*, and AS 4024.1802—2006, *Safety of machinery, Part 1802: Safety distances and safety gaps—Safety distances to prevent danger zones being reached by the lower limbs*.

It is emphasized that this Standard is part of the AS(/NZS) 4024.1 series and it is imperative that it is used in conjunction with other applicable parts of the series. A complete listing of all current parts of the AS(/NZS) 4024.1 series can be found at the Standards Australia website <www.standards.org.au> and in AS/NZS 4024.1100, *Safety of machinery, Part 1100: Application Guide*.

The objective of this Standard is to establish values for safety distances in both industrial and non-industrial environments to prevent machinery hazard zones being reached. The safety distances are appropriate for protective structures. It also gives information about distances to impede free access by the lower limbs. The distances apply when adequate safety can be achieved by distance alone. This Standard does not necessarily apply for hazards such as radiation or emission of substances.

This Standard is identical with, and has been reproduced from ISO 13857:2008, *Safety of machinery—Safety distances to prevent hazard zones being reached by upper and lower limbs*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) In the source text ‘this International Standard’ should read this ‘Australian/New Zealand Standard’.
- (b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
ISO		AS/NZS	
12100	Safety of machinery—Basic concepts, general principles for design	4024	Safety of machinery
12100-1	Part 1: Basic terminology, methodology	4024.1201	Part 1201: General principles for design—Risk assessment and risk reduction

The term ‘informative’ has been used in this Standard to define the application of the annex to which it applies. An ‘informative’ annex is only for information and guidance.

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INTRODUCTION

This document is a type B standard as stated in ISO 12100-1.

The provisions of this document can be supplemented or modified by a type C standard.

For machines which are covered by the scope of a type C standard and which have been designed and built according to the provisions of that standard, the provisions of that type C standard take precedence over the provisions of this type B standard.

One method of eliminating or reducing risks caused by machinery is to make use of safety distances preventing hazard zones from being reached by the upper and lower limbs.

In specifying safety distances, a number of aspects have to be taken into consideration, such as

- reach situations occurring when machinery is being used,
- reliable surveys of anthropometric data, taking into account population groups likely to be found in the countries concerned,
- biomechanical factors, such as compression and stretching of parts of the body and limits of joint rotation,
- technical and practical aspects, and
- additional measures for particular groups of persons (e.g. persons with special needs), which could be required due to a deviation from the specified body dimensions.

AUSTRALIAN/NEW ZEALAND STANDARD

Safety of machinery

Part 1801:

Safety distances to prevent danger zones being reached by upper and lower limbs

1 Scope

This International Standard establishes values for safety distances in both industrial and non-industrial environments to prevent machinery hazard zones being reached. The safety distances are appropriate for protective structures. It also gives information about distances to impede free access by the lower limbs (see 4.3).

This International Standard covers people of 14 years and older (the 5th percentile stature of 14 year olds is approximately 1 400 mm). In addition, for upper limbs only, it provides information for children older than 3 years (5th percentile stature of 3 year olds is approximately 900 mm) where reaching through openings needs to be addressed.

NOTE 1 Data for preventing lower limb access for children is not considered.

The distances apply when adequate safety can be achieved by distance alone. Because safety distances depend on size, there will be some people of extreme dimensions who will be able to reach hazard zones even when the requirements of this International Standard are complied with.

NOTE 2 These safety distances will not provide sufficient protection against certain hazards, for example, radiation and emission of substances. For such hazards, additional or other measures need to be taken.

The clauses of the International Standard covering lower limbs apply when access by the upper limbs is not foreseeable according to the risk assessment.

The safety distances are intended to protect those persons trying to reach hazard zones under the conditions specified (see 4.1.1).

NOTE 3 This International Standard is not intended to provide measures against reaching a hazard zone by climbing over.

2 Normative references

The following referenced documents are indispensable for the application 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 12100-1, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100-1 and the following apply.

3.1 protective structure
safeguard (e.g. a guard, an impeding device) or other physical obstruction (e.g. a part of a machine) which restricts the movement of the body and/or a part of it in order to prevent reaching hazard zones

3.2 safety distance
safe separation distance

s_r
minimum distance a protective structure is required to be placed from a hazard zone

4 Safety distances to prevent access by upper and lower limbs

4.1 General

4.1.1 Assumptions

The safety distances in this International Standard have been derived by making the following assumptions:

- the protective structures and any openings in them retain their shape and position;
- safety distances are measured from the surface restricting the body or the relevant part of the body;
- persons may force parts of the body over protective structures or through openings in an attempt to reach the hazard zone;
- the reference plane is a level at which persons would normally stand, but is not necessarily the floor (e.g. a working platform could be the reference plane);
- there is some contact with the reference plane while wearing shoes (use of high-soled shoes, climbing and jumping are not included);
- no aids such as chairs or ladders are used to change the reference plane;
- no aids such as rods or tools are used to extend the natural reach of the upper limbs.

4.1.2 Risk assessment

Before determining the safety distance that prevents people from reaching hazard zones it is necessary to decide whether to use values for high or low risk. Thus a risk assessment (see ISO 12100-1 and ISO 14121-1) shall be conducted. The risk assessment shall be based on the probability of occurrence of an injury and the foreseeable severity of that injury. An analysis of the technical and human elements on which the risk assessment is dependent is essential to achieving the appropriate selection of data from this International Standard. The risk assessment shall take into account all accesses. Where several tables are used, the most restricting values shall be taken (see examples in Annex A).

NOTE 1 Aspects of frequency, duration, energy, speed and shape of contact surface need to be taken into account when establishing the risk of injury (see ISO 14121-1).

Where there is a low risk, at least the values in Table 1 shall be used (see 4.2.2.1.1).

Where the risk is not low, Table 2, the high risk table, shall be used (see 4.2.2.1.2).

NOTE 2 Only risks arising from hazards such as friction or abrasion, where long-term or irreversible damage to the body is not foreseeable, can lead to low risks.

The safety distances (s_r) given in Table 7 apply to persons reaching through openings using the lower limbs in an attempt to reach a hazard zone.

If the requirements of this International Standard cannot be complied with, then other safety measures shall be used.

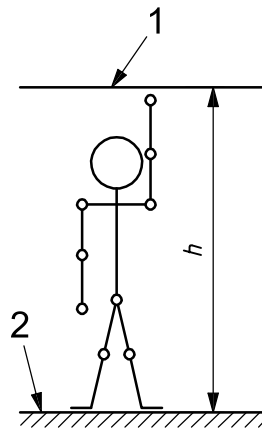
4.2 Safety distances to prevent access by upper limbs

4.2.1 Reaching upwards

4.2.1.1 Figure 1 shows the safety distance for reaching upwards.

4.2.1.2 If there is a low risk from the hazard zone, then the height of the hazard zone, h , shall be 2 500 mm or more.

4.2.1.3 If there is a high risk (see 4.1.2) from the hazard zone, then the height of the hazard zone, h , shall be 2 700 mm or more.



Key

- 1 hazard zone
- 2 reference plane
- h height of hazard zone

Figure 1 — Reaching upwards