INTERNATIONAL STANDARD 2867

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Earth-moving machinery — Access systems

Engins de terrassement — Moyens d'accès

First edition — 1974-04-01

UDC 624.132 : 621-74/-78 **Ref. No. ISO 2867-1974 (E)**

Descriptors : earth-handling equipment, operating stations, access, accessories, specifications, layout, safety devices.

Price based on 4 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2867 was drawn up by Technical Committee ISO/TC 127, *Earth-moving machinery,* and circulated to the Member Bodies in August 1972.

It has been approved by the Member Bodies of the following countries :

Australia	India	Sweden
Austria	Japan	Thailand
Czechoslovakia	New Zealand	Turkey
Egypt, Arab Rep. of	Poland	United Kingdom
France	Romania	U.S.A.
Germany	South Africa, Rep. of	U.S.S.R.

The Member Body of the following country expressed disapproval of the document on technical grounds :

Ireland

Printed in Switzerland

Earth-moving machinery — Access systems

1 SCOPE

This International Standard specifies the criteria for steps, ladders, walkways, platforms, grab rails (handrails), grab handles, guardrails, and cab entrance openings as they relate to aiding the operator and servicemen in performing their functions on the equipment.

It does not include criteria for the floor of the operating compartment or station.

2 FIELD OF APPLICATION

This International Standard is intended as a guide when designing access systems to the operating station and service points on all types of earth-moving machinery, primarily to aid in preventing accidents, and reducing injury to personnel getting on, off, or moving about on vehicles while servicing and preparing to operate them.

3 DEFINITIONS

For the purposes of this International Standard, the following definitions apply :

3.1 step : A device designed for foot placement.

3.2 ladder : A system consisting of a series of steps that are uniformly spaced and will accommodate either one foot or both feet.

3.3 walkway : A surface designed for personnel to move about on the vehicle.

3.4 platform : A surface on which personnel are required to perform a service function, or a machine function other than operating.

3.5 grab rail (handrail) and grab handle : Devices that may be grasped by the hand for body support.

3.5.1 grab rail (handrail) : A device designed specifically to permit movement of the hand to a different location without removing the hand from the device. (Figure 4.)

3.5.2 grab handle : A device designed specifically for single placement of a hand. (Figure 3.)

3.6 guardrail : A rail above the outside edge of a walkway or platform to protect a person from falling down. (Figure 6.)

3.7 entrance opening : The opening providing entry to the operating compartment. (See also ISO . . . [1].)

4 GENERAL CRITERIA

4.1 The design of these devices and the means of attachment should provide adequate strength for the purpose intended.

4.2 The designer should design for body dimensions for both the 95th percentile group and the 5th percentile groups. See ISO . . . [1].

4.3 The designs and attachment means should be such as to minimize the probability of the user being inadvertently restrained; for example, the catching or holding of a finger, hand, foot, or wearing apparel.

4.4 Devices designed for hand contact should be free of roughness, such as sharp corners or protrusions.

a) The design and placement of these devices should be such as to minimize protrusions that could increase injury in case of a fall.

b) These devices may be portable to provide convenient storage on the vehicle but, when in the use position, they should not move under load.

4.5 Steps, ladders, and grab rails to, on, and from platforms and walkways should be designed to permit the person using them to have three points of support on the system at all times (two hands and one foot, or two feet and one hand).

1) In preparation.

5 STEPS AND LADDERS

5.1 The height of the first step from the ground to the machine should not exceed 700 mm (28 in) when the machine is in the normal parked condition.

Based on principal human factors, the optimum height of the first step should be no less than 400 mm (16 in).

5.2 Let X be the horizontal projection of the distance separating two successive steps of a ladder, and Y be its vertical projection. The recommended value of the sum $X + 2Y$ is 600 mm (29 in); and in no case should it exceed 800 mm (32 in). (Figure 2.)

