

Safety of industrial trucks — Self-propelled trucks up to and including 10 000 kg capacity and industrial tractors with a drawbar pull up to and including 20 000 N —

Part 1: General requirements

The European Standard EN 1726-1:1998, with the incorporation of amendment A1:2003, has the status of a British Standard

ICS 53.060

National foreword

This British Standard is the English language version of EN 1726-1:1998, including amendment A1:2003.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee MHE/7, Industrial trucks, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 92, an inside back cover and a back cover.

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Amendments issued since publication

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ICS 53.060

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English version

Safety of industrial trucks — Self-propelled trucks up to and including 10 000 kg capacity and industrial tractors with a drawbar pull up to and including 20 000 N — Part 1: General requirements

(includes amendment A1:2003)

Sécurité des chariots de manutention —
Chariots automoteurs de capacité n'excédant
pas 10 000 kg et tracteurs dont l'effort au
crochet est inférieur ou égal à 20 000 N —
Partie 1: Prescriptions générales
(inclut l'amendement A1:2003)

Sicherheit von Flurförderzeugen —
Motorkraftbetriebene Flurförderzeuge bis
einschließlich 10 000 kg Tragfähigkeit und
Schlepper bis einschließlich 20 000 N
Zugkraft —
Teil 1: Allgemeine Anforderungen
(enthält Änderung A1:2003)

This European Standard was approved by CEN on 30 October 1998; amendment A1 was approved by CEN on 18 March 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by 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 May 1999, and conflicting national standards shall be withdrawn at the latest by May 1999.

This European Standard 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 standard.

This European Standard is one of a series of European Standards for the safety of industrial trucks.

EN 1175-1, *Safety of industrial trucks — Electrical requirements — Part 1: General requirements for battery-powered trucks.*

EN 1175-2, *Safety of industrial trucks — Electrical requirements — Part 2: General requirements for internal combustion engine powered trucks.*

EN 1175-3, *Safety of industrial trucks — Electrical requirements — Part 3: Specific requirements for electrical power transmission systems of internal combustion engine powered trucks.*

EN 1459, *Safety of industrial trucks — Self-propelled variable reach trucks.*

EN 1525, *Safety of industrial trucks — Driverless industrial trucks and their systems.*

EN 1526, *Safety of industrial trucks — Additional requirements for automated functions on trucks.*

EN 1551, *Safety of industrial trucks — Self-propelled trucks over 10 000 kg capacity.*

EN 1726-1, *Safety of industrial trucks — Self-propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull including 20 000 N — Part 1: General requirements.*

EN 1726-2, *Safety of industrial trucks — Self-propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull including 20 000 N — Part 2: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads.*

EN 1755, *Safety of industrial trucks — Operation in potentially explosive atmospheres: use in flammable gas, vapour, mist and dust.*

EN 1757-1, *Safety of industrial trucks — Pedestrian propelled trucks — Part 1: Stacker trucks.*

EN 1757-2, *Safety of industrial trucks — Pedestrian propelled trucks — Part 2: Pallet trucks.*

EN 1757-3, *Safety of industrial trucks — Pedestrian propelled trucks — Part 3: Platform trucks.*

EN 1757-4, *Safety of industrial trucks — Pedestrian propelled trucks — Part 4: Scissor lift pallet trucks.*

EN 12053, *Safety of industrial trucks — Test methods for measuring noise emissions.*

EN ISO 13564, *Safety of industrial trucks — Test methods for measuring visibility from self-propelled trucks.*

EN 13059, *Safety of industrial trucks — Test methods for measuring vibration.*

EN 12895, *Safety of industrial trucks — Electromagnetic compatibility.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This document EN 1726-1:1998/A1:2003 has been prepared by Technical Committee CEN/TC 150, Industrial trucks — Safety, the Secretariat of which is held by BSI.

This amendment to the European Standard EN 1726-1:1998 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

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.

This amendment to EN 1726-1:1998 covers the need to include the requirement for operator restraint and the specification requirements and test procedure for operator restraint systems, resulting from issues raised by the EU Commission Standing Committee 98/37.

This amendment A1 covers the necessary additional precautions by replacing existing text of EN 1726-1:1998 or adding new clauses as indicated.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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0 Introduction

This European Standard is a type C standard as stated in EN 292-1:1991. This standard has been prepared to be a harmonized standard to provide one means of conforming with the essential safety requirements of the Machinery Directive and associated EFTA regulations.

The extent to which hazards are covered is indicated in the Scope of this standard. In addition, industrial trucks shall comply as appropriate with EN 292-1:1991 for hazards which are not covered by this standard.

1 Scope

1.1 This European Standard applies to self-propelled industrial trucks including masted rough terrain trucks (see ISO 5053:1987, **3.1.3.1.8**) with removable and integrated attachments with a rated capacity up to and including 10 000 kg and to tractors with a rated drawbar pull up to and including 20 000 N.

This European Standard does not apply to:

- non-stacking low-lift straddle carriers (ISO 5053:1987, **3.1.3.2.3**);
- stacking high-lift straddle carriers (ISO 5053:1987, **3.1.3.1.11**);
- trucks powered by natural gas;
- single-axle industrial trucks.

1.2 A self-propelled industrial truck (hereinafter generally referred to as a truck) is any wheeled vehicle — except one running on rails — designed to carry, tow, push, lift, stack or tier in racks any kind of load and which is controlled by an operator who either walks with the truck or rides on a seat or on a specially arranged platform.

A pedestrian controlled industrial truck (see ISO 5053:1987, **3.4.2**) with a stand-on option is a pedestrian controlled industrial truck for the purposes of this standard.

A stand-on industrial truck (see ISO 5053:1987, **3.4.1.2**) with an auxiliary seat for the operator is considered to be a stand-on industrial truck for the purposes of this standard.

1.3 This European Standard covers the technical requirements necessary to minimize the specific hazards listed in Clause 4 which could occur during normal operation and maintenance (in accordance with the data given by the manufacturer or their authorized representative) of industrial trucks.

This European Standard does not cover those requirements to minimize hazards which may occur:

- during construction;
- when handling suspended loads which may swing freely;
- when using trucks on public roads;
- when using a work platform.

This European Standard 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 should be made to EN 292-2:1995.

1.4 This European Standard applies to industrial trucks equipped with load handling devices for normal industrial duties, e.g. fork arms or platforms, or attachments for specified applications. Fork arms, load platforms and integrated attachments are considered to be parts of the industrial truck.

Attachments mounted on the load carrier or on the fork arms which are removable by the user are not considered to be part of the industrial truck.

For attachments the appropriate clauses of this standard are applicable.

