
International Standard



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Earth-moving machinery — Guards and shields — Definitions and specifications

Engins de terrassement — Tôles et plaques — Définitions et spécifications

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Descriptors : earth moving equipment, safety devices, screens (protectors), definitions, specifications.

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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 3457 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*.

This third edition cancels and replaces the second edition (ISO 3457:1979), subclauses 4.3 and 4.4 of which have been technically revised.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Earth-moving machinery — Guards and shields — Definitions and specifications

1 Scope and field of application

This International Standard gives definitions and specifies the characteristics of different guards and shields to protect personnel from accidental hazards which may arise during operation and servicing of earth-moving machines due to :

- mechanical causes;
- thermal causes;
- chemical causes;
- electrical causes.

This International Standard is intended as a guide and covers both rubber-tyred and track-type off-highway earth-moving machinery of all sizes.

ROPS¹⁾, FOPS¹⁾ and cabs are excluded from this International Standard.

2 Reference

ISO 3164, *Earth-moving machinery — Laboratory evaluations of roll-over and falling-object protective structures — Specifications for the deflection-limiting volume.*

3 Definitions

3.1 fenders : Guards that partially cover the wheels or tracks of a machine in order to protect the operator from any material flung or carried up by the wheels or tracks, and from the moving parts themselves.

3.2 platforms : Flat shields acting as a floor area for the operating station or as a walkway on the machine. They either help shield personnel from moving parts, heat, noise, lubricants and dust, or facilitate operation and servicing.

3.3 fan guard : A structure covering the fan to protect personnel from the rotating blades during servicing operations of the machine.

It may also be a protection from moving pulleys and belts.

3.4 small unit guards : Structures intended to protect personnel from the rotating shafts, pulleys, fans and belts of alternators, generators, air compressors for braking and air-conditioning systems, oil pumps, etc.

3.5 access guards : Structures intended to protect personnel from moving parts, dangerous projections, surfaces soiled by lubricants or by dirt or, generally speaking, from any hazards when approaching, leaving or moving about on the machine.

3.6 bucket shield : A plate attached to the rear top edge of the bucket of a loader, intended to stop spillage of earthen materials onto the operator's compartment.

3.7 operator's compartment access guards : Structures shaped in such a way as to limit the operator's compartment, separating it from the transmission parts and small units in order to protect personnel from moving parts, heat, noise, lubricants and dust.

3.8 thermal guards : Guards covering hot parts of the vehicle to protect personnel from accidental contact, and to minimize fire hazard due to contact of easily flammable materials with very hot machine parts.

3.9 hose shields : Shields partially covering the hydraulic system hoses to protect the operator from hazards due to leaking or bursting hoses.

3.10 battery shields : Shields shaped in such a way as to cover the batteries and screen them from the operator's compartment in order to protect personnel from acid or vapour splashes from wet storage batteries.

3.11 electrical guards : Guards to protect personnel from accidental contact with dangerous voltages and to prevent fire hazards due to an accidental short circuit during operation or normal servicing of the vehicle.

4 Specifications

4.1 Fenders

4.1.1 General

Fenders have the purpose of protecting the operator's compartment while the machine is in motion.

Their structure shall be strong enough easily to support the operating loads and protect the operator from any material which might be flung up towards the operator's compartment by the wheels or tracks.

1) See ISO 3164.

If the fenders serve as part of the access system, they shall support a vertical force of at least 1 500 N (330 lbf).

The fenders shall not have sharp edges or corners and shall be provided with non-slip surfaces in the areas where they are used as walkways.

With reference to track or tyre overall dimensions, fenders may be defined by the following safety dimensional specifications :

- a) shape (see 4.1.2);
- b) covering length (see 4.1.3);
- c) width (see 4.1.4);
- d) distance from moving parts (see 4.1.5).

Figures 1, 2, 3 and 4 do not specify particular designs of machines. The dimensional limits indicated in the figures apply to rubber-tyred loaders, tractor scrapers, dumpers and crawler-tractors only.

4.1.2 Shape

The shape is fixed by the overall dimensions of the moving member.

For rubber-tyred machines, the shape may be curved or broken, enclosing the tyres.

For track-type machines, the shape is generally flat and parallel to the track chains.

