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Dvigala - Dostop, ograje in omejila - 2. del: Mobilna dvigala

Cranes -- Access, guards and restraints -- Part 2: Mobile cranes

Appareils de levage à charge suspendue -- Moyens d'accès, dispositifs de protection et de retenue -- Partie 2: Grues mobiles

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INTERNATIONAL STANDARD

ISO 11660-2

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Cranes — Access, guards and restraints —

Part 2: Mobile cranes

Appareils de levage à charge suspendue — Moyens d'accès, dispositifs de protection et de retenue —
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Reference number
ISO 11660-2:1994(E)

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.

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.

International Standard ISO 11660-2 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 6, *Mobile cranes*.

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 4: Jib cranes*

Annexes A and B of this part of ISO 11660 are for information only.

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Cranes — Access, guards and restraints —

Part 2:
Mobile cranes

1 Scope

This part of ISO 11660 specifies criteria for steps, stairways, ladders, walkways, platforms, handrails, handholds, guardrails and entrance openings which permit access to and from operator, inspection or maintenance platforms on mobile cranes as defined in ISO 4306-2 and parked in accordance with the manufacturer's instruction. It also presents requirements for guards and restraints as related to moving parts.

This part of ISO 11660 is also based on and partly in harmony with ISO 2860 and ISO 2867. For mobile cranes fitted with a tower ISO 11660-3 and ISO 11660-4 should be consulted.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11660. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11660 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4306-2:—[1], *Cranes — Vocabulary — Part 2: Mobile cranes.*

ISO 11660-1:—[2], *Cranes — Access, guards and restraints — Part 1: General.*

3 General

3.1 The requirements given in this part of ISO 11660 are based on one person, unladen, using the access system by himself, i.e. no other coworkers are on the access system, and on the 95th to 5th percentile human physical dimensions as presented in ISO 3411.

It shall also be recognized that some machine designs may require modifications or variances from the requirements presented in this part of ISO 11660.

4 Definitions

For the purposes of this part of ISO 11660, the following definitions apply.

4.1 access system: System provided on a machine for entrance to and exit from an operator, inspection or maintenance platform from and to the ground.

1) To be published. (Revision of ISO 4306-2:1985)

2) To be published.

The primary access system is the access system normally used, while the alternative access system is the access route used during anticipated emergency situations when the primary access system cannot be used.

4.2 jib walkway: Walkway used mainly on long jibs, such as on dragline cranes, which are inclined at angles up to 20° from the horizontal.

4.3 jib skywalk platform: Maintenance platform on jib base sections.

4.4 controlled descent device: Device which can automatically lower a person without power at a fixed speed as part of an alternative access system.

4.5 enclosure opening: Opening leading to or from an access system and large enough for a person to pass through.

4.5.1 primary opening: Opening normally used for access.

4.5.2 alternative opening: Opening for use during emergencies when the primary opening is not usable.

4.5.3 service opening: Opening for use during maintenance, service or inspection.

4.6 foot barrier: Device to prevent a person's foot from slipping off the edge of a platform or walkway.

4.7 guardrail: Device along the open sides of walkways or platforms to protect a person from falling.

4.8 handrail and handhold: Parts of an access system that may be grasped by the hand as an aid to body support and balance.

4.9 ladder: Access system or part of an access system, inclined from the horizontal at an angle greater than 50° but not more than 90°, consisting of a series of equally spaced steps that can accommodate one or both feet.

4.9.1 vertical ladder: Ladder whose angle of inclination from the horizontal is greater than 75°.

4.9.2 inclined ladder: Ladder whose angle of inclination from the horizontal is greater than 50° but not more than 75°.

4.9.3 rung ladder: Ladder consisting of side rails and rungs which can accommodate both feet, used for access where the angle of inclination from the horizontal exceeds 75°.

4.9.4 stepped ladder: Ladder consisting of side rails and steps which can accommodate both feet, used for access where the angle of inclination from the horizontal exceeds 65°.

4.10 ladder fall-limiting device: Any device which minimizes or limits the length of fall from a ladder system.

4.11 operator's platform: Area from which an operator controls the travel and work functions of the machine.

4.12 passageway: Walkway with confining barriers on both sides that extend vertically above the walking surface to a height of at least 1 200 mm for erect walking or 300 mm for crawling.

4.13 platform: Horizontal surface for the support of persons engaged in operation, maintenance, inspection or repair work.

4.14 ramp: Plane inclined at an angle of 20° or less from the horizontal, without steps, but with cleats or other surface treatment for the purpose of traction.

4.15 cleat: Device added to a walkway or ramp surface to improve traction.

4.16 rest platform; landing: Platform used in conjunction with a ladder system for a person to rest on while standing.

4.17 riser height: Height between two consecutive steps or rungs, measured from the tread surface of one step or rung to the tread surface of the next.

4.18 rung: Device on which one or both feet may be placed, generally installed on vertical ladders or on a single foot-step.

