BS EN ISO 3691-3:2016

BSI Standards Publication

Industrial trucks — Safety requirements and verification

Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads (ISO 3691-3:2016)

bsi.

National foreword

This British Standard is the UK implementation of EN ISO 3691-3:2016. It supersedes BS EN 1726-2:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MHE/7, Industrial trucks.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2017

ISBN 978 0 580 68859 1

ICS 53.060

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2017.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 3691-3

December 2016

ICS 53.060

Supersedes EN 1726-2:2000

English Version

Industrial trucks - Safety requirements and verification - Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads (ISO 3691-3:2016)

Chariots de manutention - Exigences de sécurité et vérification - Partie 3: Exigences complémentaires pour chariots avec poste de conduite élevable et pour chariots spécialement conçus pour une conduite avec des charges en élévation (ISO 3691-3:2016)

Flurförderzeuge - Sicherheitstechnische Anforderungen und Verifizierung - Teil 3: Zusätzliche Anforderungen für Flurförderzeuge mit hebbarem Fahrerplatz und Flurförderzeuge, die zum Fahren mit angehobener Last ausgelegt sind (ISO 3691-3:2016)

This European Standard was approved by CEN on 24 November 2016.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

This document (EN ISO 3691-3:2016) has been prepared by Technical Committee ISO/TC 110 "Industrial trucks" in collaboration with Technical Committee CEN/TC 150 “Industrial Trucks - Safety” the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2017, and conflicting national standards shall be withdrawn at the latest by June 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1726-2:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 3691-3:2016 has been approved by CEN as EN ISO 3691-3:2016 without any modification.

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/396 (Machinery) Mandate to CEN and Cenelec for standardization in the field of machinery to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC Machinery Directive.

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2006/42/EC Machinery Directive

Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
All	All	With the exclusion of all references to ISO/TS 3691-8

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this International Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

The committee responsible for this document is ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*.

This first edition of ISO 3691-3, together with ISO 3691-1, ISO 3691-2, ISO 3691-4, ISO 3691-5, ISO 3691-6, ISO/TS 3691-7, and ISO/TS 3691-8, cancels and replaces ISO 3691:1980, of which it constitutes a technical revision.

ISO 3691 consists of the following parts, under the general title *Industrial trucks — Safety requirements and verification*:

— *Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

— *Part 2: Self-propelled variable-reach trucks*

— *Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads*

— *Part 5: Pedestrian-propelled trucks*

— *Part 6: Burden and personnel carriers*

— *Part 7: Regional requirements for countries within the European Community* [Technical Specification]

— *Part 8: Regional requirements for countries outside the European Community* [Technical Specification]

The following parts are under preparation:

— *Part 4: Driverless industrial trucks and their systems*

Introduction

General

This part of ISO 3691 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 part of ISO 3691.

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.

The ISO 3691 series covers safety requirements and their verification for industrial trucks as defined in ISO 5053-1.

Structure

An important step forward in the work on the ISO 3691 series was the agreement to issue a new structure of International Standards for industrial trucks having on one side, basic standards for all kinds of trucks (see Foreword) and on the other side, independent standards to cover the respective specific functions of industrial trucks, e.g. visibility, noise, vibration, electrical requirements, etc.

Assessment of hazards

The product needs to be designed in such a way that it is fit for its purpose or function and can be adjusted and maintained without putting persons at risk when used under the conditions foreseen by the manufacturer.

In order to properly design a product and to cover all specific safety requirements, the manufacturer will have to identify the hazards that apply to his product and carry out a risk assessment. The manufacturer will then need to design and construct the product taking this assessment into account.

The aim of this procedure is to eliminate the risk of accidents throughout the foreseeable lifetime of the machinery, including the phases of assembling and dismantling where risks of accidents could also arise from foreseeable abnormal situations.

In selecting the most appropriate methods, the manufacturer will need to apply the following principles in the order given here:

a) eliminate or reduce risks as far as possible by design (inherently safe machinery design and construction);

b) take the necessary protective measures in relation to risks that cannot be eliminated by design;

c) inform users of any shortcoming of the protective measures adopted;

d) indicate whether any particular training is required;

e) specify any need to provide personal protection equipment;

f) refer to the appropriate user's document for proper operating instructions.

