
**Safety of machinery — Permanent
means of access to machinery —**

Part 1:
**Choice of fixed means and general
requirements of access**

*Sécurité des machines — Moyens d'accès permanents aux
machines —*

Partie 1: Choix d'un moyen d'accès et des exigences générales d'accès



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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 199, *Safety of machinery*.

This second edition cancels and replaces the first edition (ISO 14122-1:2001), which has been technically revised. It also incorporates the Amendment ISO 14122-1:2001/Amd 1:2010. See [Annex B](#).

ISO 14122 consists of the following parts, under the general title *Safety of machinery — Permanent means of access to machines*:

- *Part 1: Choice of fixed means and general requirements of access*
- *Part 2: Working platforms and walkways*
- *Part 3: Stairs, stepladders and guard-rails*
- *Part 4: Fixed ladders*

An additional part, dealing with mobile machinery, is under preparation.

Introduction

This International Standard is a type-B standard as stated in ISO 12100.

This International Standard is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium, and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.);

Others can be affected by the level of machinery safety achieved with the means of this International Standard by the above-mentioned stakeholder groups:

- machine users/employers (small, medium, and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium, and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above mentioned stakeholder groups have been given the possibility to participate at the drafting process of this International Standard.

In addition, this International Standard is intended for standardization bodies elaborating type-C standards.

The requirements of this International Standard 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 requirements of that standard, the requirements of that type-C standard take precedence.

The purpose of this International Standard is to define the general requirements for safe access to machines. This part of ISO 14122 gives guidance about the correct choice of access means when the necessary access to the machine is not possible directly from the ground level or from a floor or platform.

[Annex A](#) is informative and contains “Examples of the possible changes in the machine or system to make a better access possible”.

Safety of machinery — Permanent means of access to machinery —

Part 1: Choice of fixed means and general requirements of access

1 Scope

This part of ISO 14122 gives general requirements for access to stationary machines and guidance about the correct choice of means of access when necessary access to the stationary machine is not possible directly from the ground level or from a floor.

It is applicable to permanent means of access which are a part of a stationary machine, and also to non-powered adjustable parts (e.g. foldable, slidable) and movable parts of fixed means of access.

NOTE 1 “Fixed” means of access are those mounted in such a manner (for example, by screws, nuts, welding) that they can only be removed by the use of tools.

This part of ISO 14122 specifies minimum requirements that also apply when the same means of access is required as the part of the building or civil construction (e.g. working platforms, walkways, ladders) where the machine is installed, on condition that the main function of that part of the construction is to provide a means of access to the machine.

NOTE 2 Where no local regulation or standards exist, this part of ISO 14122 can be used for means of access which are outside the scope of the standard.

It is intended that this part of ISO 14122 be used with a relevant access-specific part of ISO 14122.

The ISO 14122 series as a whole is applicable to both stationary and mobile machinery where fixed means of access are necessary. It is not applicable to powered means of access such as lifts, escalators, or other devices specially designed to lift persons between two levels.

This part of ISO 14122 is not applicable to machinery manufactured before the date of its publication.

For the significant hazards covered by this part of ISO 14122, see [Clause 4](#).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 14122-3:2016, *Safety of machinery — Permanent means of access to machines — Part 3: Stairs, stepladders and guard-rails*

ISO 14122-4:2016, *Safety of machinery — Permanent means of access to machine — Part 4: Fixed ladders*

3 Terms and definitions

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

**3.1
fixed ladder**

fixed means of access with an angle of pitch from more than 75° up to 90°, whose horizontal elements are rungs

Note 1 to entry: See [Figure 1](#).

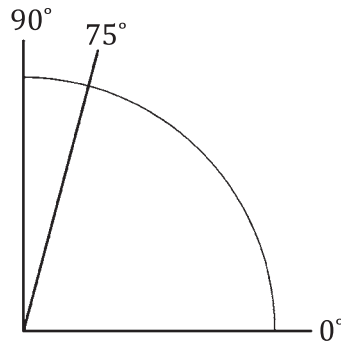


Figure 1 — 75° < angle of pitch ≤ 90° for a fixed ladder

**3.2
stepladder**

fixed means of access with an angle of pitch from more than 45° up to 75°, whose horizontal elements are steps

Note 1 to entry: See [Figure 2](#).