4.19 stairway: Access system or part of an access system inclined from the horizontal at an angle greater than 33,7° but not more than 67° and consisting of four or more steps.

4.20 step: Device for placement of one or both feet, either as part of a ladder or stairway, or installed (placed) individually.

4.21 stride distance: Horizontal distance from the leading edge of one step to the leading edge of the next step.

4.22 three-point support: Feature of an access system which permits, but does not require, a person to use simultaneously two hands and one foot or two

feet and one hand, while ascending, descending or moving about on the crane.

4.23 tread depth: Distance from the leading edge to the back of the step.

4.24 walkway: Part of an access system that permits walking or crawling between locations on a crane.

4.25 powered or manually actuated access device: Device that through power or manual actuation provides a complete or partial primary access or alternative access system.

4.26 slip-resistant surface: Access system surface having qualities which improve the traction obtained by the foot.

Annex A presents examples of surfaces that are considered "slip-resistant".

5 General criteria

5.1 Access system design shall consider:

a) the probability of a user being inadvertently restrained by protruding devices such as controls, steps or handles catching or holding body appendages or wearing apparel;

b) protrusions which could trip the user or increase the severity of an injury in case of a fall;

c) providing handrails or handholds with a smooth handgrasp surface;

d) the probability of user contact with potential hazards such as extreme differences in heat or cold, electrical hazards, moving parts and sharp corners;

e) use of the access system shall be easily understood and require no training;

f) proper placement of components offering three-point support to the user ascending or descending the access system when more than 1 m above the ground.

5.2 Primary access system devices may be portable for convenient storage on the crane but shall be capable of being positively secured when in use or in the stored position.

5.3 An alternative exit shall be provided and shall be clearly indicated if not obvious.

6 Performance criteria

6.1 The walking and standing surfaces of access systems shall withstand, without visible permanent deformation, the following minimum forces applied perpendicular to the surface.

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

b) 4 500 N uniformily distributed per square metre of surface area or fraction thereof if less than a square metre.

These forces need not be applied simultaneously.

6.2 Openings in walkways and platform surfaces shall not permit the passage of a spherical object of diameter $\geqslant$ 40 mm. If the floor surface is above a surface where persons will be walking, standing or working, the opening shall not permit the passage of a spherical object of diameter $\geqslant$ 20 mm. Solid surfaces shall be used when necessary to prevent the passage of material that could result in personal injury to a person above or below the surface. For jib walkways and other similar areas that are used only for inspection or maintenance, the standing or stepping surface openings may be increased to twice the above values.

6.3 Handrails, handholds and guardrails shall be capable of withstanding a minimum force of 1 000 N applied at any point from any direction without visible permanent deformation. Flexible devices shall not deflect under the applied test load more than 80 mm from their normal undeflected position.

6.4 Machinery enclosure roofs used only for support of personnel during inspection, such as cab and canopy roofs, may comply only with 6.1 a).

6.5 All surfaces of the access system for e.g. walking, stepping or crawling (including any device or structural component thereof used as part of an access system) shall be slip-resistant.

Crane track shoe and track pad surfaces can be used as access steps if three-point support is provided.

7 Steps

7.1 Steps shall conform to the dimensions given in figure 1 and table 1. Where possible, steps should be wide enough to accommodate both feet.

7.2 Where lateral body movement is necessary from the top or bottom step of a ladder to the next stepping surface, the distance between the rung and the nearest edge of the bearing surface shall be within a spherical radius R of 300 mm max. (see figure 1).

7.3 Steps shall be coordinated with properly positioned handrails and handholds.

7.4 Wherever a foot can protrude through the step and contact a moving part, a shield shall be provided between the step and the moving part.

7.5 Step design should incorporate a barrier at the ends of the step which the foot will contact in the event of lateral slippage.

7.6 The step tread surface shall not be intended for use as a handhold.

7.7 Step design should minimize accumulation of debris and aid in the cleaning of mud and debris from the shoe sole. Crawler tracks, if permitted as steps, do not meet this requirement.