1.5 Where industrial trucks are required to operate in severe conditions (e.g. in extreme climates, in freezer applications, strong magnetic fields) special precautions may be necessary. These are not covered by this standard.

1.6 For trucks with an elevating driver position of more than 1 200 mm and/or trucks especially designed to travel with an elevated load of more than 1 200 mm the additional requirements of prEN 1726-2 apply.

1.7 This amendment applies to trucks put on the market after the date of publication. ^(A1)

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 281:1988, *Construction and layout of pedals of self-propelled industrial trucks; sit-down rider-controls*.

EN 292-1:1991, *Safety of machinery — Basic concepts — General principles for design — Part 1: Basic terminology methodology*.

EN 292-2:1995, *Safety of machinery — Basic concepts — General principles for design — Part 2: Technical principles and specifications*.

EN 954-1, *Safety of machinery — Safety related parts of control systems — Part 1: General principles for design*.

EN 1175-1, *Safety of industrial trucks — Electrical requirements — Part 1: General requirements for battery-powered trucks*.

EN 1175-2, *Safety of industrial trucks — Electrical requirements — Part 2: General requirements for internal combustion engine powered trucks*.

EN 1175-3, *Safety of industrial trucks — Electrical requirements — Part 3: Specific requirements for electrical power transmission systems of internal combustion engine powered trucks*.

EN 1526, *Safety of industrial trucks — Additional requirements for automated functions on trucks*.

prEN 1726-2, *Safety of industrial trucks — Self-propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull including 20 000 N — Part 2: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads*.

prEN 1755, *Safety of industrial trucks — Operation in potentially explosive atmospheres: use in flammable gas vapour mist and dust*.

prEN 1757-1, *Safety of industrial trucks — Pedestrian propelled trucks — Part 1: Stacker trucks*.

prEN 12053, *Safety of industrial trucks — Test methods for measuring noise emissions*.

prEN ISO 13564, *Safety of industrial trucks — Test methods for measuring visibility from self-propelled trucks*.

prEN 13059, *Safety of industrial trucks — Test methods for measuring vibration*.

ISO 1074:1991, *Counterbalanced fork lift trucks — Stability tests*.

ISO 2330:1995, *Fork-lift trucks — Fork arms — Technical characteristics and testing*.

ISO 2867:1994, *Earth-moving machinery — Safety requirements — Access systems*.

ISO/DIS 3184.2, *Reach and straddle fork-lift trucks — Stability tests*.

ISO/DIS 3287, *Powered industrial trucks — Control symbols*.

ISO 3795:1989, *Road vehicles and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*.

ISO 5053:1987, *Powered industrial trucks — Terminology, Bilingual edition*.

ISO 5766:1990, *Pallet stackers and high-lift platform trucks — Stability tests*.

ISO 5767:1992, *Industrial trucks operating in special conditions of stacking with mast tilted forward — Additional stability tests*.

ISO 6055, *High-lift rider trucks — Overhead guards — Specification and testing*.

ISO 6292:1996, *Powered industrial trucks — Brake performance and component strength*.

ISO 10525, *Counterbalanced trucks handling freight containers of 6 m (20 ft) length and above — Additional stability tests*.

ISO 10658:1996, *Industrial trucks operating in special conditions of stacking with load offset by powered devices — Additional stability tests*.

3 Definitions

For the purposes of this standard the definitions of the industrial trucks and their components given in ISO 5053:1987 apply, together with the following.

3.1

operator

any trained person who is responsible for the movement and load handling of the industrial truck
the operator may be transported by the industrial truck, or may be on foot accompanying the truck or may be remote from the truck (cables, radio etc.)

3.2

normal operating position

position in which the operator shall be able to control all functions for driving and load handling

3.3

low lift height

lifting height providing sufficient ground clearance for horizontal transport of loads up to and including 500 mm

NOTE Non-stacking.

3.4

automatically acting brakes

brakes which are applied in non-operated conditions by stored energy, e.g. spring force, until released by sustained force under the control of the operator

the brake is automatically applied in the event of failure of energy supply to the brake system

3.5

normal operating conditions

normal operating conditions are those described in the stability documents as shown in 5.8

The following applies to trucks for which stability tests are not specified:

- a) driving (travelling and lifting) on substantially firm, smooth, level and prepared surfaces;
- b) driving with the load centre of gravity approximately on the longitudinal centre plane of the truck;
- c) travelling with the mast or fork arms tilted backwards, where applicable, and the load in the lowered (travelling) position

NOTE to a) The precise floor conditions differ with the type of truck, e.g. a reach truck with small solid tyres requires a smoother and more level floor than a counterbalanced truck with larger pneumatic tyres. The floor conditions on which the type of truck is designed to operate shall be specified in the instruction manual (see 7.2.2).

3.6 Rated capacity

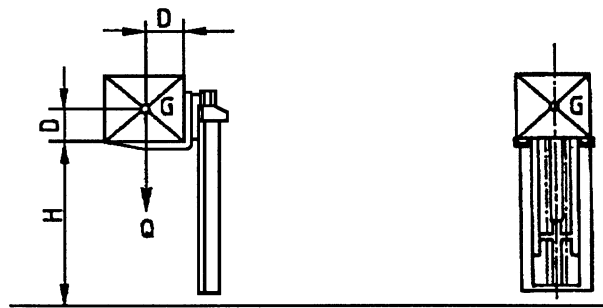
3.6.1

rated capacity of high lift trucks

load in kilograms, given by the manufacturer, that the truck type is capable of transporting or lifting under the following specific conditions

For the load Q the following conditions apply:

- load centre of gravity G (see Figure 1) position in the standard load centre distance D (3.9);
- load Q vertical stacked to the standard lift height (3.8);
- trucks equipped with a double mast where the maximum lift height is equal to the standard lift height. When the truck does not utilize a double mast it shall be given a rated capacity on the standard lift height as if the mast were available



- D = standard load centre distance
 G = load centre of gravity, positioned in the longitudinal plane of symmetry between the mast uprights
 H = standard lift height
 Q = rated load

Figure 1

3.6.2

rated capacity of trucks with low lift height

the rated capacity is the maximum load in kilograms permitted by the manufacturer and uniformly distributed over the load carrying platform or device, that the truck is capable of transporting and lifting under normal use

the rated capacity is equal to the actual capacity

NOTE This also applies to trucks with fixed platforms.