Industrial trucks need to be designed to prevent foreseeable misuse wherever possible, if such would engender risk. In other cases, the manufacturer's instructions will need to draw the user's attention to ways shown by experience in which the machinery ought not to be used.

This part of ISO 3691 does not repeat all the technical rules which are state-of-the-art and which are applicable to the material used to construct the industrial truck. Reference will also need to be made to ISO 12100.

Legislative situation/Vienna Agreement

From the very beginning, the task of the working group was to revise ISO 3691:1980 and establish worldwide basic standards to comply with the major legislative regulations in, for example, the EU, Japan, Australia, and North America.

Every effort was made to develop a globally relevant International Standard. That goal was achieved with most of the issues. For several potential problem areas, compromises were needed and will be needed in the future. Where divergent regional requirements remain, these are addressed by ISO/TS 3691-7 and ISO/TS 3691-8.

In order to ensure that the revised International Standard will be actively used in the ISO member countries worldwide, procedures are necessary to replace the existing national standards and technical regulations by the revised International Standard. In the European Community, ISO and the European Committee for Standardization (CEN) agreed on technical co-operation under the Vienna Agreement, with the aim of replacing European Standards (EN) by International Standards. Other countries are asked to make similar agreements to ensure that their national standards and technical regulations are replaced by this International Standard.

Only by these actions will there be the guarantee that products in accordance with International Standards can be shipped worldwide freely without any technical barriers.

INTERNATIONAL STANDARD ISO 3691-3:2016(E)

Industrial trucks — Safety requirements and verification —

Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads

1 Scope

This part of ISO 3691 gives safety requirements and the means for their verification, additional to those of ISO 3691-1, for industrial trucks with a vertical, non-tilting mast:

a) those trucks having an elevating operator position, and order-picking trucks, as defined in ISO 5053-1, where the elevating operator position and the load-handling device lifts to a height of more than 1 200 mm above ground level;

b) lateral- and front-stacking trucks, as defined in ISO 5053-1, designed to travel with a load-handling device elevated more than 1 200 mm above ground level, with the load-handling device elevated, lowered or laterally displaced, laden or unladen, while the truck is travelling.

These trucks are designed to travel indoors on a smooth, level surface (e.g. concrete) and can be guided, unguided, or both, when in use; they are not intended to tow or push.

This part of ISO 3691 is not applicable to stacker trucks which handle two loads, one on the forks and the other on the support arms, this type of truck being covered by ISO 3691-1.

It is not applicable to trucks with an elevating operator position up to and including 1 200 mm, or to trucks specifically designed to travel with an elevated load having a fork height up to and including 1 200 mm above ground level.

It is not applicable to low-level order pickers with elevating operator's position up to and including 1 200 mm lift height which can be equipped with an additional load lifting device having a maximum lift height of 1 800 mm from ground level.

This part of ISO 3691 deals with all significant hazards, hazardous situations, or hazardous events, as listed in Annex A, relevant to the applicable machines when used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

It does not establish requirements for hazards that can occur when using trucks on public roads or when operating in potentially explosive atmospheres.

Regional requirements, additional to the requirements given in this part of ISO 3691, are addressed in ISO/TS 3691-7 and ISO/TS 3691-8.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 3691-1:2011, *Industrial trucks — Safety requirements and verification — Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

ISO 5053-1:2015, *Industrial trucks — Terminology and classification — Part 1: Types of industrial trucks*

ISO 6292:2008, *Powered industrial trucks and tractors — Brake performance and component strength*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 22915-21, *Industrial trucks — Verification of stability — Part 21: Order-picking trucks with operator position elevating above 1 200 mm*

ISO 22915-22, *Industrial trucks — Verification of stability — Part 22: Lateral- and front-stacking trucks with and without elevating operator position*

ISO 24134, *Industrial trucks — Additional requirements for automated functions on trucks*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053-1:2015, ISO 12100;2010, ISO 3691-1:2011, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
operating with elevated load
elevation or lowering of a load with the load handling device while the truck is travelling

3.2
elevating operator position
operator's platform which can be elevated more than 1 200 mm from the ground to the floor of the platform measured with the truck unladen

3.3
aisle
operating area of the truck between the racks or load faces

3.4
load-handling device
means that supports the load

EXAMPLE Forks, platform, and attachment.