5.3 Where lateral movement is necessary from a top step of a ladder to a walkway or a platform, the distance should not exceed 300 mm (12 in).

5.4 It is preferred that all steps be wide enough to accommodate both feet. The recommended width for such design is 400 mm (16 in) and in no case should it be less than 300 mm (12 in).

5.5 In those cases of steps where only one foot is used on a step, the recommended width is 200 mm (8 in) and in no case should it be less than 160 mm (6,5 in). The use of such steps dictates that they be co-ordinated with properly positioned grab rails or grab handles to enforce the use of the proper foot.

5.6 The recommended dimension for toe clearance from the outside edge of the step is 200 mm (8 in), and in no case should it be less than 150 mm (6 in). (Figure 1.)

5.7 The recommended clearance height at the instep is 190 mm (7,5 in) but in no case should it be less than 150 mm (6 in). (Figure 1.)

5.8 Wherever a foot may contact a moving part by protruding through the step, a shield should be provided between the step and the moving part.

5.9 The tread surface of a step should not be designed for use as a grab handle. The leading edge or steps should have no protrusions capable of snagging a finger, ring or clothing.

5.10 The design of steps should minimize the accumulation of debris. The tread surface should be of high slip resistance and should aid in the cleaning of mud and debris from the shoe sole.

5.11 Pivoting mounted steps should be avoided whenever possible. Where ground clearances dictate, the first step from the ground may be so mounted. However, only one step in a series may be so mounted.

5.12 The recommended headroom clearance above all ladders and steps is 2 010 mm (80 in).

6 GRAB RAILS (HANDRAILS) AND GRAB HANDLES

6.1 Grab rails appropriately spaced to provide continuous support to a moving man should be placed within convenient reach.

6.2 The preferred cross-section of a grab rail and grab handle is circular. However, a square or rectangular cross-section with round corners is permissible but it should be free from sharp edges.

6.3 For circular cross-section grab rails and grab handles the maximum diameter should be 38 mm (1.5 in). The minimum diameter should be 16 mm (5/8 in). The recommended dimension is 25 mm (1 in). For square or rectangular cross-sections, these dimensions apply across flats (axially between parallel surfaces).

6.4 Grab handles should have an accessible minimum length between the bend radii of the support legs of 150 mm (6 in). The recommended length is 250 mm (10 in) to all surfaces. (Figure 3.)

6.5 The minimum hand clearance of all grab rails and grab handles should be 75 mm (3 in) to all surfaces. (Figure 3.)

6.6 Grab rails and successive grab handles should be placed parallel to the path of motion of the user. Grab handles may be vertical or horizontal but should be parallel and consistent within a given system.

6.7 Any grab rail or grab handle on which the hand surface extends beyond the support should have a change of shape at the end of the hand surface to help prevent the hand from slipping off the end.

6.8 Grab rails or grab handles for access purposes should begin at a maximum height of 1 600 mm (63 in) above the ground, the platform or walkway where the steps start when the machine is in a normal parked position. It is recommended that the grab rail continue to at least 900 mm (36 in) above the final step. The maximum height should be given not only above the ground but also above the platform and walkway where the steps start.

6.9 The vertical grab rails or grab handle should be spaced no more than 200 mm (8 in) to the side of the nearest edge of the step surface. The recommended spacing between parallel grab rails is 400 mm (16 in). The maximum spacing between parallel grab rails is 600 mm (24 in).

6.10 On inclined ladders, where hip clearance is a factor, the recommended spacing between parallel grab rails is 600 mm (24 in).

6.11 The recommended grab rail height vertically above any step or inclined ladder is 900 mm (36 in). (Figure 4.)

6.12 When grab handles or grab rails are placed in parallel along walkways, they should be located 850 mm (34 in) to 1 400 mm (56 in) above the walkways. (Figure 5.)

6.13 The use of grab handles in a ladder system is preferred to grab rails. Where grab handles are used, the spacing should correspond to the step spacing.

