
**Earth-moving machinery — Safety —
Part 1:
General requirements**

Engins de terrassement — Sécurité —

Partie 1: Exigences générales

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ISO 20474-1:2008

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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 20474-1 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety, ergonomics and general requirements*.

ISO 20474 consists of the following parts, under the general title *Earth-moving machinery — Safety*:

- *Part 1: General requirements*
- *Part 2: Requirements for tractor-dozers* [ISO 20474-1:2008](https://standards.iteh.ai/catalog/standards/sist/b6c91156-8107-4a8f-87bd-1192da668a0a/iso-20474-1-2008)
- *Part 3: Requirements for loaders*
- *Part 4: Requirements for backhoe-loaders*
- *Part 5: Requirements for hydraulic excavators*
- *Part 6: Requirements for dumpers*
- *Part 7: Requirements for scrapers*
- *Part 8: Requirements for graders*
- *Part 9: Requirements for pipelayers*
- *Part 10: Requirements for trenchers*
- *Part 11: Requirements for earth and landfill compactors*
- *Part 12: Requirements for cable excavators*
- *Part 13: Requirements for rollers*
- *Part 14: Information on national and regional provisions [Technical Specification]*

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Introduction

This document is a type-C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

Provisions that are applicable for Australia, EU, Japan or the USA, and which are mandatory for compliance with specific governmental laws, directives or regulations in force in the particular country or region, are given in ISO/TS 20474-14.

NOTE Other countries or regions may also have regional requirements.

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Earth-moving machinery — Safety —

Part 1: General requirements

1 Scope

This part of ISO 20474 specifies the general safety requirements for earth-moving machinery as defined in ISO 6165, each of these requirements being common to two or more earth-moving machine families. It is also applicable to machine attachments, and to derived machinery designed primarily for equipment used to loosen, pick-up, move, transport and/or distribute earth, or to grade earth and rock.

It is intended to be used in conjunction with the other parts of ISO 20474, which give the provisions that are specific to particular machine families, and with ISO/TS 20474-14, which gives information on provisions that are mandatory in particular countries or regions. Those specific requirements take precedence over the requirements of this part of ISO 20474 for the machines concerned. For multipurpose machinery, all of those parts of ISO 20474 whose requirements cover the functions and applications of such machines are applicable.

EXAMPLE For a compact loader also used as a trencher, the relevant requirements of ISO 20474-1, ISO 20474-3 and ISO 20474-10 are applicable.

This part of ISO 20474 deals with all significant hazards, hazardous situations and events relevant to the earth-moving machinery within its Scope when used as intended or under conditions of misuse reasonably foreseeable by the manufacturer (see also ISO/TS 20474-14). It specifies the appropriate technical measures for eliminating or reducing risks arising from significant hazards, hazardous situations or events during commissioning, operation and maintenance. It does not deal with the electrical hazards related to the main circuits and drives of machines when the principal source of energy is electrical. It is not applicable to machines manufactured before the date of its publication.

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 2860, *Earth-moving machinery — Minimum access dimensions*

ISO 2867, *Earth-moving machinery — Access systems*

ISO 3164, *Earth-moving machinery — Laboratory evaluations of protective structures — Specifications for deflection-limiting volume*

ISO 3411:2007, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope*

ISO 3449, *Earth-moving machinery — Falling-object protective structures — Laboratory tests and performance requirements*

ISO 3450, *Earth-moving machinery — Braking systems of rubber-tyred machines — System and performance requirements and test procedures*

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ISO 3457:2003, *Earth-moving machinery — Guards — Definitions and requirements*

ISO 3471, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements*

ISO 3795, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 4250-3, *Earth-mover tyres and rims — Part 3: Rims*

ISO 4413, *Hydraulic fluid power — General rules relating to systems*

ISO 5006, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

ISO 5010, *Earth-moving machinery — Rubber-tyred machines — Steering requirements*

ISO 6011, *Earth-moving machinery — Visual display of machine operation*

ISO 6014, *Earth-moving machinery — Determination of ground speed*

ISO 6016, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*

ISO 6165, *Earth-moving machinery — Basic types — Identification and terms and definitions*

ISO 6395, *Earth-moving machinery — Determination of sound power level — Dynamic test conditions*

ISO 6396, *Earth-moving machinery — Determination of emission sound pressure level at operator's position — Dynamic test conditions*

ISO 6405-1, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 6405-2, *Earth-moving machinery — Symbols for operator controls and other displays — Part 2: Specific symbols for machines, equipment and accessories*

ISO 6682, *Earth-moving machinery — Zones of comfort and reach for controls*

ISO 6683, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests*

ISO 6750, *Earth-moving machinery — Operator's manual — Content and format*

ISO 8643, *Earth-moving machinery — Hydraulic excavator and backhoe loader boom-lowering control device — Requirements and tests*