3.5
auxiliary lift
lift mechanism additional to the main lifting device

3.6
guidance system
system which guides the truck on a predetermined path not directly controlled by the operator

3.7
supplementary platform
load-carrying platform accessible from the operator's platform, designed for mounting on the elevating device of an order-picking truck

Note 1 to entry: This platform may be removable.

3.8
personal fall prevention system
system that limits the fall of the operator

3.9
disposable pallet
pallet intended to be discarded after a single cycle of use

3.10
VNA
very narrow aisle
traffic path for industrial trucks in storage systems without a safety distance of at least 0,5 m between the outer parts of the truck (including the load) and fixed parts of the environment (e.g. uprights)

4 Safety requirements and/or protective measures

4.1 General

The truck shall comply with the safety requirements and/or protective measures of this clause.

In addition, the truck 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 3691.

4.2 Modes of operation when lateral stacking

While the truck is lifting, lowering, or travelling at more than 2,5 km/h, it shall not be possible for any part of the lateral reach mechanism to intrude into the racking space. When this lateral reach mechanism is extended, extending or retracting, travelling speed shall be restricted to 2,5 km/h or less.

When a truck is designed for lateral and front stacking, it shall have a device which automatically prevents:

a) travelling at more than 2,5 km/h when the load handling device is in the forward position;

b) turning of the load-handling device in its forward position with a travelling speed of more than 2,5 km/h.

These requirements do not apply if the load handling device is kept within the truck width (excluding guidance system).

Guided trucks operating in aisles with a non-mechanical guidance system shall comply with the automatic steering requirements of ISO 24134.

4.3 Brakes

4.3.1 Operation without guidance systems

For operations without guidance systems, the braking performance shall comply with ISO 6292:2008, Table 2 or 3, group C.

Braking when travelling at more than 9 km/h is subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7.

4.3.2 Operation within guided systems

For operation within guided systems, the braking performance shall comply with ISO 6292:2008, Table 2 or 3, group C.

4.4 Additional requirements for trucks with elevating operator position

4.4.1 Travel speed

Travel speed shall be dependent on braking (see 4.4.2) and stability requirements (see 4.6).

4.4.2 Brakes

Automatically acting brakes shall be provided. This (these) brake(s) can be a service as well as a parking brake.

4.4.3 Controls

4.4.3.1 Arrangement

All controls to operate the truck shall be arranged at the elevating operator platform, except the emergency lowering control as specified in 4.4.6. It shall not be possible to operate any of the truck functions other than emergency lowering controls unless the operator is at the normal operator position.

4.4.3.2 Fixed section control position

Where two operator positions are embodied, one on the elevating section and one on the fixed section, it shall not be possible to actuate the fixed section controls when the elevating section controls are operable. However, the emergency lowering control requirements specified in 4.4.6 are still applicable.

4.4.3.3 Operator protection

Means shall be provided to keep the operator within the confines of the operating position while operating the truck within very narrow aisles, e.g. two hand controls according to ISO 13851, or operator positioning. Any additional person shall be similarly protected.

4.4.3.4 Fitting of more than one operating position

When a truck with an elevating operator position is fitted with more than one operating position, as defined in ISO 3691-1:2011, 4.4.1.2 and/or 4.4.1.3, a lockable switch or other means, e.g. magnetic card, code system, shall be provided to activate the controls for each operating position, protected as specified in 4.4.3.3.

4.4.4 Systems for lifting and lowering

4.4.4.1 Mechanical lifting systems

The chains employed in the operator and load elevating system shall comply with the requirements of 4.4.4.4 to 4.4.4.6.