3.6.3

rated capacity of removable attachments

the maximum load in kilograms and load centre distance, where appropriate, that the attachment is capable of handling in normal operation under conditions specified by the attachment manufacturer

3.7

actual capacity

the maximum load in kilograms depending on lift height, load centre and attachments, permitted by the manufacturer that the subject truck is capable of transporting or lifting in normal use (the use for which a truck is designed according to the manufacturer or his authorized representative)

actual capacity may vary with the different types and heights of mast fitted, and the different standard load centre distances (3.9) used in rating

additional actual capacity ratings with removable attachments may also be established where permitted by the appropriate stability tests

3.8

standard lift height

height H in millimetres measured from the ground to the upper face of the fork blades or lifting platform
these heights are standardized as follows:

- $H = 2\,500$ mm for pallet stackers and high-lift platform trucks having a width across fork arms or platform up to and including 690 mm;
- $H = 3\,300$ mm for all other types of truck

3.9

standard load centre distance

distance D in millimetres measured horizontally and vertically between the centre of gravity of the load G and the front face of the fork shank and the upper face of the fork blade (Figure 1)

The standard load centre distances are:

- for counterbalanced trucks, as specified in Table 1:

Table 1

Rated load Q in kg		Standard load centre distance D in mm		
from	up to and not including	400	500	600
0	1 000	X		
1 000	5 000		X	
5 000	10 001			X

- for single side-loading trucks and lateral and front stacking trucks, as specified by the manufacturer;
- for trucks for special applications, in relation to the application;
- for all other trucks 600 mm

3.10

rated drawbar pull of tractors

the horizontal drawbar pull at the coupling, in newtons, given by the manufacturer, that the industrial tractor can develop at a specified coupling height whilst travelling on a smooth, dry and horizontal concrete surface:

- for tractors powered by an internal combustion engine, whilst moving at a uniform speed of not less than 10 % of the rated no-load speed; and
- for battery powered tractors, which can be sustained continuously for a period of 1 h

For stand-on or sit-on tractors the rated drawbar pull shall be established using an operator's mass of 90 kg (ballasted accordingly)

NOTE The requirements for the quality of the floor may differ for the floor used indoors and outdoors. This floor quality depends on the operating conditions of the tractor. These conditions shall be specified in the instruction handbook (see 7.2.2).

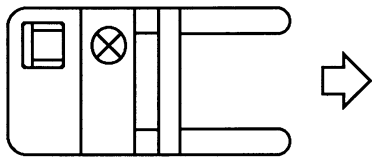
3.11

forward driving direction and front end

the arrow shows the forward direction of the truck (priority travel)

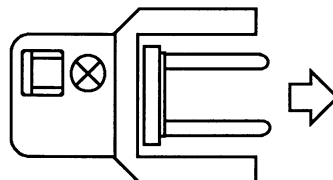
The front end of the truck is the end nearest to the arrow

3.11.1
sit-on trucks



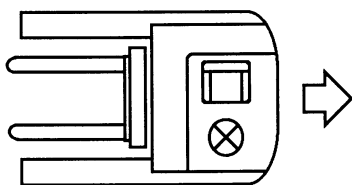
a) Counterbalanced lift truck

Figure 2



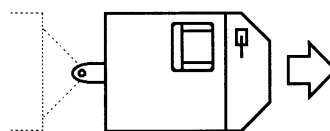
b) Straddle or reach truck (with retractable mast or fork)

Figure 3



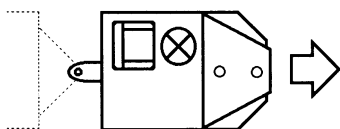
c) Straddle or reach truck (with retractable mast or fork) with the operator facing at right angles to the normal line of travel

Figure 4



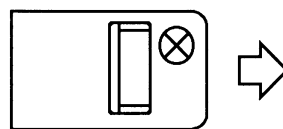
d) Towing tractor – Front-end control

Figure 5



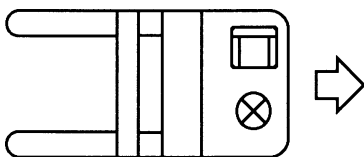
e) Towing tractor – Rear-end control

Figure 6



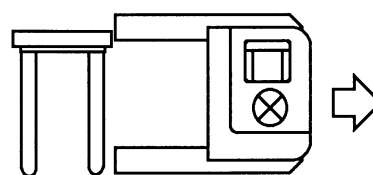
f) Fixed-platform truck

Figure 7



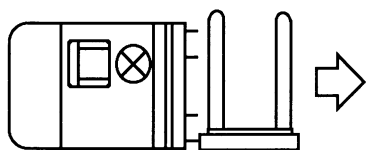
g) Counterbalanced lift truck with the operator facing at right angles to the normal line of travel

Figure 8



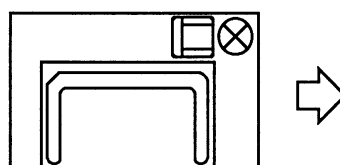
h) Lateral stacking truck with the operator facing at right angles to the normal line of travel

Figure 9



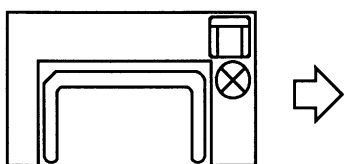
i) Lateral stacking trucks with the operator seated forward

Figure 10



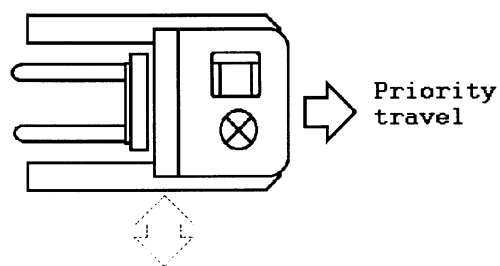
j) Side loading truck

Figure 11



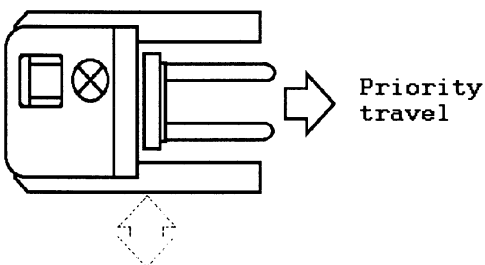
k) Side-loading truck with the operator facing at the right angles to the normal line of travel

Figure 12



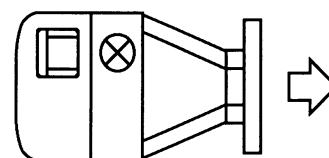
l) Multi-directional reach trucks with the operator facing at right angles to the normal line of travel