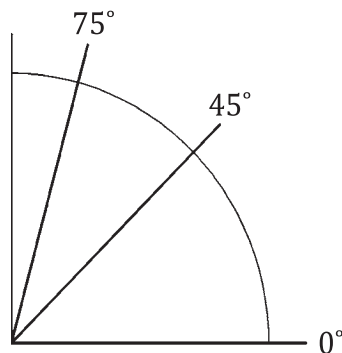


Figure 2 — 45° < angle of pitch ≤ 75° for a stepladder

**3.3
stair**

fixed means of access with an angle of pitch from more than 20° up to 45°, whose horizontal elements are steps

Note 1 to entry: See [Figure 3](#).

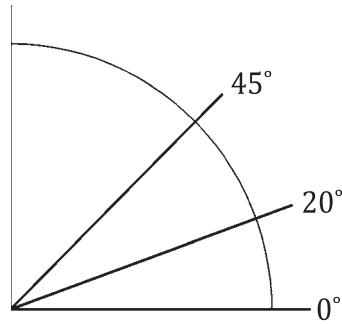


Figure 3 — $20^\circ < \text{angle of pitch} \leq 45^\circ$ for a stair

3.4 ramp

fixed means of access, comprising a continuous inclined plane having an angle of pitch from more than 0° up to 20°

Note 1 to entry: See [Figure 4](#).

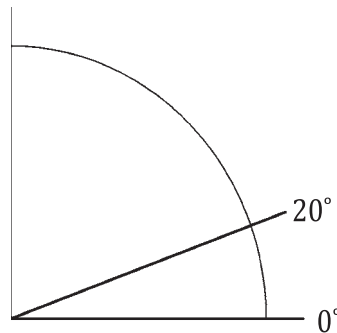


Figure 4 — $0^\circ < \text{angle of pitch} \leq 20^\circ$ for a ramp

4 Significant hazards

The most significant hazards to be considered when determining the type and location of the means of access are the following:

- a) falling;
- b) falling from height;
- c) slipping;
- d) tripping;
- e) excessive physical effort, e.g. from climbing a series of fixed ladders;
- f) falling of materials or objects when they may cause a risk to persons.

NOTE 1 Other hazards generated by machinery to which a person could be exposed during access using means of access according to this standard, e.g. caused by the functioning of machinery [moving parts of the machine, movement of the machine itself (mobile machines), radiation, extreme temperatures, noise, steam, hot liquids] or caused by its environment (harmful airborne substances), are not covered by this part of ISO 14122, but the designer/manufacturer of the machine needs to consider them, e.g. by preventing unauthorized access.

NOTE 2 ISO 12100 gives principles for risk assessment to identify and control all hazards. This part of ISO 14122 is aimed at the prevention of persons falling and of excessive physical effort.

5 General requirements for design and construction

Means of access shall be designed and constructed and the materials selected so that they withstand the foreseeable conditions of use. In particular, at least the following details shall be considered:

- a) dimensioning and selection of components (including fixings, connections, supports, and foundations) to ensure sufficient rigidity and stability;
- b) environmental conditions such as wind forces, temperature, dust, humidity, snow;
- c) resistance of all parts to environmental effects, e.g. as climate, chemical agents, corrosive gases (e.g. by the use of a corrosion resistant material or with the aid of a protective coating);
- d) positioning of constructional elements so that liquid/dirt cannot be accumulated, e.g. in the joints;
- e) use of compatible materials, e.g. to minimize galvanic action or differential thermal expansion;
- f) any parts liable to be in contact with the users shall be designed so as not to hurt or hinder (sharp corners, welds with burrs, rough edges, etc.);
- g) walking surfaces shall offer adequate slip resistance (see ISO 14122-2:2016, Annex A);
- h) dimensions of walkways and working platforms shall be according to available anthropometric data (see ISO 14122-2:2016, 4.2.2, ISO 15534-1, and ISO 15534-3);
- i) wherever practicable, a fixed installation shall be provided.