4.4.4.2 Hydraulic lifting systems

A device shall be provided which prevents descent in the event of a pipe fracturing or a hose bursting. This device shall be either directly attached to or incorporated in the lift cylinder. It shall not be possible to disengage this device unless the rate of descent is limited to not exceed 0,6 m/s.

4.4.4.3 Combined lifting systems

Combined lifting systems shall comply with 4.4.4.2 and 4.4.4.4 to 4.4.4.6.

4.4.4.4 Chains employed in operator elevating systems

4.4.4.4.1 Where chains are used for elevating/lowering the operating position, at least two identical, independently anchored, chains are to be employed.

4.4.4.4.2 Means shall be provided (e.g. adjustment) to equalize the loading of chains used for elevating and lowering the operator position. It shall be possible to inspect the chains over their entire length without dismantling more than covers or guards.

4.4.4.4.3 As a deviation from ISO 3691-1, the safety factor K_1 for chains shall be at least 10.

4.4.4.4.4 The strength of every chain termination shall be at least 80 % of the certified minimum breaking load of the chain required for the maximum actual capacity of the truck.

4.4.4.5 Slack chain detection

Operator elevating mechanisms that use chains shall be fitted with a slack chain detection device. The slack chain detection device when actuated shall automatically stop the downward motion of the elevating mechanism of the operator platform.

4.4.4.6 Disengagement of the operator's platform

Means shall be provided to prevent the operator's platform from being accidentally disengaged from the elevating mechanism over the complete range of its movements (e.g. limitation of stroke or mechanical stop).

4.4.5 Operator position

4.4.5.1 Operator's platform

Elevated operator's platforms with a lift height of more than 1 200 mm from the ground and fixed operator's stand-on platforms located at heights of more than 1 200 mm shall be equipped with means of fall protection on all sides (e.g. bars or guard rails).

The upper surface of the means shall be at a height between 900 mm and 1 100 mm measured from the upper surface of the means to the floor of the elevated operator position. The means shall be capable of withstanding without permanent deformation a force of 900 N applied in a vertical downwards direction and a force of 900 N applied in a horizontal direction from the inside to the outside, and shall not be capable of being opened outwards.

Where guard rails are fitted, they shall comprise top rails, intermediate rails, and toe boards. The toe board shall have a height of 100 mm and the bottom edge of the toe board shall be at a maximum height of 35 mm above the floor.

See Figures 1 to 4 for different types of platforms and examples of guarding.

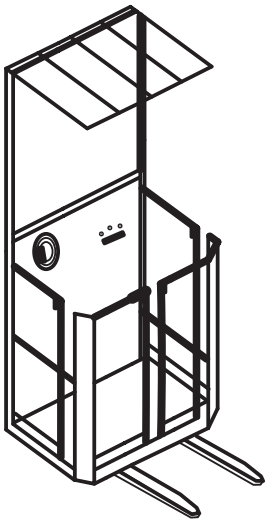

Figure 1 — Standard platform without auxiliary lift (schematic only)

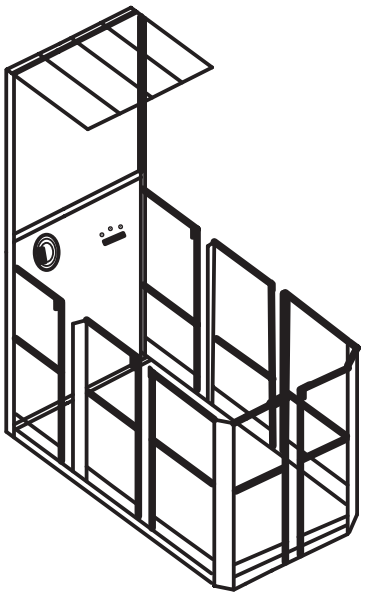

Figure 2 — Extended platform (schematic only)