Figure 13



m) Multi-directional reach truck with the operator seated forward

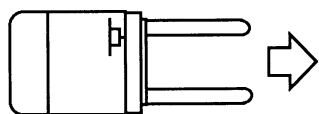
Figure 14



n) Pushing tractor

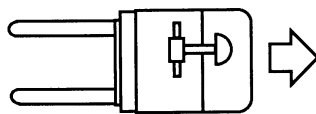
Figure 15

3.11.2 stand-on trucks



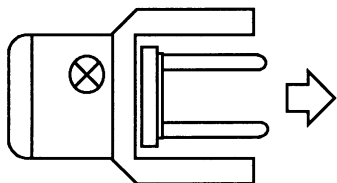
a) Counterbalanced lift truck with steering wheel

Figure 16



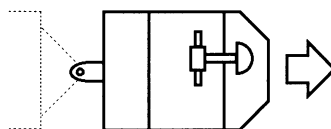
b) Counterbalanced lift truck with tiller control, operator facing away from load

Figure 17



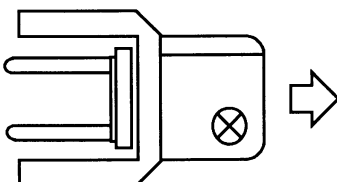
c) Straddle or reach truck (with retractable mast or fork)

Figure 18



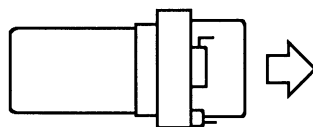
d) Towing tractor with tiller

Figure 19



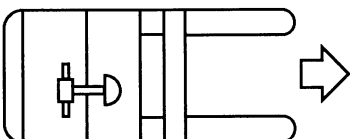
e) Straddle or reach truck (with retractable mast or fork) with operator facing approximately at right angles to the normal line of travel

Figure 20



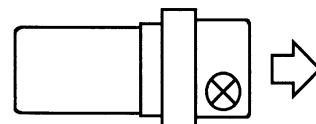
f) High-lift or low-lift platform truck or powered pallet truck or pallet stacker

Figure 21



g) Powered pallet truck with tiller and platform and operator facing substantially away from the direction of forward travel

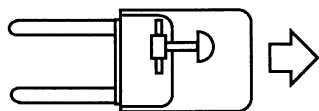
Figure 22



h) High-lift platform or fixed platform truck, powered pallet truck or pallet stacker with operator facing approximately at right angles to the normal line of travel

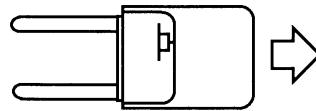
Figure 23

NOTE The platform may be a fold away type — the truck will then change to pedestrian operation (see Figure 29).



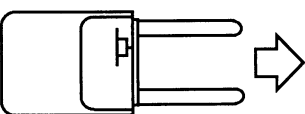
i) Order picker truck with tiller control (elevating operator position possible)

Figure 24



j) Order picker truck with steering wheel (elevating operator position possible)

Figure 25

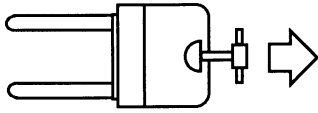


k) Order picker truck with steering wheel (elevating operator position possible)

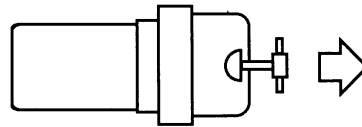
Figure 26

3.11.3

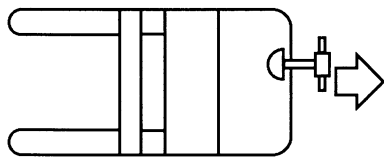
pedestrian-controlled trucks with tiller



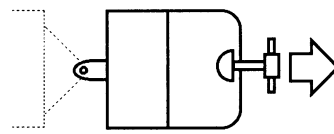
a) Pallet truck or high-lift pallet truck
Figure 27



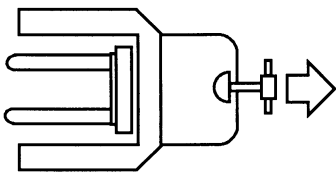
b) High-lift or fixed platform truck
Figure 28



c) Counterbalanced lift truck
Figure 29



d) Tractor
Figure 30



e) Straddle truck or reach truck
Figure 31

4 List of hazards

The following hazards from EN 414:1992, Annex A, are applicable in the situations described and could involve risks to persons if not reduced or eliminated. The corresponding requirements are designed to limit the risk or reduce these hazards in each situation.

Hazard		Corresponding requirement	
4.1	Mechanical hazards		
4.1.1	Crushing hazard	5.3	Brakes
		5.4	Controls
		5.5.3	Engine access
		5.7	Operator position
		5.7.3	Platform
		5.7.5	Protection from road wheels
		5.7.7	Protection against crushing, shearing and trapping points
		5.9.1	Operator's overhead guard
		5.9.3	Warning device
		5.9.5	Towing devices
		5.10.1	Visibility
		5.11.1.1	Cab headroom
		5.11.5	Transport
		7.2.2	Operation of the truck
		7.3.3.4	Warning symbols
4.1.2	Shearing hazard	5.3	Brakes
		5.4	Controls
		5.5.3	Engine access
		5.7	Operator position
		5.7.3	Platform
		5.7.5	Protection from road wheels
		5.7.7	Protection against crushing, shearing and trapping points
		5.9.3	Warning device
		5.9.4	Wheels with split wheel rims
		5.10.1	Visibility
		7.2.2	Operation of the truck
		7.3.3.4	Warning symbols
4.1.3	Cutting or severing hazard	5.1.3	Edges or angles
		5.5.3	Engine access
		5.7.7	Protection against crushing, shearing and trapping points
4.1.4	Entanglement hazard	5.5.3	Engine access
4.1.5	Drawing-in or trapping hazard	5.5.3	Engine access
		5.7.5	Protection from road wheels
		5.7.7	Protection against crushing, shearing and trapping points
		5.7.8	Operator restraint 
	— Cab	5.11.1.6	Cab

