INTERNATIONAL STANDARD

ISO 11660-1

Second edition
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Cranes — Access, guards and restraints —

Part 1: General

Appareils de levage à charge suspendue — Moyens d'accès, dispositifs de protection et de retenue —
Partie 1: Généralités

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 11660-1 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 7, *Tower cranes*.

This second edition cancels and replaces the first edition (ISO 11660-1:1999), which has been technically revised.

ISO 11660 consists of the following parts, under the general title *Cranes — Access, guards and restraints*:

— *Part 1: General*

— *Part 2: Mobile cranes*

— *Part 3: Tower cranes*

— *Part 5: Bridge and gantry cranes*

Cranes — Access, guards and restraints —

Part 1:
General

1 Scope

This part of ISO 11660 establishes the general requirements for access to control stations and other areas of cranes as defined in ISO 4306-1, during normal operations, maintenance, inspection, erection, dismantling and emergency. It also deals with guards and restraints in general, concerning the protection of persons on or near the crane with regard to moving parts, falling objects or live parts.

The particular requirements relating to access, guards and restraints for the various types of cranes and lifting appliances are given in ISO 11660-2, ISO 11660-3 and ISO 11660-5.

In some cases, the particular requirements may not comply with the general requirements. Different dimensions can be permitted provided an equivalent degree of protection is achieved.

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 4306-1, *Cranes — Vocabulary — Part 1: General*

IEC 60204-32, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4306-1 and the following apply.

3.1.1
rung ladder
means of access consisting of side-rails and rungs which accommodate both feet, used where the angle of inclination to the horizontal of inclination exceeds 75°

3.1.2
stepped ladder
means of access consisting of side-rails and steps which accommodate both feet, used where the angle of inclination to the horizontal exceeds 60°

3.1.3
stair
means of access used where the angle of inclination to the horizontal does not exceed 50°

3.1.4
ramp
plane inclined at an angle of 20° or less from the horizontal, without steps

3.1.5
walkway
part of an access system, with essentially horizontal flooring, that permits walking or crawling between locations on a crane

3.1.6
rest platform
standing area for persons to rest, situated at intervals between flights of ladders or stairs

3.1.7
platform
horizontal surface for the support of persons engaged in operation, maintenance, inspection or repair work

3.1.8
handrail
device that provides continuous hand support between two locations

3.1.9
handhold
means of providing support by a single hand placement

3.1.10
toeboard
vertical plate that is placed around the perimeter of the platform to retain loose objects

3.1.11
foothold
means of providing support for one or two feet

3.1.12
manhole
access opening to allow the passage of a person and which can be fitted with a cover

3.1.13
hatch
access opening to allow the passage of a person and which is fitted with a hinged door

3.1.14
powered access system
means of access with a power source other than manual and which is used only by operators of the crane

3.1.15
personal protective equipment
any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards

3.2 Symbols

a stride distance

b rung end

c free length for hand clearance

d distance between centre line of rung and vertical surface

e distance between ladder and an obstacle to the rear

f distance between axis of ladder and a lateral obstacle

g gap between discontinuous elements

h riser height

i rung pitch

k rung size

m step width

n diameter/width of handrail/handhold

p tread depth

q hand clearance to mounting surface

r vertical distance between lower part of handrail/handhold and floor/foothold

s vertical distance between higher part of handrail/handhold and floor of platform/rest platform situated at top of ladder/stair

t clearance between edge of handrail/handhold situated along ladder and edge of rung/side-rail of ladder

u clearance between parallel handrails/handholds through which body must pass

v distance between floor/stair and handrail/guard-rail

v_1 gap between top of toe board and bottom of intermediate guard-rail

v_2 gap between top of intermediate guard-rail and bottom of guard-rail

w distance between floor and top of toe board

y clearance between floor and lower edge of toe board

z distance between rung and handhold/handrail

4 Access

4.1 Classification of access

For the purposes of this part of ISO 11660, the following cases apply:

a) **type 1 access**: access designed for use without personal protective equipment;

b) **type 2 access**: access for which some characteristics of type 1 access are not provided; type 2 access may require the use of personal protective equipment.