The upper part of the fenders of track-type machines should preferably be flush with the platform in the operator's compartment.

4.1.3 Covering length

The covering length is established by the location and dimension of the operator's compartment (*Z*).

The operator's compartment shall be protected in the access area and also against any earth or material thrown up by the operating parts.

For rubber-tyred machines (with wheels in the straight-ahead position and with any tyre radius *R*), the covering length is determined by tangent lines from the tyre to the corners of the DLV as shown in figure 1.

For track-type machines (with any track radius *R*), the covering length is determined by a tangent line from the face of the track to the corner of the DLV as shown in figure 2.

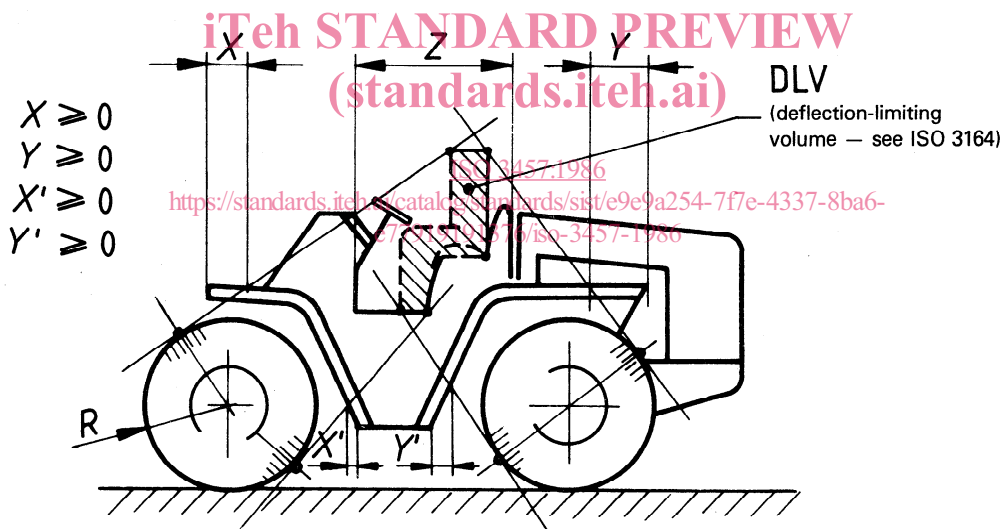


Figure 1

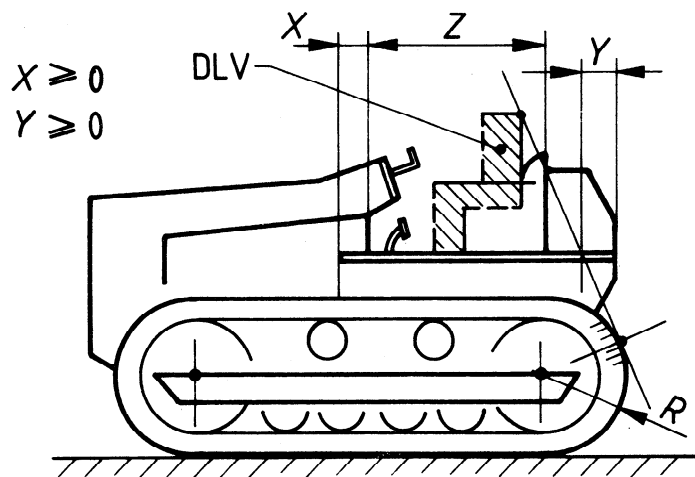


Figure 2

4.1.4 Width

The width is fixed by the following methods.

Near the operator's compartment, an area adjacent to the moving parts shall be covered to such an extent as to ensure protection at least in the conditions specified in 4.1.3.

The width of the fenders should be such as to allow the operator to view some part of the tyre or track in order to check spinning and location of the machine.

For track-type machines, the outer edge of the fender shall be sufficiently spaced from the outer edge of the track to enable the operator to place his foot properly on the track while getting into his compartment and thus avoid being hindered or hurt because of an excessively jutting fender edge if the track in the compartment area is used as part of the access system.