Hazard		Corresponding requirement
4.1.6	Impact hazard — from mechanical failure	5.1.2 Calculation
		5.6.1 Lift chains and wire ropes
		5.6.2 Mechanical lifting system
		5.6.3 Hydraulic lifting and tilting system
		5.6.5 Fork arms
		6.2 Structural verification
		7.2.2 Operation of the truck
	— from unstable loads	5.6.2 Mechanical lifting system
		5.6.3 Hydraulic lifting and tilting system
		5.6.5.2 Fork arms
		5.6.6 Fork carriers
		5.6.7 Attachments
	— from road debris — from lifting or transporting a truck	5.9.1 Operator's overhead guard
		5.9.2 Load backrest
		5.11.1.1 Cab headroom
		5.7.5.1 Protection from road wheels
		5.11.5 Transport
4.1.7	Stabbing or puncture hazard	5.1.3 Edges or angles
		7.2.5 Service and maintenance of the truck
4.1.8	Friction or abrasion hazard	— Not applicable
4.1.9	High pressure fluid ejection	5.1.4 Stored energy components
		5.6.4.1 Hydraulic circuit
		5.6.4.2 Pressure control
		5.6.7.3 Hydraulic system: attachments
		5.6.7.4 Hydraulic systems: combined
4.1.10	Ejection of parts	7.2.2 Operation of the truck
		See 4.10.2
4.1.11	Loss of stability	5.2.3 Driving speed
		5.6.3.4 Hydraulic tilting systems
		5.8 Stability
		7.2.2 Operation of the truck
		7.3 Minimum marking
4.1.12	Slip, trip and fall hazards	5.7.2 Operator access and egress
		5.7.3 Platform
		7.2.2 Operation of the truck

Hazard		Corresponding requirement	
4.2	Electrical hazards		
4.2.1	Electrical contact	5.1.1	Electrical requirements
4.2.2	Electrostatic phenomena	—	Not covered by this standard
4.2.3	Thermal radiation	—	Not applicable
4.2.4	External influences	—	Not covered by this standard
4.3	Thermal hazards		
4.3.1	Burns and scalds	5.5.1 5.7.6	Exhaust system Protection from burning
4.3.2	Severe climatic conditions	5.11.1	Cab
4.4	Hazards generated by noise		
4.4.1	Hearing loss	5.11.2 7.2.1 7.2.2	Noise emission Concerning the truck/attachment Operation of the truck
4.4.2	Interference with speech	5.11.2 7.2.1 7.2.2	Noise emission Concerning the truck/attachment Operation of the truck
4.5	Hazards generated by vibration	5.11.3 7.2	Vibration Instruction handbook
4.6	Hazards generated by radiation	—	Not covered by this standard
4.7	Hazards generated by materials		
4.7.1	Contact or inhalation	5.5.1 5.11.1.3 7.2.4	Exhaust systems Totally enclosed cab Details for internal combustion engine powered trucks
4.7.2	Fire or explosion	5.1.1 5.5.2 5.5.4 5.11.1.2 7.2.1	Electrical requirements Fuel tanks LPG requirements Fire resistance material Concerning the truck/attachment
4.7.3	Biological and microbiological hazards	—	Not applicable

Hazard		Corresponding requirement	
4.8	Hazards due to neglect of ergonomics		
4.8.1	Unhealthy postures or excess effort	5.7.1 Operator's position: dimensions 5.7.2 Operator access and egress 5.7.4 Operator's seat 5.9.1.1 Overhead guard: headroom 5.11.1.1 Cab headroom 7.2.2 Operation of the truck	
4.8.2	Inadequacy with human anatomy and comfort	5.4.3.3 Steering shock restriction (not dealt with for tractors) 5.5.1 Exhaust system 5.11.1.3 Totally enclosed cab 5.11.1.4 Operator's cab, heater 7.2.1 Concerning the truck/attachment 7.2.2 Operation of the truck	
4.8.3	Neglected use of personal protection equipment	—	Not applicable
4.8.4	Inadequate local lighting	5.10.2	Truck lighting
4.8.5	Mental overload or underload	—	Not applicable
4.8.6	Human errors	5.4.7 Marking 7.1 Residual hazards 7.2 Instruction handbook 7.3.3.4 Warning symbols	
4.9	Hazard combinations	—	Not applicable
4.10	Hazards due to functional disorders		
4.10.1	Failure of energy supply	5.3.3 Automatically acting brakes 5.4.3.2 Failure of power supply 5.6.4.3 Failure of energy supply	
4.10.2	— Ejection of parts — Loss of the load	— 7.2.2 Operation of the truck	Not applicable
4.10.3	Failure of control system	5.1.1 Electrical requirements 5.2.2 Unintentional movement 5.6.4 Hydraulic system 5.6.7.3 Hydraulic system: attachments 5.6.7.4 Hydraulic systems: combined 7.2.5 Service and maintenance of the truck	

Hazard		Corresponding requirement	
4.10.4	Errors of fitting	5.1.4	Stored energy components
		7.2.6	Transportation, commissioning and storage
4.10.5	Loss of machinery stability	See 4.1.11	
4.11	Hazards due to missing safety means	—	Not applicable
Additional hazards due to mobility			
4.12	Inadequate lighting of moving/working area	See 4.8.4	
4.13	Hazards due to sudden movement, instability etc. during handling	5.2.1	Unintended starting
		5.2.3.1	Driving speed: Pedestrian-controlled trucks
		5.2.3.2	Driving speed: Stand-on trucks
		5.8	Stability
		5.9.3	Warning device
		5.9.5	Towing devices
		5.11.5	Transport
4.14	Inadequate/inergonomic design of driving/operating position	6.3	Functional verification
		7.2.2	Operation of the truck
4.14.1	Hazards due to dangerous environments (contact with moving parts, exhaust gases etc.)	5.5.1	Exhaust system
		5.7	Operator position
		5.7.5	Protection from road wheels
		5.7.7.3	Protection of the foot
4.14.2	Inadequate visibility from operator's position — on pedestrian-controlled trucks	5.11.4	Operation in potentially explosive atmosphere
		5.10.1	Visibility
4.14.3	Inadequate seat/seating	5.11.1.5	Windscreen wipers
		—	Not applicable
		5.7	Operator's position

Hazard	Corresponding requirement
4.14.4 Inadequate/ergonomic design/positioning of controls	
— distance between the levers	— Not covered by this standard
— power for acting levers	— Not covered by this standard
— strength of controls	— Not covered by this standard
— controls of manually operated lifting systems	5.4.4.2 Controls
— strength of brake components	5.3.1 Brakes
— controls for automated functions	5.4.6 Controls for automated functions
— steering shock	5.4.3.3 Steering shock restriction
— construction and layout of tiller	— Not covered by this standard
4.14.5 Starting/moving of self-propelled machinery	
— layout of pedals	5.4.2.1 Sit-on trucks
— additional operator positions	5.4.1.2 Additional operator's positions
4.14.6 Road traffic of self-propelled machinery	
— layout of pedals	5.4.2.1 Sit-on trucks
— steering shock	5.4.3.3 Steering shock restriction
— direction of movement	5.4.2 Travel and braking controls
	5.4.2.4 Differential lock
	5.4.3.1 Steering direction
	5.4.5 Multi-function controls
— controls for remote control	5.4.2.5 Additional operation from outside the truck
4.14.7 Movement of pedestrian controlled machinery	
— direction of movement	5.4.2.3 Pedestrian controlled trucks
	5.4.3.1 Steering direction
4.15 Mechanical hazards	
4.15.1 Hazards to exposed persons due to uncontrolled movement	
	5.4.1.1 Arrangement of controls
	5.6.3.1 Hydraulic lifting system
	5.6.3.4 Hydraulic tilting system
4.15.2 Hazards due to break-up and/or ejection of parts	— Not applicable