ISO 9244, *Earth-moving machinery — Machine safety labels — General principles*

ISO 9533, *Earth-moving machinery — Machine-mounted forward and reverse audible warning alarm — Sound test method*

ISO 10263-2, *Earth-moving machinery — Operator enclosure environment — Part 2: Air filter test*

ISO 10263-3, *Earth-moving machinery — Operator enclosure environment — Part 3: Operator enclosure pressurization test method*

ISO 10263-4, *Earth-moving machinery — Operator enclosure environment — Part 4: Operator enclosure ventilation, heating and/or air-conditioning test method*

ISO 10264, *Earth-moving machinery — Key-locked starting systems*

ISO 10265, *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems*

- ISO 10532, *Earth-moving machinery — Machine-mounted retrieval device — Performance requirements*
- ISO 10533, *Earth-moving machinery — Lift-arm support devices*
- ISO 10570, *Earth-moving machinery — Articulated frame lock — Performance requirements*
- ISO 10968:2004, *Earth-moving machinery — Operator's controls*
- ISO 11112:1995, *Earth-moving machinery — Operator's seat — Dimensions and requirements*
- ISO 11862, *Earth-moving machinery — Auxiliary starting aid electrical connector*
- ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*
- ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*
- ISO 12117-2, *Earth-moving machinery — Laboratory tests and performance requirements for protective structures of excavators — Part 2: Roll over protective structures (ROPS) for excavators of over 6 t¹⁾*
- ISO 12508, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*
- ISO 12509, *Earth-moving machinery — Lighting, signalling and marking lights, and reflex-reflector devices*
- ISO 13333, *Earth-moving machinery — Dumper body support and operator's cab tilt support devices*
- ISO 13766, *Earth-moving machinery — Electromagnetic compatibility*
- ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*
- ISO 14401-1, *Earth-moving machinery — Field of vision of surveillance and rear-view mirrors — Part 1: Test methods*
- ISO 14401-2, *Earth-moving machinery — Field of vision of surveillance and rear-view mirrors — Part 2: Performance criteria*
- ISO 15817, *Earth-moving machinery — Safety requirements for remote operator control*
- ISO 15818, *Earth-moving machinery — Lifting and tying-down attachment points — Performance requirements²⁾*
- ISO 15998, *Earth-moving machinery — Machine-control systems (MCS) using electronic components — Performance criteria and tests for functional safety*
- ISO 16528-1, *Boilers and pressure vessels — Part 1: Performance requirements*
- ISO 16528-2, *Boilers and pressure vessels — Part 2: Procedures for fulfilling the requirements of ISO 16528-1*
- ISO 17063, *Earth-moving machinery — Braking systems of pedestrian-controlled machines — Performance requirements and test procedures*
- ISO 21507, *Earth-moving machinery — Performance requirements for non-metallic fuel tanks*
- IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

1) To be published.

2) To be published.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100-1 and the following apply.

3.1 earth-moving machinery
self-propelled or towed machine on wheels, crawlers or legs, having equipment or attachment (working tool), or both, primarily designed to perform excavation, loading, transportation, drilling, spreading, compacting or trenching of earth, rock and other materials

[ISO 6165:2006, definition 3.1]

3.1.1 compact machine
earth-moving machinery having an operating mass as defined in ISO 6016 of 4 500 kg or less, or, in the case of compact excavators, having an operating mass as defined in ISO 6016 of 6 000 kg or less

3.1.2 derivated machinery
earth-moving machinery fitted with equipment and/or attachment that modifies its function

NOTE In the European Economic Area (EEA), the equipment and/attachment, as defined in ISO 6016, that modifies the function of a machine and that is intended to be assembled by the operator can be *interchangeable equipment* in the sense of the Machinery Directive.

3.2 attachment working tool
component or assembly of components that can be mounted onto the base machine or equipment for a specific use

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NOTE See ISO 6746-1, ISO 6746-2 and ISO 6016.
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3.3 attachment bracket
device to facilitate quick interchange of attachments

3.4 object handling
application of earth-moving machinery comprising lifting, lowering and transporting of a load by use of lifting accessories, whereby the assistance of a person or the operator of the machine is required for hooking, unhooking or stabilizing (while transporting) the load

NOTE 1 If the load is picked up by a self-acting device and no assistance of a person is required for hooking, unhooking and stabilising the load, this work is considered as a usual earth-moving application.

NOTE 2 Examples of lifting accessories are wire ropes, chains or textile straps; loads in object handling applications include pipes and vessels; examples of self-acting devices are grabs, clamshell buckets, log clamps, vacuum lifting device, magnetic plate and fork.