4.2 Selection of access

4.2.1 Selection of the means of access

Access to control stations, machinery spaces and portions of the crane for which periodic inspection or maintenance is required shall be provided by means such as steps, stairs, ladders, gangways, landings and platforms complete with such handrails, handholds and other accessories as are necessary.

The system shall allow for safe access to cabin and walkway.

For cranes that are regularly erected and dismantled, means of access shall be provided as required for those operations. Their design shall permit performance of the work required.

For high cranes, it may be advantageous to have a powered access means to the cabin. If a powered access system is provided, the crane shall be designed to receive it. In this case, a complementary means of access of type 2 shall also be provided.

Manufacturers shall take into consideration the following when determining the means of access to be provided:

a) frequency of use;

b) equipment or tools to be carried;

c) vertical distance to cover;

d) nature of use, e.g. maintenance, inspection, walkway.

Figure 1 shows the ranges of angle for different means of access in their working position.

Provision of access should be in the following preferential order: stair, rung ladder, stepped ladder. In addition, fixed means (e.g. hoop guard, side protection) shall be preferred to personnel protective equipment.

4.2.2 Selection of the type of access

The selection of the type of access shall be as follows:

— access to control station and starting equipment: **type 1 access**;

— access for maintenance period more frequent than once per month: **type 1 access**.

In the following cases, **type 2 access** may be used:

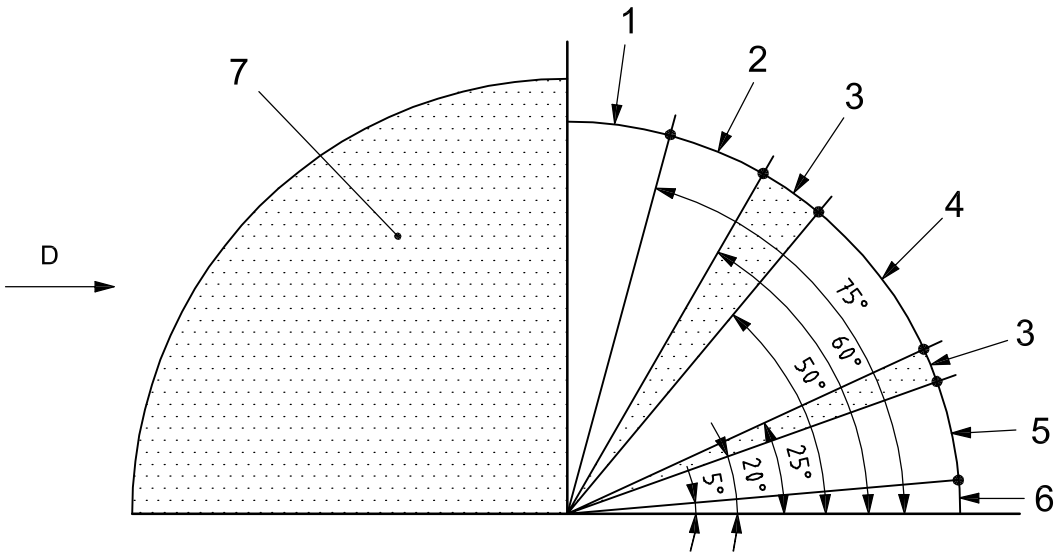
a) access for maintenance period less frequent than once per month: in this case, access shall be designed for use without personal protective device against falls from height;

b) access for erection and dismantling.

NOTE For a definition of maintenance, see ISO 23815-1:2007, 3.2, “planned (preventive) maintenance”.

4.2.3 Protection against falls from height

Table 1 summarizes the various equipment as defined in Clauses 6, 7 and 9, with the possible corresponding protection depending on the type of access.