Hazard		Corresponding requirement	
4.15.3	Hazards due to rolling over (deflection limiting volume; DLV)	—	Not applicable
4.15.4	Hazards due to falling objects (DLV)	5.9.1	Operator's overhead guard
		5.9.2	Load backrest
		5.11.1.1	Cab headroom
4.15.5	Inadequate means of access	5.7.2	Operator access and egress
		5.7.3	Platform
4.15.6	Hazards caused due to towing, coupling connecting, transmission etc.	5.9.5	Towing devices
4.15.7	Hazards due to batteries, fire, emissions etc.	5.1.1	Electrical requirements
		5.5.1	Exhaust system
		5.5.2	Fuel tank
		5.5.4	LPG requirements
		7.2.1	Concerning the truck/attachment
		7.2.3	Details for battery powered trucks
		7.2.4	Details for internal combustion engine powered trucks

Additional hazards due to lifting operation

4.16.1	Lack of stability	5.8	Stability
4.16.2	Derailment of machinery	—	Not applicable
4.16.3	Loss of mechanical strength of machinery and lifting accessories	5.1.2	Calculation
		5.6.1	Lift chains and wire ropes
		5.6.2	Mechanical lifting system
		5.6.5	Fork arms
		5.6.7	Attachments
		6.1	Verification, General
		6.2	Structural verification

Hazard		Corresponding requirement	
4.16.4	Hazards caused by uncontrolled movement	5.4.2	Travel and braking controls
		5.4.4	Load handling controls
		5.4.5	Multi-function controls
		5.4.6	Controls for automated function
		5.6.2	Mechanical lifting system
		5.6.3	Hydraulic lifting and tilting system
		5.6.4	Hydraulic system
		5.6.7.2	Attachments
		5.6.7.3	Hydraulic system: attachments
		5.6.7.4	Hydraulic systems: combined
		5.6.7.5	Spreader
4.17	Inadequate view of trajectories of the moving parts	5.10.1	Visibility
4.18	Hazards caused by lightning	—	Not applicable
4.19	Hazards due to loading/overloading	5.6.4.2	Pressure control
		5.8	Stability
		6.1	Verification, General
		N	Informative annex, Loading control
4.20	Hazards due to pressure vessels	—	Not covered by this standard

5 Requirements

5.1 General

5.1.1 *Electrical requirements*

Electrical systems and equipment shall comply with EN 1175-1, EN 1175-2 and EN 1175-3.

5.1.2 *Calculation*

For calculation of strength and durability of components the requirements of Clause 5 and 6.2 shall be met.

5.1.3 *Edges or angles*

In the area of the operator in the normal operating position and in the area of access and egress no sharp edges or angles shall occur.

5.1.4 *Stored energy components*

Stored energy components which cannot be removed or disassembled without decompression, e.g. hydraulic accumulator or spring applied brakes, shall have the capability of decompression.

5.2 Starting/moving

5.2.1 Unintended starting

All trucks shall be provided with a device (e.g. a key) which prevents unintended starting by any unauthorized person. Devices for pedestrian controlled trucks and rider controlled trucks manufactured by the same manufacturer shall not be interchangeable between the two truck types.

5.2.2 Unintentional movement

5.2.2.1 A parking brake shall be provided complying with **5.3.1**.

5.2.2.2 Internal combustion engine powered trucks shall be fitted with a device which prevents the engine being started whilst the transmission is engaged.

5.2.2.3 Travel controls on internal combustion engine powered trucks shall be so arranged that on level ground the truck will not move from rest until the transmission has been engaged.

When the transmission is engaged, the internal combustion engine powered truck shall not move faster than 2,5 km/h as long as the controls for the driving speed are not activated.

5.2.2.4 On rider controlled trucks, means shall be provided to prevent powered travel when the operator dismounts from the truck. On internal combustion engine powered trucks, the parking brake and neutral travel control applied by the operator may be used to satisfy this requirement.

5.2.2.5 Movement of battery powered trucks shall not be possible while only the protection device against unintended use as specified in **5.2.1** is activated. Internal combustion engine powered trucks shall comply with **5.2.2.2**.

5.2.3 Driving speed

5.2.3.1 Single speed pedestrian controlled trucks operating on level ground shall not exceed a travel speed of 4 km/h and acceleration of 0,5 m/s² and shall be designed for low-lift only. Variable speed pedestrian controlled trucks operating on level ground shall not exceed a travel speed of 6 km/h and shall be controllable to align with the speed of the operator on foot.

5.2.3.2 Stand-on trucks shall be so designed that on level ground they are not capable of speeds in excess of 16 km/h.

5.3 Brakes

5.3.1 All trucks shall be designed with service and parking brakes complying with ISO 6292:1996.

5.3.2 Stand-on and pedestrian-controlled trucks shall have an automatically acting brake. This brake can be service as well as parking brake.

5.3.3 Failure of the power supply for automatically acting brakes shall not result in loss of braking.

5.3.4 Trucks that travel with elevated operator position and/or elevated load up to and including 1 200 mm (e.g. ISO 5053:1987, **3.1.3.1.6**, **3.1.3.3**) shall meet the braking requirements of Class C of Table 1 of ISO 6292:1996.

5.4 Controls

5.4.1 General

5.4.1.1 Controls shall, where practicable, be consistent with the truck motions being operated and shall be confined within the plan view outline of the truck or tiller.

5.4.1.2 If additional operating positions are fitted, the operation of the controls shall only be possible from one operating position at a time, except the emergency switch-off.

5.4.2 Travel and braking controls

The motion of the speed operating control shall be designed so that an increase in the action of the control increases the travel speed. When the control is released, its action shall return to neutral.

5.4.2.1 Sit-on trucks

Pedal operated travel and braking controls shall comply with EN 281:1988.

5.4.2.2 Stand-on trucks

- a) The foot operated automatically acting brake system shall be released by pressing down on the pedal.
- b) When a tiller is fitted, it shall be provided with control devices for travel direction and speed.
- c) Brakes shall be automatically applied:
 - when they are operated by the tiller and when this tiller is released;
 - when they are operated by the travel-control switch and when this travel-control switch is released.