For rubber-tyred machines (see figure 3), considering each tyre width C , the width is determined as follows :

$$L \geq 200 \text{ mm (8 in)}$$

$$(G - L) < 0,5 C$$

L = width of the fender in the section running through the length (Z) of the operator's compartment.

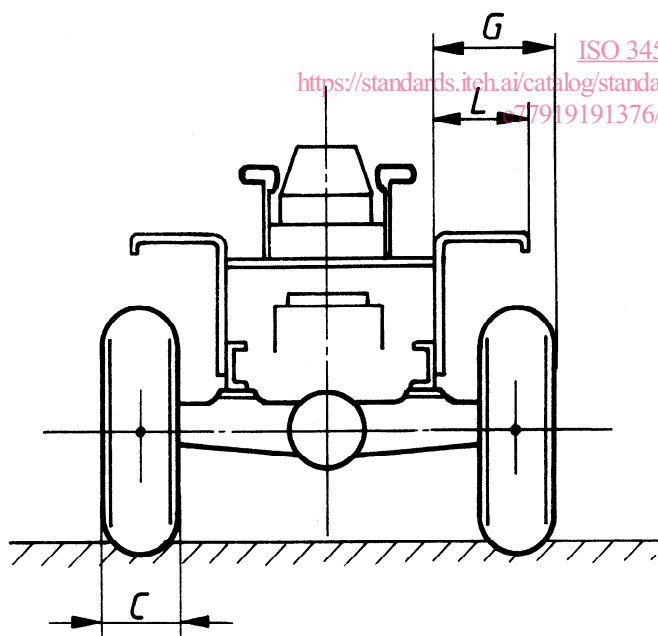


Figure 3

For track-type machines (see figure 4), considering any track shoe width C , the width is determined as follows :

$$L \geq 200 \text{ mm (8 in)}$$

$C \geq (G - L) \geq 200 \text{ mm (8 in)}$ if the track in length Z (figure 2) is used as a part of the access system.

L = width of the fender in the section running through the length (Z) of the operator's compartment.

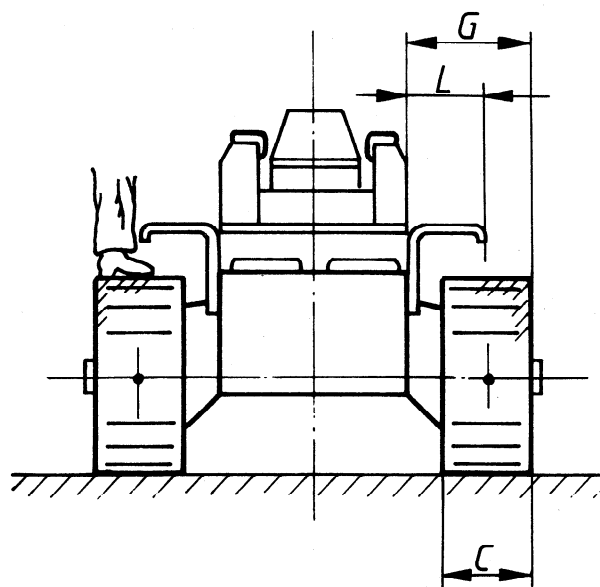


Figure 4

4.1.5 Distance from moving parts

The distance from moving parts is established by a minimum safety dimension which takes into account :

the possible bulk of soil material dragged around by the moving member;

the longitudinal and cross oscillations of the tracks or tyres;

the tyre steering angle;

possible options for the moving member such as : special tyre chains for wheeled machines, street plates for track-type machines, etc.

4.2 Platforms

The platform shall have a non-skid surface; the platform should be preferably on one plane and be level; it shall be free from unnecessary obstructions or projections.

The structure shall be sufficiently sturdy to support any expected combination of personnel readily, plus any attached loads, and it shall protect the operator from hazards from drivelines or pressure lines.

4.3 Fan guard

The fan guard shall be sufficiently sturdy to ensure that it cannot readily be deflected into the moving blades of the fan and that it provides protection against accidental contact of any part of the anatomy with the blades.

When exposed or accessible belts and pulleys are used, the guard should ensure all-round protection to avoid accidental pinching hazards.