6.14 Control levers and pedals should be so designed that they are not used unconsciously as grab handles or grab rails.

7 GUARDRAILS

7.1 It is recommended that a rigid guardrail be placed along the edge of walkways and platforms.

7.2 The recommended guardrail height is between 1 000 mm (40 in) and 1 100 mm (44 in) above the walkway or platform. A second rail should be spaced midway between the walkway and the top rail. (Figure 6.)

7.3 Where an opening in the guardrail has been provided, other than at the end of a guardrail, to provide access to a ladder or step, a safety bar or equivalent should be provided across the opening.

8 WALKWAYS AND PLATFORMS

8.1 Tread surfaces of all walkways and platforms should have high slip resistance or self-cleaning properties where practical.

8.2 Walkways and platforms with guardrails should have a minimum width of 380 mm (15 in) without any protrusions above the walkways or platform.

Walkways with handrails on adjacent structures and which are used only for servicing and maintenance of the stationary vehicle should have a minimum width of 230 mm (9.0 in) (300 mm (12 in) desirable).

8.3 The edge of a walkway or platform adjacent to a step or ladder should have no protrusions capable of snagging a finger, ring, or clothing.

8.4 The floors of walkways and platforms should be equipped on the sides, where the handrail is placed, with a protective board (toe guard) having a minimum height of 50 mm (2 in). (See figure 6.)

9 VERTICAL CAB ENTRANCE OPENINGS

9.1 The recommended entrance opening width is 680 mm (27 in). The minimum opening width measured from the platform is 300 mm (12 in) up to a height of 770 mm (30 in) and 450 mm (18 in) above the 770 mm (30 in) height.

9.2 The recommended door height of sit-down type cabs is 1 600 mm (63 in) or more from the floor. The recommended height of doors in stand-up cabs is 1 800 mm (72 in) or more from the floor.

9.3 An alternative exit for emergency purposes should be provided in a cab surface different from the entrance door wall. The exit dimensions should be equal to or larger than the dimensions given in ISO . . . [1].

9.4 The door should be accessible directly from the access steps or from a walkway or platform.

9.5 The external door handle should be located from 500 to 1 500 mm (20 to 58 in) above the place on which the man must stand to open the door. The recommended height is 900 mm (36 in). On machines where the door is opened from the ground, the door handle height should not be less than 1 700 mm (67 in).

9.6 The internal door handle should be located from 500 to 850 mm (20 to 34 in) from the floor for the seated man and from 800 to 1 000 mm (32 to 40 in) from the floor for the standing man.

1) In preparation.

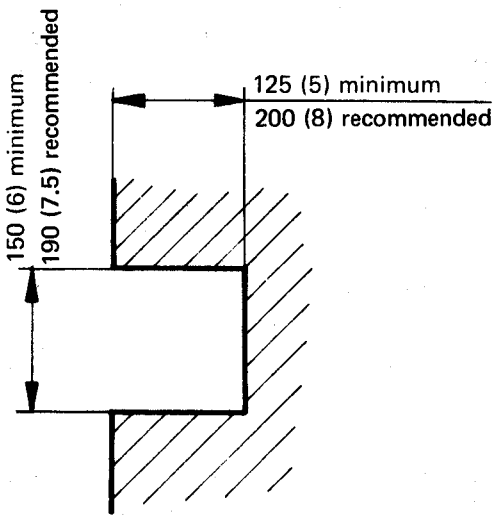
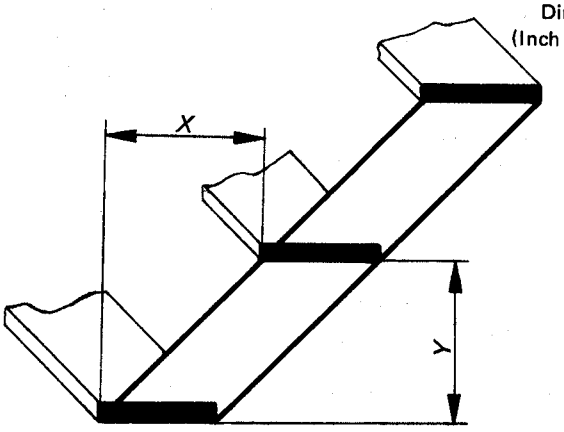