Dimensions in millimetres

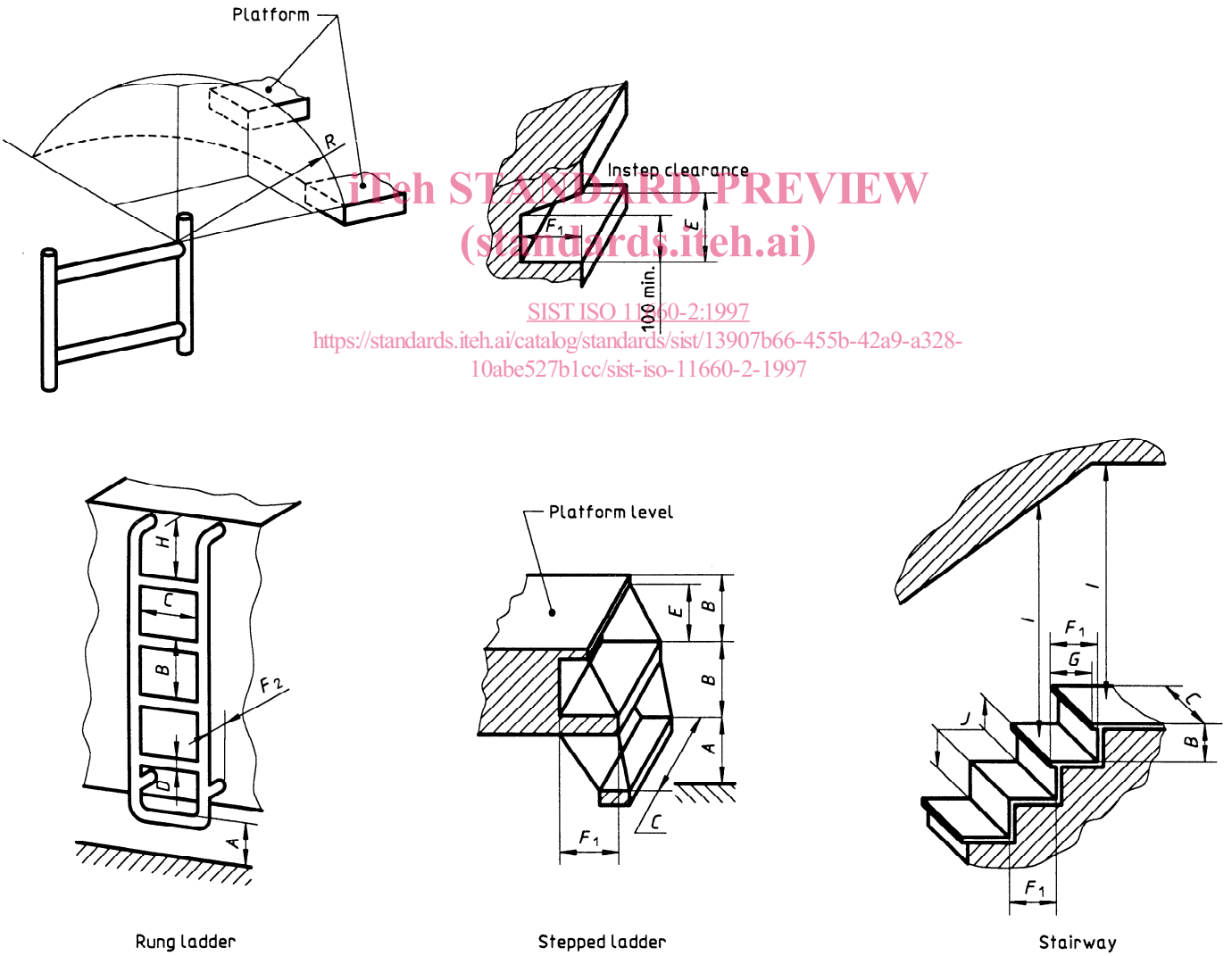

Figure 1 — Steps, ladders and stairways

Table 1 — Dimensions of steps, ladders and stairways

Dimensions in millimetres

Symbol	Description	Dimension	
		min.	max.
A	Height of first step above ground or platform	—	600
B	Riser height		
	Rung ladders	230	400
	Steps (stepped ladders, stairs, etc.)	180	250
C	Step width		
	Ladders		
	for one foot	160	—
	for both feet	320	—
	Stairway	320	—
D	Rung tread — diameter or width	19	40
E	Instep clearance	150	—
F_1	Tread depth		
	Steps (stepped ladders, stairways, etc.)	240[1]	400
F_2	Toe clearance (free space behind rungs)	150	—
G	Stride distance[2]	130	270
H	Distance from top rung of ladder to platform level	—	150
I	Head clearance above step leading to walkway	2 000	—
J	Step placement (stair) $(2B + G)$	630	
R	Step placement from ladder	—	300

1) See 9.3; can be reduced to 130 when free space for toe clearance is provided.

2) The formula given for J shall always be satisfied.

7.8 Step design shall, as far as is practical, provide the user with natural foot placement while descending, or steps shall be clearly visible to the user while descending.

NOTE 1 Natural foot placement of steps does not ensure user confidence. Only familiarity with the access system can instill confidence.

7.9 Flexibly-mounted series of steps should be avoided. If used, the steps shall not move more than 80 mm elastically in any plane when a horizontal force of 1 000 N is applied centred on the outer edge of the leading edge of the first nonswinging step from the ground. The first step from the ground may be free-swinging.

8 Ladders

8.1 Ladder steps shall meet the criteria specified in clause 7.

8.2 Vertical ladders which extend more than 5 m vertically above ground level shall be equipped with a ladder fall-limiting device, preferably of the passive type. Such a device shall not require continual manipulation for the user to ascend or descend the ladder.

8.2.1 The lower end of a ladder cage or other similar device, if used, shall be a maximum of 3 m above ground or platform level.