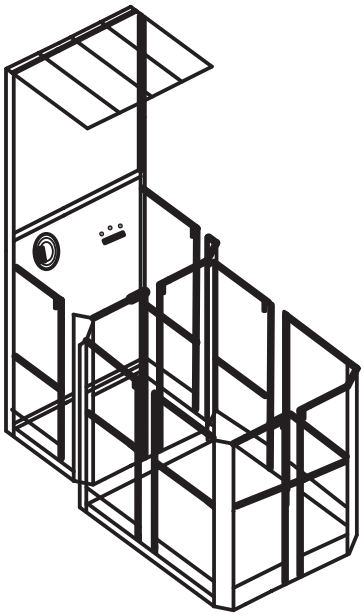

Figure 3 — Supplementary platform (schematic only)

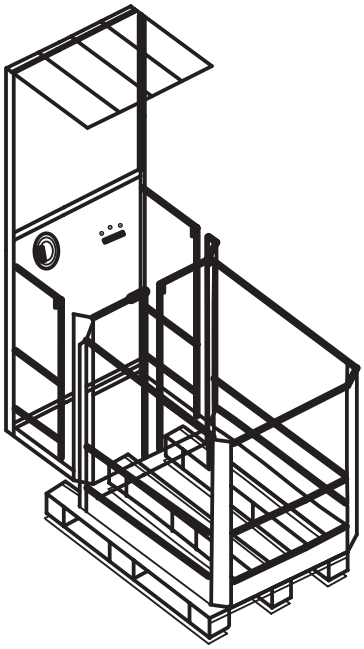

Figure 4 — Supplementary platform with defined walking surface (pallet) (schematic only)

4.4.5.2 Interlocking of guards

The access gate/door shall not be capable of opening outwards or downwards. When the operator's position is above 1 200 mm, the gates, doors, etc. shall have a means, e.g. electrical interlocking, that prevents travelling, elevating or lowering movements when they are not correctly closed. If a trapdoor in the floor is used, it shall have the dimensions specified in ISO 2860 and shall only open upwards.

Interlocking gates are not required if a fall prevention system according to 4.4.5.5 is used.

4.4.5.3 Guarding for supplementary platform

If an extended or supplementary platform as shown in Figures 2 to 4 is provided, it shall fulfil the requirements of 4.4.5.1 and shall be extended to encompass the whole area accessible to the operator and assistant if an assistant is permitted by design. If no supplementary platform is in place (see Figure 1), a mechanical guard as specified in 4.4.5.1 and 4.4.5.2 shall be in place between the operator's platform and the load-handling device; alternatively, the operator's platform shall be prevented from lifting above 1 200 mm.

The requirements for supplementary platforms equipped with a fall protection device are subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-8.

4.4.5.4 Defined walking surface

For trucks intended by the manufacturer to be used with a defined walking surface, as shown in Figure 4, means, which are part of the truck, shall be provided to join the walking surface by a positive engagement device to prevent overturning and shifting of that walking surface [see 6.2 f)]. Disposable pallets are not allowed.

If no defined walking surface is in place, a mechanical guard as specified in 4.4.5.1 and 4.4.5.2 shall be in place between the operator platform and the load-handling device or the platform shall be prevented from lifting above 1 200 mm.

A top rail omitting the intermediate rail and the toe board is sufficient at the opposite end of the operator's platform.

4.4.5.5 Platforms equipped with a fall protection device

Platforms equipped with a fall protection device are subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-7 and ISO/TS 3691-8.

4.4.5.6 Anchorage points of fall protection device(s)

Anchorage point(s) of fall protection device(s) shall be capable of withstanding three consecutive drop tests of 135 kg falling a distance of 1 800 mm without failure of the anchorage point. If a second person is to use the same anchorage point, the test weight shall be 270 kg.

Anchorage points for fall protection is subject to regional requirements, additional to the requirements of this part of ISO 3691. See ISO/TS 3691-8.

4.4.5.7 Prevention of being trapped

When the truck is used in very narrow aisles and where the operator platform is lifted more than 3 000 mm above the ground and where the enclosure of the operator position is such that the operator could become trapped, the doors shall be designed to facilitate release from the outside or an alternative means of egress/access, e.g. trap door, shall be provided.