FIGURE 1 – **Step**

Dimensions in millimetres
(Inch equivalents in parentheses)



$X + 2Y \leqslant 800$ (40)

FIGURE 2 – **Ladder**

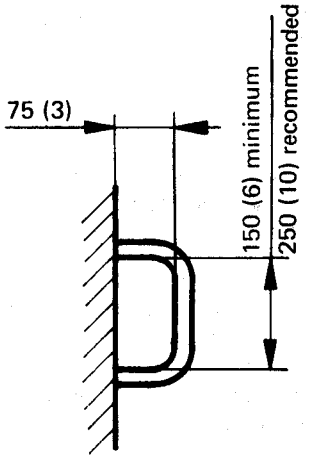


FIGURE 3 – **Grab handle**

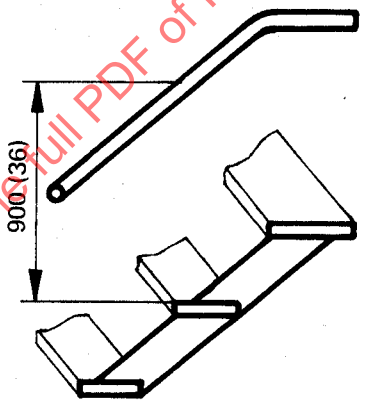


FIGURE 4 – **Handrail**

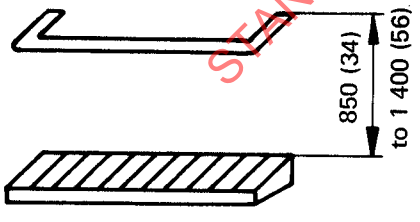


FIGURE 5 – **Grab rail above walkway**

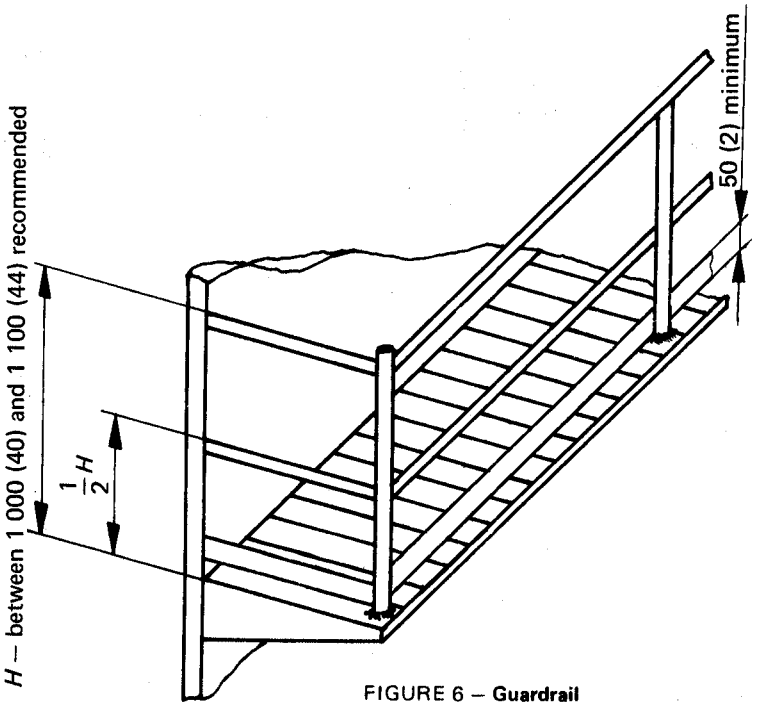


FIGURE 6 – **Guardrail**