4.4 Small unit guards

Exposed or accessible drives to alternators, generators, air compressors, pumps and rotating units shall be covered with

guards to protect personnel from hazards due to parts of the anatomy or clothing being caught in the belt pulley pinch points and other external moving parts of such devices.

The structure shall be sufficiently sturdy to ensure that it provides protection against accidental contact of any part of the anatomy with the moving members.

4.5 Access guards

The structure shall be sufficiently sturdy to carry the operating loads easily without being deflected into the moving parts and shall not transmit undue vibrations. The outer parts shall not have sharp edges or corners.

Where such guards may be used as steps, they shall be able to carry a vertical force of at least 1 500 N (330 lbf) and shall have a non-skid surface.

4.6 Bucket shield

The bucket should be so designed that the rear edge is high enough to prevent undue spillage of debris onto the operator's compartment.

In some instances, the safety of the operator may be increased by attaching an additional shield acting as an extension to the upper rear edge of the bucket (see figure 5).

This shield is not intended to increase the bucket capacity.

The extension part shall be sufficiently sturdy to ensure that it can hold any type of material, a grid construction being preferred for the sake of visibility.

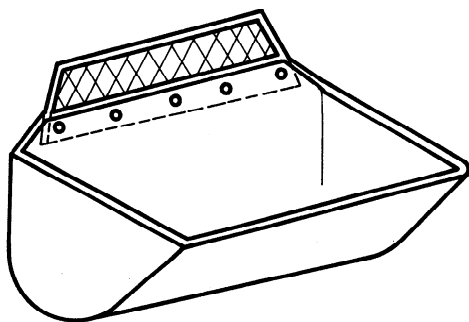


Figure 5

4.7 Operator's compartment access guards

The structure should be sufficiently sturdy not to deflect into the moving parts and shall not transmit any annoying vibrations. The outer surfaces shall not have sharp edges or corners.

4.8 Thermal guards

On machines where space limitations expose personnel to possible contact with hot or very cold parts during normal operation or servicing, such parts shall be guarded with covers which may be combined with insulation or ventilation to bring the temperature of the final exposed surface to a safe level.

These guards shall protect the operator from any fire hazards due to casual contacts of easily flammable material with very hot parts of the machine (see figure 6).

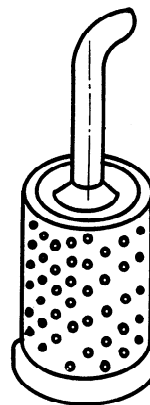


Figure 6

4.9 Hose shields

Where hoses are used operating at a pressure of at least 5 000 kPa (700 lbf/in²) and/or at a temperature of at least 50 °C (120 °F), and are located within 0,5 m (20 in) of the operator, deflecting shields should be provided to protect the operator from sudden hose failure (see figure 7).

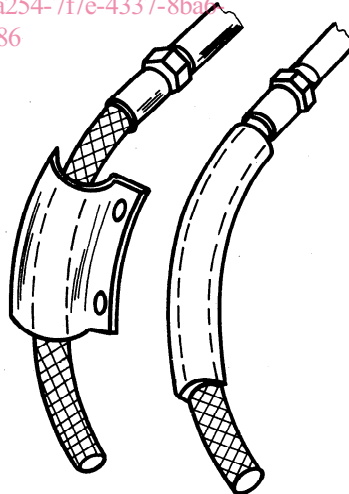


Figure 7

The shield shall be sufficiently sturdy to stop or divert fluids away from the operator.

4.10 Battery shields

The shields shall be corrosion-resistant to protect the operator from possible harmful contacts with the acid liquid spilt from the levelling plugs and from its vapours, as a result of abrupt movements or oscillations of the operating machine or as a result of high temperatures in the area where the battery is placed.

Battery acid and vapours shall be diverted away from the operator's compartment by means of these shields.

4.11 Electrical guards

Although the electrical system of the vehicles considered in this International Standard operates at a maximum voltage of 24 V and is not dangerous for personnel, an electric cut-off device

shall be provided in one of the battery connections. The device shall be suitably protected to prevent easy access and re-connection by vandals or other unauthorized persons. This device is intended to act as a safety measure during major servicing operations, preventing accidental starting of the engine of the vehicle, and also preventing unauthorized starting of the engine at times when the machine is out of use and unattended.

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