5.4.2.3 Pedestrian controlled trucks

- a) The tiller shall be fitted with control devices for travel direction and speed.
- b) When the tiller is released, it shall automatically return to its upper rest position, cut off power to the drive unit and engage the brake.
- c) When the tiller is in its lower position, the power to the drive unit shall be cut off and the brake shall be engaged.

5.4.2.4 Differential lock

- a) If the truck is fitted with a differential lock which is pedal operated, depression of the pedal shall lock the differential.
- b) Unlocking shall be possible during travel.

5.4.2.5 Additional operation from outside the truck

If travel control from outside the truck is provided for the operator on sit-on or stand-on trucks, when operated from the outside, the truck shall not be allowed to move faster than a speed of 6 km/h and tractors not more than 4 km/h. These controls can be attached to the truck or remote control can be provided. The operating system can be made operable by means of a separate switch or automatically when the operator leaves the truck or tractor overriding the requirements of 5.2.2.4.

- a) All trucks.

As soon as the operating element is released, the drive unit shall switch off automatically and the brake system engaged. Simultaneous operation from the operator position shall be excluded.

- b) Additional requirements for remote control cable connected:

- length and layout of the cables shall allow the operator to operate from outside of the area of hazard of the truck and having visibility of the road. It shall not be possible for the cable to become entangled with the wheels;
- on the portable control panel the control elements for movement, with the exception of emergency stop, shall be safeguarded against inadvertent operation.

- c) Additional requirements for cableless remote control:

- the transmission range shall be adequate to allow the operator to operate from outside the area of hazards of the truck and having visibility of the road;
- no mutual influence shall be possible when more than one truck is operating under remote control at the same time;
- the loop signal shall be sent continuously and repeatedly during operation. In the case of failure in the communication the requirements of 5.4.2.5a) shall be met in no more than 0,5 s;
- the reliability level shall be at least 10^{-9} and the hamming distance shall be 2;
- the remote control shall meet the requirements of EN 954-1, Category 1;
- on the portable control panel, the control element for movement with exception of the emergency stop shall be safeguarded against unintentional operation.

- d) Additional requirements for trucks with towing coupling:

- the controls (e.g. rear touch device) shall be arranged so that the operator does not have to step between the truck and the trailer to operate them;
- the rear touch device shall be secured against unauthorized use and unintentional operation;
- when operating the rear touch device the truck shall travel at a speed of not more than 2,5 km/h.

5.4.3 Steering controls

5.4.3.1 Steering direction

- a) For stand-on or sit-on trucks, clockwise rotation of the steering wheel or any other steering operating control shall steer the truck to the right when driving forwards. When the truck is equipped with a rotating operator seat or dual operating system, clockwise motion of the steering wheel shall result in a steering direction to the right-hand side of the operator when the truck is driving in the opposite direction and the operator is looking in this direction.
- b) For tiller steered trucks, clockwise rotation of the tiller shall move the steer wheel clockwise.

5.4.3.2 Failure of power supply

In the event of an interruption of the power supplied to the steering system (including a dead motor or engine) it shall be possible to maintain the path being steered until the truck is brought to a controlled stop.

5.4.3.3 Steering shock restriction

The transmission of shocks from the ground to the steering wheel of sit-on and stand-on trucks except tractors shall be limited and shall comply with the requirements of Annex A.

5.4.4 Load handling controls

5.4.4.1 Controls shall return to neutral when released, even in the case of accidental operation, stopping all load movement.

5.4.4.2 The hand power forces and the layout of controls of manually operated lifting systems shall comply with prEN 1757-1.

5.4.5 Multi-function controls

Where a control performs more than one function, each separate function shall be clearly marked.

5.4.6 Controls for automated functions

The controls shall comply with prEN 1526.

5.4.7 Marking

For marking controls, graphic symbols complying with 7.3.1.4 are sufficient.

5.5 Power systems and accessories

5.5.1 Exhaust system

Exhaust systems shall be so designed that the health of the operator is not impaired by temperature rises (see 5.7.6) or exhaust gases (see 7.2.4).

5.5.2 Fuel tank

5.5.2.1 If a fuel tank is within or contiguous to the engine compartment and excessively high temperatures may occur, the tank and/or filling arrangement shall be isolated from the electrical and exhaust systems by suitable protection, e.g. a separate enclosure or baffles. The tank location and facilities for filling shall be such that spillage or leakage will not drain into the engine compartment or onto electrical or exhaust system parts.

5.5.2.2 Fuel spillage shall not be possible under normal operating conditions.

5.5.3 Engine access

5.5.3.1 If when the engine cover is open there are unguarded moving parts within the engine compartment, access to the compartment shall be possible only by means of a key or tool, or by a release handle within a lockable operator's cab.

5.5.3.2 Opening access covers, such as traction battery or engine covers, shall be provided with means of preventing unintentional closure, where such unintentional closure could cause an injury.

5.5.4 Additional requirements for internal combustion engine powered trucks using liquefied petroleum gas (LPG)

5.5.4.1 Container

- a) Containers for LPG shall be either permanently fixed on the truck or removable.
- b) Removable containers shall be secured on the truck in such a way that only intentional release is possible.
- c) Pipe fittings and accessories on containers shall be protected against mechanical damage when used as specified by the manufacturer.
- d) Containers, whether fixed or removable, shall be equipped with a device to prevent unintentional emission of gas or liquid, particularly in the case of a pipe failure. This does not apply to pressure relief valves.
- e) The fuel take-off on the container shall be equipped with an easily and quickly accessible manually operated valve. The position and method of operation of this valve shall be clearly marked on the outside of the truck on or near the valve.
- f) The fuel take-off shall be in a liquid form unless the container and engine are specially equipped for a direct vapour withdrawal.
- g) Containers to be filled by the user shall have the following fitted.
 - A safety pressure relief valve shall be connected to the vapour space of the container. Where such containers are fitted inside compartments of trucks, the discharge side of the relief valve shall be piped to atmosphere. The gas shall be led away safely. [See also 5.5.4.3d)].
 - A fixed maximum level indicating device shall be fitted. Where containers are fitted inside compartments of trucks, the discharge side of any maximum level indicating device which relies on bleeding gas to atmosphere shall terminate at a readily visible position on the outside of the truck.
 - Maximum level indicating devices which rely on bleeding to atmosphere shall be designed so that the bleed hole is not larger than 1,5 mm in diameter and also so that the parts of the device cannot be completely withdrawn in normal gauging operations.
 - Maximum liquid level devices shall be suitable for the LPG in use, indicate the maximum product level and shall not vent to atmosphere.
- h) If containers are installed in a compartment, this compartment shall have permanent openings at the bottom. The total surface area of these ventilation openings shall be at least 200 cm² allowing adequate ventilation to the outside atmosphere and without risk to the operator.
- i) When containers are removable, their fastenings shall permit easy handling and checking of the installation after the exchange of containers.
- j) Removable containers which incorporate a safety pressure relief valve shall be so positioned on the truck that the safety pressure relief valve opening is always in communication with the vapour space at the top of the container. This may be accomplished by an indexing pin which positions the container when the container is properly installed.
- k) If an additional container is carried on the truck, it shall be secured in the same manner as the main container.
- l) Containers shall be positioned in such a way that they are not exposed to the damaging effects of heat, particularly heat from the engine and the exhaust system. It shall be possible to fit a heat shield which shall not inhibit ventilation under any circumstances.
- m) Containers shall be fitted on the truck in such a way that they are not unduly exposed to abrasion or shock nor to the corrosive action of the products handled by the truck.
- n) Containers and their connections shall be installed in such a way that there are no projections outside the plan view outline of the truck.