Key

1 rung ladder
2 stepped ladder
3 area to be avoided
4 stairs
5 inclined walkway
6 walkway
7 prohibited area
D access direction for climbing

Figure 1 — Ranges of angle for different means of access in their working position

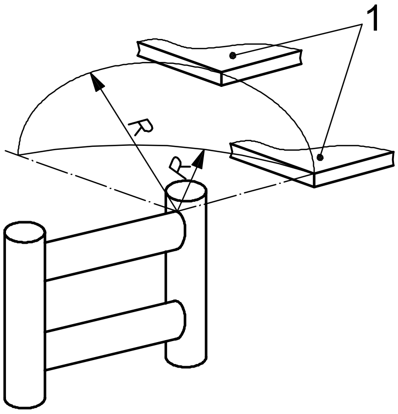
Table 1 — Protection depending on the type of access

Equipment	Type 1		Type 2	
	Collective protective equipment	Personal protective equipment	Collective protective equipment	Personal protective equipment
Stairs	YES (Side protection)	NO	YES	YES
Stepped ladders	YES (Side protection)	NO	YES (Side protection)	NO
Rungs ladders (foot hold)	YES (Hoop guards)	NO	YES (Hoop guards)	YES
Walkway	YES (Side protection)	NO	YES (Side protection)	YES

5 General requirements

5.1 Provisions shall be made on every access to provide simultaneous three point support (two hands and one foot; or two feet and one hand).

5.2 Where lateral body movement is necessary from a rung of a ladder to another support surface, the distance between the step or rung and the nearest edge of the support surface shall be within a spherical radius of 0,3 m maximum (see Figure 2).



Key

1 support surfaces

R spherical radius

Figure 2 — Distance between a step or rung and the nearest edge of any support surface

5.3 Means of access, walking and standing areas shall:

a) have their working position(s) designated, e.g. platform on articulated boom needs defined position of the boom for access;

b) take into account the number of persons, and the presence of objects such as tools and spare parts;

c) be constructed of materials specified as being incombustible and with slip resistant surfaces (see Annex A) which do not retain liquid.

5.4 Every control station shall have at least one exit onto a fixed means of access. An alternative means of egress shall be provided when the fixed means of access cannot be reached from all working positions of the control station or of the crane.

5.5 Any aperture in the floor of a gangway, inclined walkway, landing or platform situated above an area where persons could be present shall have slots or interstices which:

a) do not allow a sphere of 20 mm to pass through;

b) have a maximum width of 12 mm when the length is equal to or greater than 200 mm.

5.6 Hand supports shall have smooth surfaces. Edges shall have radii (minimum 2 mm) or be chamfered (minimum 2 mm × 2 mm).

Rung ends to retain the hands or feet shall be provided at the ends of handholds and footholds.

5.7 When access is foreseen with portable ladders, permanent means shall be provided to prevent the head of the ladder from moving.

Those ladders shall meet the requirements of this part of ISO 11660 for ladders.

5.8 Where means of access are provided between moving parts of the crane structure, the trapping, crushing, falling hazards shall be addressed in the following preferable order: interlocking, locking, information/marking.

6 Stairs and stepped ladders

6.1 The steps shall be of the non skid type and the outer edge (nose) shall be free from sharp edges.

6.2 Step construction shall minimize accumulation of debris and aid in the cleaning of mud and debris from the shoe sole where appropriate.

6.3 The steps shall withstand without permanent deformation:

a) a force of 2 000 N applied through a 125 mm diameter disc at any location of the surface; and

b) a uniformly distributed force of 4 500 N per square meter.

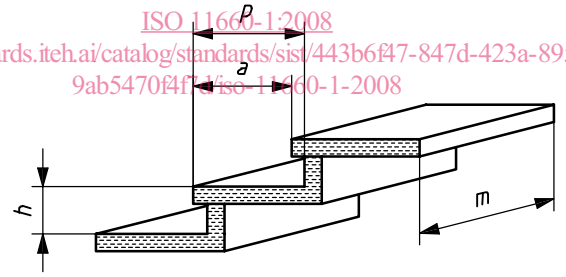
6.4 Type 1 stairs shall be provided with a handrail and an intermediate guard-rail (see Clause 10 and Table 7) on both sides.

If the distance between stairs and a continuous surface is less than 0,2 m it is permissible to omit intermediate guard-rails.

All stepped ladders shall be provided with handrails or handholds on both sides (see Clause 10).

Steps shall be regularly spaced. The distance from the floor to the first step should be the same as the riser height of the stair or ladder; but may vary to accommodate movement between the floor and the step or for the fitting of standardized components.

Stairs and stepped ladders shall have dimensions in accordance with Figure 3, Table 2 and Table 3.



Key

a stride distance
h riser height
m step width
p tread depth

Figure 3 — Dimensional parameters for stairs and stepped ladders