6 Requirements for the selection of the fixed means of access

6.1 General

There shall be a safe and convenient means of access to all the intervention zones and points of the machine where the need for access can be foreseen during the whole life cycle of the machine, e.g. setting, feeding, maintenance. When necessary for practical reasons, fixed access in accordance with this standard can include non-powered movable or adjustable parts.

6.2 Preferred means of access

As far as practicable, the means of access to the machinery shall be in the following order:

- a) access directly from ground level or from a floor, (for more details, see [6.3.1.1](#) and ISO 14122-2);
- b) ramps or stairs (for more details, see [6.4](#));
- c) stepladders or fixed ladders (for more details, see [6.5](#)).

The applicable range of pitch for the above means of fixed access is summarized in [Figure 5](#). Other factors influencing selection are given at [6.4](#) and [6.5](#).

6.3 Selection of the means of access

6.3.1 General

6.3.1.1 Whenever possible, access to control devices and other parts of the machine should be from either ground level, a floor or a platform to minimize the use of ramps, stairs, and ladders.

6.3.1.2 If access according to [6.3.1.1](#) is not possible or practicable, see [6.3.2.2](#) and [6.4](#).

6.3.2 Conditions for the application of stepladder or fixed ladder

6.3.2.1 In the design of access to machinery, stepladders and fixed ladders shall be avoided as far as practicable due to the higher risk of falling and because of the greater physical effort when using these access means.

6.3.2.2 If access means according to [6.3.1.1](#) and [6.4](#) is not possible, selection of a stepladder or fixed ladder may be considered. The final decision shall be made on the basis of the risk assessment and include ergonomic aspects.

If the level of risk (see ISO 12100) is considered to be too high, the basic concept of the means of access to the machine shall be changed to allow access ways with a reduced risk to be used (see [6.3.1](#) and [Annex A](#)).

6.3.2.3 The following list presents some examples of the cases when a stepladder or fixed ladder may be selected.

- if climbing height is high;
- the frequency of use is low;
- when not carrying any large tools or other large equipment which, for example, prevents correct use;
- when it is not foreseen to be used for the evacuation of injured persons;
- when the structure of the machine does not make stairs or other basic means possible (see [6.3.1](#)).

NOTE A tower crane provides an example of where a fixed ladder is the only practical means of access.

For the selection between stepladder and fixed ladder, see [6.5](#).

6.4 Selection between a ramp or a stair

When selecting a ramp or stair, the following points, a) and b), shall be taken into account.

a) A ramp should be considered in the following cases:

- for a small vertical distance;
- where it is necessary to transport wheeled vehicles (e.g. forklift trucks, hand cart).

The different angles of the ramp, depending on the use, are the following:

- for hand carts or other manually transported wheeled vehicles, a maximum angle of 3° (particularly when likely to be used by handicapped persons);
- for motor vehicles (e.g. forklift trucks), see ISO 14122-5;
- for walking, a maximum angle of 20° (generally and preferably not more than 10°).

NOTE Ramps are often preferable to stairs with only one or two steps.

The properties of the surface have very strong influence on the safety of the ramp. The surface shall have very good resistance against slipping in particular for ramps between 10° and 20°.