5.5.4.2 LPG piping

- a) Connecting piping and all associated parts shall be easily accessible, protected against damage and wear, and flexible enough to withstand vibration and deformation in service, as follows:
- piping shall be so arranged that damage or leaks are easily detectable;
 - piping shall be installed in such a way that it cannot be damaged by the hot parts of the engine;
 - fully rigid pipes shall not be used for connecting the container to equipment on the engine.
- b) Pressure flexible hoses above 1 bar shall be supported at least every 500 mm. Rigid pipes shall be supported at least every 600 mm.
- c) Hoses, pipes and all connections operating at pressures above 1 bar shall be suitable for a working pressure of 25 bar and shall withstand without bursting a test pressure of 75 bar. Hoses, pipes and all connections operating below 1 bar shall withstand without bursting a test pressure of five times the maximum pressure likely to be encountered in service.
- d) Excessive pressure shall be avoided in any section of pipe work containing LPG in liquid form between two shut-off valves which may be closed, e.g. a pressure relief valve or other suitable means may be used if necessary.
- e) Aluminium piping shall not be used in LPG lines.
- f) Hose lengths shall be as short as practical.
- g) Pressure unions and joints above 1 bar shall be made of metal except for any constrained sealing washers.

5.5.4.3 Equipment

- a) The supply of gas shall be automatically cut off when the engine stops irrespective of whether or not the ignition system has been switched off.
- b) For multi-fuel applications, the system shall be designed to avoid the possibility of LPG entering any other fuel container, and to shut off each fuel source before the alternative one is opened.
- c) If the truck is equipped with two or more containers to supply fuel, they shall be connected via a multiway valve, or other suitable means, so that LPG can only be drawn from one container at a time. The use of two or more containers at the same time shall not be possible.
- d) Safety pressure relief valves or liquid level indicators shall be installed in such a way that they cannot discharge in the direction of the operator or onto truck components which may be a source of ignition.
- e) If corrosion of a part would interfere with its proper functioning, that part shall be provided with a corrosion-resistant protective coating.
- f) All fuel system components shall be firmly secured to the truck.
- g) Pressure reducing valves shall be readily accessible for inspection and maintenance.

5.6 Systems for lifting and tilting

5.6.1 Lift chains and wire ropes

Chains and wire ropes shall have a certificate on record from the chain or wire rope manufacturer, showing the breaking load.

5.6.1.1 Chains

When the lifting mechanism includes a chain or chains, the truck manufacturer shall only use leaf or roller chains which, in relation to the minimum breaking load certified by the manufacturer of the chain, will provide a minimum factor $K_1 = 5$ in relation to the static load that would exist in a single chain or equally loaded chains when the maximum load is in the transporting position, assuming no friction in the mast structure, given by the equation:

$$K_1 = \frac{\text{min. breaking load for new chain} \times \text{number of chains}}{\text{max. load of the truck} + \text{dead weight of the lifting mechanism carried by the chains}}$$

Pulley diameters shall be at least three times the pitch of the chains.

5.6.1.2 Wire ropes

When the lift mechanism includes one or more wire ropes, the truck manufacturer shall select wire ropes which, in relation to the minimum breaking load certified by the manufacturer of the wire rope, will provide a minimum factor $K_2 = 6$ in relation to the static load that would exist in a single wire rope or equally loaded wire ropes when the maximum load is in the transporting position, assuming no friction in the mast structure.

$$K_2 = \frac{\text{min. breaking load for new wire rope} \times \text{number of wire ropes}}{\text{max. load of the truck} + \text{dead weight of the lifting mechanism carried by the wire ropes}}$$

The diameter of wire rope guide pulleys, measured from the bottom of the groove, shall be at least 22 times the diameter of the wire rope.

Splicing of wire ropes except at the terminal ends is not allowed.

5.6.2 Mechanical lifting system

5.6.2.1 The lifting system shall comply with the requirements of 5.6.3.3.

5.6.2.2 When mechanical lifting systems are used it shall not under normal operation be possible to lower the load using a friction brake.

5.6.2.3 In the event of failure of the mechanism or its parts (e.g. gearwheel, chainwheel, spindle or rope pulley) it shall not cause the elevated driver position and/or the load to fall. This requirement also applies to rack and pinion lifting systems or with spindle drive.

5.6.2.4 The lowering speed of the lifting mechanism with its rated load shall not exceed 0,6 m/s.

5.6.3 Hydraulic lifting and tilting system

5.6.3.1 Hydraulic lifting system

With the mast substantially vertical, the descent of the rated load caused by an internal leakage in the hydraulic system shall not exceed 100 mm during the first 10 min with the oil in the hydraulic system at normal operating temperature.

5.6.3.2 Lowering speed limitation

A control device shall be incorporated in the lift circuit which even in the event of a failure of the hydraulic circuit, excluding the hydraulic lift cylinder(s), shall restrict the rate of descent of the lifting mechanism with its rated load to 0,6 m/s maximum.

5.6.3.3 Limitation of stroke

The lift assembly shall be fitted with stops to prevent over-travel. In addition, means shall be provided to prevent the fork carrier and moving elements of the mast structure from accidentally disengaging from the upper end of the mast.

5.6.3.4 Hydraulic tilting systems

The internal leakage rate of the complete hydraulic tilting system (i.e. cylinder, valve, etc.) with the oil at normal operating temperature shall allow an average tilting speed of the mast to the front of less than 5° in the first 10 min, from the vertical mast position when the rated load is at a height of 2 500 mm or, in the case of trucks with lift heights of less than 2 500 mm, at their maximum lift height. The average tilting speed allowed by leakages shall not exceed 0,5°/min for trucks with a maximum forward tilt of less than 5°.