3.5 maximum rated operating [lift] capacity
<object handling> maximum load which can be lifted in at least one position of the working range as specified by the manufacturer (e.g. on the rated object handling capacity table) in the most stable configuration (such as with outriggers down)

NOTE 1 A definition of *rated operating capacity* for loaders given in ISO 14397-1 is used in ISO 20474-3 and ISO 20474-4.

NOTE 2 *Rated lift capacity* forms the subject of ISO 10567 and is the term used in ISO 20474-5.

4 Safety requirements and/or protective measures

4.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause, in as far as those are not modified by the specific requirements of another part of ISO 20474.

In addition, the machine shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this part of ISO 20474.

4.2 Access

4.2.1 General requirements

Adequate access systems shall be provided to the operator's station and areas where routine maintenance (as defined in ISO 3457) has to be performed by the operator as described in the operator's manual. The access system shall comply with ISO 2867.

Effect of mud on the means of access shall be minimized by adequate design.

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.2.2 Access to articulated machines

On machines with articulated frames and in the fully articulated steering position, a minimum clearance of 150 mm for the lower limbs shall be provided between firm structures and components with relative movement in the path of the access systems to the operator's station, as illustrated in Figure 1.

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Dimension in millimetres

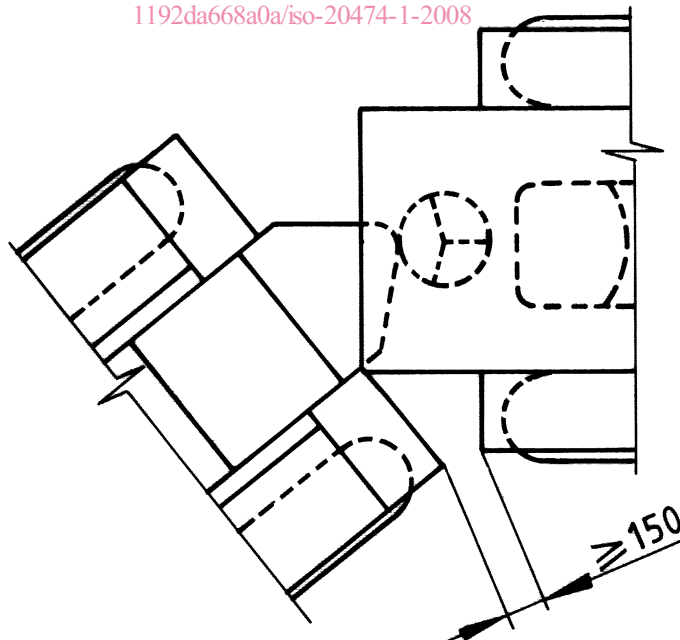


Figure 1 — Minimum clearance of lower limbs at access to operator's station on machines with articulated steering

4.3 Operator's station

4.3.1 General requirements

4.3.1.1 Machinery equipment

Machines with an operating mass of less than 1 500 kg are not required to have a cab.

Machines with an operating mass greater than or equal to 1 500 kg (see ISO 6016) shall be equipped with a cab, unless the foreseeable adverse weather conditions allow all-year operation without a cab (negotiated between manufacturer and user).

Machines shall be equipped with a cab and a contamination protective system if the machine is intended for use in unhealthy environments, e.g. contaminated areas (negotiated between manufacturer and user). See 4.14.1.

If a hazard due to projection of fractured material exists, e.g. operation with a hydraulic- or demolition-hammer, protection such as impact-resistant material, a mesh guard or an equivalent protection may be required for the application. Instructions shall be included in the operator's manual concerning the need for additional protection for such applications, based upon a risk assessment.

For mandatory national and regional requirements, see ISO/TS 20474-14.

4.3.1.2 Minimum space

The minimum space available to the operator shall be as defined in ISO 3411, modified by the provisions of 4.3.2.5.

The minimum space and location of the controls at the operator's station shall be in accordance with ISO 6682.

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For mandatory national and regional provisions, see ISO/TS 20474-14.

4.3.1.3 Moving parts

Measures shall be taken to avoid accidental contact from the operating position with moving parts, e.g. wheels, tracks or working equipment and/or attachments, in accordance with the relevant subclauses of 4.14.

4.3.1.4 Engine exhaust

The engine exhaust system shall release the exhaust gas away from the operator and the air inlet of the cab.

4.3.1.5 Instruction storage

For mandatory national and regional provisions, see ISO/TS 20474-14.

4.3.1.6 Sharp edges

The operator's working space within the operator's station, e.g. ceiling, inner walls, instrument panels and access to the operator's station, shall not present any sharp exposed edges or acute angles/corners. The radius of corners and the bluntness of edges shall comply with ISO 12508, in order to avoid sharp edges (see also 4.14.6).