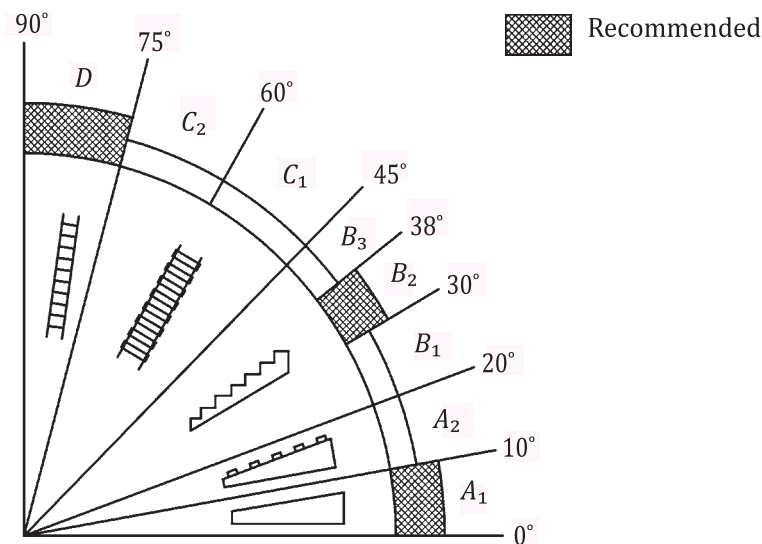
b) Stairs (for detailed requirements, see ISO 14122-3):

- the recommended angle of pitch is between 30° and 38°.

6.5 Selection between stepladder and fixed ladder

For selection, the following points, a) and b), shall be taken into account. For the detailed requirements of these means of access, see ISO 14122-3 (stepladder) and ISO 14122-4 (fixed ladder).

- a) Consequences on the level of safety affected by the choice of a stepladder:
 - when going upwards, a stepladder is easier and physically less demanding to use than a fixed ladder;
 - when going upwards, the risk of falling from a stepladder is smaller than falling from a fixed ladder;
 - if a person is coming down a stepladder and not facing it, depending on the angle, there is an increased risk of falling because it is easier to lose three-point contact;
 - if a person is using the stepladder while carrying objects by hand, there is an increased risk of falling down;
 - according to ISO 14122-3, the maximum flight of a stepladder is more limited than a flight of a fixed ladder;
 - a stepladder with an angle of pitch between 60° and 75° should only be selected due to space limits or process requirements.
- b) Consequences on the level of safety affected by the choice of a fixed ladder:
 - the person needs to face the fixed ladder and also has to use his hands for holding — therefore, the user needs to climb and descend facing the fixed ladder;
 - fixed ladders are physically more difficult to use than stepladders;
 - according to ISO 14122-4, the maximum flight of fixed ladders without a rest platform is limited.



Key	
A ₁ ramp, recommended	B ₃ stair
A ₂ ramp with enhanced slip resistance	C ₁ stepladder
B ₁ stair	C ₂ stepladder
B ₂ stair, recommended	D fixed ladder, recommended

Figure 5 — Range of the various means of access

7 General requirements for information for use

7.1 Instruction handbook

The instruction handbook of the machinery shall state clearly the following:

- a) what are the fixed access means provided by the manufacturer of the machinery;
- b) the conditions of use e.g. the maximum load and number of persons allowed on fixed access systems when appropriate;
- c) instructions necessary for correct assembly of the fixed access systems on site, e.g. method of fixing;
- d) an instruction that the a horizontal, flat and solid surface should be provided at access points to each fixed access system;
- e) repeat any warnings provided on the fixed access system related to their use for access.
- f) any maintenance and inspection requirements e.g. to identify excessive deterioration when operating in aggressive environments, wear in movable elements.

7.2 Warnings

The maximum load including, for example, the number of persons and additional load(s) such as tools and equipment, shall be marked at suitable positions, where access is gained (entry and exit points).

It is preferable to direct users by signs instead of written instructions.

Annex A (informative)

Examples for the changes in the machine or system to make better access possible

The machine designer should initially ensure that all controls to effectively operate the machine are positioned in accessible and easily reached locations.

- Consider the position of pillars, beams, pipelines, cable trays, platforms, storage tanks, etc. to make the use of stairs designed in accordance with this part of ISO 14122 or other preferable access means possible.
- Consider the design of the means of access (e.g. location) to make stairs designed in accordance with this part of ISO 14122 or other preferable means of access possible.