4.4.5.8 Floor of the operator position

The floor of the operator position shall be horizontal and slip resistant, e.g. ribbed mats, abrasive coating, expanded metal, or similar material.

a) It shall be capable of withstanding a pressure of 1 500 N/m^2 and a mass of 100 kg uniformly distributed over any area of 0,16 m^2 at any part of its surface.

b) Where the floor is provided with glazing, it shall be of equivalent supporting strength to the floor or be protected to a standard equivalent to the floor. The glass shall be of safety type, e.g. toughened glass, laminated glass. Alternatively, plastic can be used.

c) Where grated flooring is used, the holes or openings shall not allow a 20 mm diameter sphere to pass through. The section of each opening shall in no case exceed 400 mm^2.

4.4.5.9 Sides fitted with glazing

If the sides of the operator platform are fitted with glazing it shall be toughened or laminated safety glass. The protection specified in 4.4.5.1 shall be extended across the glazing as appropriate. Alternatively, plastic can be used provided it has equivalent strength to toughened or laminated glass.

4.4.6 Emergency lowering control

Trucks designed to elevate the operator more than 3 000 mm above ground level shall be fitted with an emergency lowering control, that is capable of being operated from ground level whose function is to return the elevating operator position to ground level, even in the absence of any energy source. The rate of descent is limited to 0,6 m/s. The control position shall not be in the path of the load, platform, or elevating means.

4.5 Optical warning devices

Trucks designed to elevate more than 3 000 mm above ground level shall be fitted with an optical warning device. The warning device shall flash (e.g. flashing light or revolving light) and be visible from ground level. The warning device shall flash when the operator's platform is being lowered and/or when the truck is travelling.

4.6 Stability

In order to reduce the hazards of longitudinal and lateral tip over in the operating conditions foreseen by the manufacturer, trucks specified below shall comply with the requirements as specified in the following International Standards:

— for order-picking trucks with operator positions elevated above 1200 mm, ISO 22915-21;

— for lateral and front stacking trucks with or without elevating operator, ISO 22915-22.

The requirements for stability are subject to regional requirements; see ISO/TS 3691-7.

5 Verification of requirements

Verification shall be in accordance with ISO 3691-1:2011, Clause 5.

6 Information for use

6.1 General

Each truck and removable attachment shall be supplied to the user with an instruction handbook(s) covering operating and regular servicing, and addressing all identified hazards, printed in the language(s) of the country in which the truck is to be used, where required by national law. See also ISO 12100:2010, Clause 6.

There is no need for the workshop and parts handbooks intended for use by specialized personnel employed by the manufacturer or their authorized representative to be supplied with each truck, and these can be printed in the language of the country where the truck is to be used, as required by national law. In other cases, the instructions shall be in a language agreed between the truck supplier and purchaser.

6.2 Instruction handbook — Operation of truck — Requirements additional to those of ISO 3691-1

a) Information on how to operate the truck if the conditions according to 4.4.4.5 has occurred.

b) Instruction for operation with a specific number of person(s).

c) Instruction for ingress and egress to the operator's platform in an elevated position.

d) Instruction for operation of the emergency lowering control.

e) Information on procedure to be followed should the operator be stuck in an elevated position.

f) Information about pallets which can be used as a walking surface as described in 4.4.5.4 and their fixing means.

g) Restriction concerning towing, pushing, and abnormal use.

h) Instructions for operation with and without guidance systems.

i) Information about devices for the protection of additional persons within the confines of the operator's platform.

j) Instruction for operation with platform elevated.

k) Information addressing visibility when platform elevated.

l) Instruction for the use of fall protection systems.

m) Information about maintenance and replacing the parts of the fall protection system (e.g. tether/lanyard).

n) Information to the operator about the effect of operator mass on capacity and stability of the truck.

6.3 Marking

Trucks shall be marked legibly and indelibly (e.g. weather proof, profiled letters) with the following minimum information:

The number of persons permitted on the operator's platform while the truck is in use.

6.4 Installation information

6.4.1 The truck manufacturer shall provide the user with dimensional tolerances for the floor, clearance requirements for racking, and details of other interfacing equipment.

