
**Aircraft ground equipment — Basic
requirements —**

Part 2:
Safety requirements

Matériel au sol pour aéronefs — Exigences de base —

Partie 2: Exigences de sécurité
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Published in Switzerland

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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 6966-2 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 9, *Air cargo and ground equipment*.

This first edition of ISO 6966-2, together with ISO 6966-1, cancels and replaces ISO 6966:1993, which has been technically revised.

ISO 6966 consists of the following parts, under the general title *Aircraft ground equipment — Basic requirements*:

— *Part 1: General design requirements*

— *Part 2: Safety requirements*

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Introduction

This part of ISO 6966 specifies the safety requirements to be taken into account by manufacturers for the design of aircraft ground support equipment. It identifies the various concerns to be taken into consideration to ensure ground equipment safety for operators and aircraft.

Throughout this part of ISO 6966, the minimum essential criteria are identified by use of the key word “shall”. Recommended criteria are identified by use of the key word “should” and, while not mandatory, are considered to be of primary importance in providing safe, economical and usable aircraft ground support equipment. Deviation from recommended criteria should only occur after careful consideration and thorough service evaluation have shown alternative methods to provide an equivalent level of safety.

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Aircraft ground equipment — Basic requirements —

Part 2: Safety requirements

IMPORTANT — In most countries, standing government health and safety laws and regulations apply to machinery, implicitly or explicitly including aircraft ground support equipment. Nothing in this part of ISO 6966, however, shall be deemed or otherwise used to supersede any locally applicable law or regulation, unless a specific exemption has been obtained for this purpose from the appropriate authority.

1 Scope

This part of ISO 6966 specifies the minimum design requirements applicable to all aircraft ground support equipment, as defined in 3.1, in order to ensure

- a) safety of staff operating or maintaining the equipment or in its vicinity;
- b) protection of aircraft against interference or damage.

The requirements of this part of ISO 6966 apply to any piece of aircraft ground support equipment, as defined in 3.1, used on airports. <https://standards.iteh.ai/catalog/standards/sist/63ad1dd7-96dd-40f7-81bd-243cc88b0b32/iso-6966-2-2005>

NOTE An informative list of the most commonly used pieces of ground equipment is provided in Annex A.

This part of ISO 6966 does not provide all the design requirements applicable for aircraft ground support equipment. Other requirements apply, and can be found in separate standards:

- ISO 6966-1 specifies the general, other than safety related, design requirements applicable to all aircraft ground support equipment;
- ISO 4116 specifies the additional requirements applicable for conveying surfaces of those pieces of aircraft ground support equipment intended for handling and loading of baggage and cargo unit load devices;
- specific standards, listed in the Bibliography, define the functional and performance requirements for certain types of aircraft ground support equipment.

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 3411, *Earth-moving machinery — Human physical dimensions of operators and minimum operator space envelope*

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

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

ISO 3864 (all parts), *Graphical symbols — Safety colours and safety signs*

ISO 4116, *Air cargo equipment — Ground equipment requirements for compatibility with aircraft unit load devices*

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

ISO 6966-1, *Aircraft ground equipment — Basic requirements — Part 1: General design requirements*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

ISO 11995:1996, *Aircraft — Stability requirements for loading and servicing equipment*

ISO 14122-3, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails*

ECE 43, *Uniform provisions concerning the approval of safety glazing and glazing material* ¹⁾

ECE 79, *Uniform provisions concerning the approval of vehicles with regard to steering equipment* ¹⁾

3 Terms and definitions

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For the purposes of this document, the terms and definitions given in ISO 6966-1 apply, some of which are reproduced below for the convenience of the user.

3.1

aircraft ground support equipment GSE

ground equipment

ramp equipment

any piece of mobile equipment, whether or not powered or self-propelled, purpose designed, built and used for ground handling, servicing or field maintenance of civil transport aircraft on the ramp area of an airport

NOTE A non-comprehensive informative list of the most commonly used pieces of ground equipment is provided in Annex A.

3.2

ramp area

apron GB

zone of an airport where aircraft manoeuvre and park for ground handling purposes

3.3

ramp

apron GB

tarmac US

surface of the ground in the ramp area

1) ECE 43 and 79 are part of the United Nations Economic Commission of Europe agreement concerning the adoption of uniform conditions of approval and reciprocal recognition of approval for motor vehicle equipment and parts, and can be obtained from any United Nations office.