EXAMPLE 1 Make the access from another side so that there is enough room for stairs designed in accordance with this part of ISO 14122. Add horizontal platforms if necessary.

EXAMPLE 2 Make changes in the design of the means of access so that stairs are possible (e.g. change in the direction).

- Consider the machine to remove the need for access or to make the access possible from the ground level or from a floor.

EXAMPLE 1 Lubrication points should be easily reached from the ground level.

EXAMPLE 2 Use a different method of lubrication, such as the following:

- permanent lubrication;
- lubrication circuit with a pump.

EXAMPLE 3 Motor and power transmission means positioned so that access to the maintenance and servicing points is possible from the ground level.

EXAMPLE 4 The machine is installed to another place so that access is possible, e.g. from an already existing platform.

EXAMPLE 5 Change the position of pipelines and/or valves so that operation of the valve is possible from the ground level or from a floor.

Annex B (informative)

Significant technical changes between this part of ISO 14122 and the previous edition

See [Table B.1](#).

Table B.1 — Technical changes

ISO 14122-1	ISO 14122-1:2001 ISO 14122-1:2001/Amd1:2010
Added: <i>“and general requirements”</i>	Title
Modified: This part is limited only to <i>“stationary machinery”</i> , is applicable on <i>“non-powered adjustable parts”</i> defines <i>“guidance about correct choice”</i> and provides <i>“general requirements for access”</i> .	1 Scope
Updated	2 Normative references
Paragraph has been modified and replaced by Note 1.	Clause 4, second paragraph
Added: New Clause 5 <i>“General Requirements for design and construction”</i> Includes common requirements of Part 2 to Part 4	—
6.1 , <i>“non-powered moveable or adjustable parts.”</i> are included.	5.1
6.2 b), Deleted: <i>“lifts”</i>	5.2 b)
6.3.1 , Replaced: by <i>“General”</i>	5.3.1, title
6.3.1.1 , Modified: <i>“Whenever possible, access to control devices and other parts of the machine is preferred from either a ground level a floor or platform, to minimize the use of ramps, stairs, ladders.”</i>	5.3.1.1
6.3.1.2 , Modified by reference to <i>“6.4”</i> and deleted: <i>“lifts”</i>	5.3.1.2
6.3.2 , Added: <i>“fixed ladders “</i>	5.3.2, title
6.3.2.1 , Added: <i>“fixed ladders “</i>	5.3.2.1
6.3.2.3 , Modified and Note on b) deleted	5.3.2.3
6.4 , Modified	5.4
6.4 a). Deleted	5.4 a)
6.5 a), Modified, new wording	5.5 a)
6.5 b) 3rd bullet, deleted	5.5 b) 3rd bullet
Modified	Figure 5
Deleted	6
Added: new Clause 7 <i>“Information for use”</i> Includes common requirements of Part 2 to Part 4	—
Modified	Annex A
NOTE This list includes the significant technical changes but is not an exhaustive list of all modifications from the previous version.	

Bibliography

- [1] ISO 13854, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*
- [2] ISO 13857, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*
- [3] ISO 14122-2, *Safety of machinery — Permanent means of access to machines — Part 2: Working platforms and walkways*
- [4] ISO 15534-1, *Ergonomic design for the safety of machinery — Part 1: Principles for determining the dimensions required for openings for whole-body access into machinery*
- [6] ISO 15534-2, *Ergonomic design for the safety of machinery — Part 2: Principles for determining the dimensions required for access openings*
- [7] ISO 15534-3, *Ergonomic design for the safety of machinery — Part 3: Anthropometric data*
- [8] EN 353-1, *Personal protective equipment against falls from a height — Part 1: Guided type fall arresters including a rigid anchor line*
- [9] EN 364, *Personal protective equipment against falls from a height; test methods*
- [10] EN 795, *Personal fall protection equipment — Anchor devices*