6.4.2 The truck manufacturer shall provide information to the (end) user that trucks operating in aisles with guidance systems shall have a designed minimum side clearance of not less than 90 mm between any elevating part of the truck, including the load and the racking or loads in the rack in their proper stacked position.

Annex A
(informative)

List of significant hazards

This list contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this part of ISO 3691, identified by risk assessment of carriers and which require action to eliminate or reduce the risk. The list is additional to that given in ISO 3691-1 and is intended to be used together with it. See Table A.1 and ISO 3691-1:2011, Table A.1.

NOTE The structure of the table is based on that of ISO 12100:2010, Table B.1. The order of lines within a group corresponds to the truck functionalities.

Table A.1 — List of significant hazards

No.	Type or group/origin	Potential consequences	Clause/ subclause	Corresponding requirement
1	**Mechanical hazards**			
	— Acceleration, deceleration (kinetic energy) — Machinery mobility — Moving elements — Rotating elements	— Being run over — Being thrown — Crushing — Drawing-in or trapping — Impact	4.2	Modes of operation with lateral stacking
			4.3, 4.4.2	Brakes
			4.4.1	Travel speed
			4.4.3	Controls
			4.4.4	System for lifting and lowering
			4.4.5	Operator's position
			4.5	Optical warning devices
			Clause 5	Verification of safety requirements and/ or protective measures
			Clause 6	Information for use
	— Angular parts — Approach of a moving element to a fixed part — Cutting parts — Sharp edges	— Crushing — Cutting or severing — Drawing-in or trapping — Entanglement — Shearing — Stabbing or puncture	4.2	Modes of operation with lateral stacking
			4.4.3.3	Operator protection
			4.4.5	Operator position
			4.4.5.7	Prevention of being trapped
			4.4.6	Emergency lowering control
			Clause 5	Verification of safety requirements and/ or protective measures
			Clause 6	Information for use
	— Gravity (stored energy)	— Crushing — Impact	4.4.4.2	Hydraulic lifting system
			4.4.4.4	Chains employed in operator lifting system
			4.4.4.5	Slack chain detection
			Clause 5	Verification of requirements
			Clause 6	Information for use

Table A.1 *(continued)*

No.	Type or group/origin	Potential consequences	Clause/ subclause	Corresponding requirement
	— Height from ground	— Being thrown	4.3	Brakes
		— Crushing	4.4	Additional requirements for trucks with elevating operator position
		— Drawing-in or trapping	4.6	Stability
		— Impact	Clause 5	Verification of requirements
		— Slipping, tripping and falling	Clause 6	Information for use
	— Rough, slippery surface	— Slipping, tripping and falling	4.4.5.8	Floor of operator position
	— Stability	— Being thrown	4.6	Stability
		— Crushing	Clause 5	Verification of safety requirements and/ or protective measures
		— Impact	Clause 6	Information for use
2	**Electrical hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
3	**Thermal hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
4	**Noise hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
5	**Vibration hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
6	**Radiation hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
7	**Material/substance hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
8	**Ergonomic hazards**			
	— Access	— Discomfort	4.4.5	Operator position
	— Design or location of indicators and visual display units	— Fatigue	Clause 5	Verification of safety requirements and/ or protective measures
	— Design, location, or identification of control devices	— Musculo-skeletal disorders	Clause 6	Information for use
	— Effort	— Stress		
	— Local lighting	— Any other (e.g. mechanical, electrical) as a consequence of human error		
	— Mental overload/underload			
	— Posture			
	— Repetitive activity			
	— Visibility			
9	**Hazards associated with environment in which machine is used**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			
10	**Combination of hazards**			
	No origin of this kind of hazard in industrial trucks covered by these specifications			

Bibliography

[1] ISO/TS 3691-7, *Industrial trucks — Safety requirements and verification — Part 7: Regional requirements for countries within the European Community*

[2] ISO/TS 3691-8, *Industrial trucks — Safety requirements and verification — Part 8: Regional requirements for countries outside the European Community*

[3] ISO 13851, *Safety of machinery — Two-hand control devices — Functional aspects and design principles*

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