4 Characteristics

4.1 General

4.1.1 Considerable importance is attached to having equipment into which the essential safety aspects have been incorporated as part of the basic design (design to safety). It is particularly necessary when designing aircraft ground support equipment (GSE) to take into account the adverse conditions which frequently prevail in ramp areas, e.g. congested vehicle movement, exposure to weather, night operation, noise from aircraft and other vehicles, and difficult communications.

4.1.2 Design to safety should be based on a specific comprehensive risk assessment for each type of aircraft GSE, to be conducted by the manufacturer. The retained design should be commensurate with the results of the risk assessment and should take into account, if applicable, each area of potential concern listed in Clause 4.

4.1.3 Design should aim at providing intrinsically safe equipment, i.e. where potentially unsafe occurrences are prevented by basic design features such as equipment and component geometry, layout, or mode of operation, minimizing inasmuch as feasible the necessity to use additive safety devices or circuits. Where such additional devices or circuits dedicated to safety purposes cannot be avoided, risk assessment shall include an evaluation of any potential drawbacks or unforeseen additional hazards resulting from this addition.

4.1.4 All equipment or any component thereof, the failure of which could be hazardous, shall be designed to be fail-safe, or, where impractical, duplicated. In the event of duplication, each of the duplicated components shall separately be capable of safely performing its function in the event of failure of its duplicate.

4.1.5 The content of this part of ISO 6966 was determined by taking into account generally recognized assumptions with regard to

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- a) the normally intended use of aircraft GSE, when used on the ramp of international civil airports in order to handle, service or maintain civil transport aircraft;
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- b) the environmental (surface, slope, weather, lighting, operating rules, staff qualification, etc.) conditions prevailing on the ramp area of the majority of international civil airports.

Manufacturers of aircraft GSE should define in the relevant documentation (see Clause 6) the specifically intended conditions of use and environment for each item of equipment, and purchasers systematically review their own specific conditions of use and environment in order to determine whether those stated are adequate, or negotiate with the manufacturer appropriate modifications to ensure they are.

NOTE For intended operation in Europe, additional EU Machinery Directive requirements also apply. They can be met by complying with the requirements of the following European standards.

EN 1915-1, *Aircraft ground support equipment — General requirements — Part 1: Basic safety requirements*

EN 1915-2, *Aircraft ground support equipment — General requirements — Part 2: Stability and strength requirements, calculations and test methods*

EN 1915-3, *Aircraft ground support equipment — General requirements — Part 3: Vibration measurement methods and reduction*

EN 1915-4, *Aircraft ground support equipment — General requirements — Part 4: Noise measurement methods and reduction*

4.2 Personnel accommodation

4.2.1 Personnel working surfaces

4.2.1.1 All personnel working surfaces, including work platforms, walkways, steps, landings and crossings, as well as stairs, ramps, ladder rungs, cleats or treads, shall be self-draining and have a high-traction (non-slip) surface.

4.2.1.2 Walkways shall have a minimum width of 0,4 m (16 in), except on unit load device conveying surfaces where they shall have a minimum width of 0,3 m (12 in). Standing areas and landings shall have minimum dimensions of 0,4 m × 0,5 m (16 in × 20 in).

4.2.1.3 Ladder and stair treads shall be designed to support a minimum load of 890 N (200 lb). Landings and all personnel working surfaces shall be designed to support a minimum load of 1 100 N (250 lb) for each person occupying said landing and/or working surface at the same time, and withstand a minimum distributed load of 3 000 N·m⁻² (63 lb/ft²) over their whole surface.

4.2.1.4 All operational personnel work platforms and walkways where there is a possibility of falling from heights in excess of 1,0 m (40 in) shall have guardrails with a minimum height of 1,1 m (43 in) in accordance with ISO 14122-3, including the following:

- a handrail;
- a kick plate (toe board) with a minimum height of 0,1 m (4 in);
- at least one knee rail, located no more than 0,5 m (20 in) above the kick plate.

4.2.1.5 On vehicles with an open cabin with passenger seat(s), a hip guard shall be provided on the outside edge of the outer seat(s), with a minimum height of 80 mm (3 in) above the seat surface.

4.2.1.6 Where ladders are used for access, the incline angle shall not be less than 75°, with a maximum of 90°. Where stairs are used, the incline angle shall not be less than 20°, with a maximum of 50°. Equal spacing between rungs or steps, not to exceed 0,3 m (12 in), shall be maintained above the first one. Steps shall have a minimum depth of 80 mm (3 in). Rungs shall have a minimum diameter of 20 mm (0,8 in). A minimum 150 mm (6 in) clearance shall be maintained from any obstruction, including between parallel elements of a telescopic ladder or stair.

4.2.2 Driver/operator cabin

Where a cabin is provided, the minimum size of the driver's or operator's space envelope shall conform to the requirements of ISO 3411. For seated accommodation, individual restraint systems (safety belts) should be provided in accordance with locally applicable regulations.

Where transport of persons other than the driver/operator is specified, the GSE shall be equipped with

- seats, with restraint system when located in the outer position directly behind the windshield, or
- standing accommodation with appropriate handholds.

All glass in doors and windows shall be safety glass meeting the requirements of ECE 43, or alternative material (e.g. polycarbonate) with at least the same performance characteristics. The windshield and all windows considered to be important for the driver's field of view when travelling shall be transparent and as distortion-free as possible.

When selecting driver or operator seats, consideration should be given to

- providing adjustment if required to maintain ergonomic access to controls regardless of the person's size;
- protection against the vibrations encountered during vehicle travelling or operation.

The floor, upholstery and insulation of enclosed cabins shall consist of flame retardant material that has a horizontal burning rate not greater than 250 mm (10 in) per minute in accordance with ISO 3795.

The inside of the cabin shall not include any sharp edges or protrusions. All corners and edges shall be chamfered or rounded with a minimum radius of 3 mm (0,1 in).

4.2.3 Visibility

4.2.3.1 Vehicle drivers and operators shall have clear and unimpaired visibility when operating the unit. The shape and arrangement of any driver's or operator's cabin shall not restrict the field of view for travel or operation. There shall at least be mirrors designed and fitted in such a way that the driver is able to observe the rear sideward areas.

4.2.3.2 Any vehicle equipped with a windshield shall be provided with a powered windshield wiper giving a wipe area of not less than 60 % of the glazed area. A sun visor of suitable size shall be provided. Overhead view panels should also be fitted with wiping mechanisms.

4.2.3.3 On vehicles equipped with an enclosed cabin, the windshield shall be provided with a defogger and/or defroster.

4.2.3.4 Lighting shall be arranged in such a way that no disturbing dazzling effect is caused in conjunction with the windshield and other windows that are in the driver's field of view.

4.2.3.5 Passive visibility of the vehicle shall be enhanced by reflective material or, preferably, fluorescent paint being applied on all its outer corners, using safety colours in accordance with ISO 3864.

4.2.4 Controls, monitoring devices and displays

4.2.4.1 Controls and warning lights shall be grouped and located so as to be convenient to the operator from his normal operating station or stations, within his reach in accordance with ISO 6682. All control device actuators shall be constructed and mounted so as to minimize the risk of inadvertent operation.

4.2.4.2 Where there is more than one station, interlocks should be provided at each station to render inoperative the controls of all other stations.

4.2.4.3 Controls and warning lights shall be properly and permanently identified, preferably by pictograms in accordance with ISO 7000.

NOTE Graphical symbols for use on aircraft ground equipment will form the subject of a future International Standard (ISO 11532).

4.2.4.4 Controls and controlling circuits shall be designed in such a manner that failure within a control or its circuitry will not introduce an unsafe operating condition.

4.2.4.5 All operational controls shall move in the direction of travel for the function which they control, and shall be designed so that when they have been released, the energy initiating the controlled movement is cut off ("hold-to-run" or "dead man" type), unless the control is set to achieve a function to permit the user to accomplish another task. In this case, such set controls shall be detented or similarly locked into the operating position to prevent inadvertent deactivation or reversing. Such controls shall be readily available to the operator(s). Operating controls used only in emergencies need not meet this requirement.

As an exception, the transmission shift lever sequence on automatic transmissions of vehicles to be exclusively operated at North American (USA, Canada, Mexico) airports may conform to local highway vehicle practice with a shift position sequence P, R, N, D, L starting from the front of the vehicle.

4.2.4.6 On-off switches shall be "on" in the up position, or away from the operator if mounted on a horizontal plane.