

Safety of industrial trucks — Self propelled trucks over 10 000 kg capacity

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British Standard

ICS 53.060

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National foreword

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- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 72, an inside back cover and a back cover.

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Safety of industrial trucks - Self propelled trucks over 10 000 kg capacity

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automoteurs de plus de 10 000 kg

Sicherheit von Flurförderzeugen - Kraftbetriebene
Flurförderzeuge über 10 000 kg Tragfähigkeit

This European Standard was approved by CEN on 16 April 1999.

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

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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of an identical text or by endorsement, at the latest by October 2000 conflicting national standards shall be withdrawn at the latest by October 2000.

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. The complete series is as follows:

EN 1726,	<i>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</i>
EN 1726-1,	<i>Part 1 : General requirements</i>
EN 1726-2,	<i>Part 2 : Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads</i>
EN 1551,	<i>Safety of Industrial trucks — Self propelled trucks over 10 000 kg capacity</i>
EN 1459,	<i>Safety of Industrial trucks — Self propelled variable reach trucks</i>
EN 1757,	<i>Safety of Industrial trucks — Pedestrian propelled trucks</i>
EN 1757-1,	<i>Part 1 : Stacker trucks</i>
EN 1757-2,	<i>Part 2 : Pallet trucks</i>
EN 1757-3,	<i>Part 3 : Platform trucks</i>
EN 1757-4,	<i>Part 4 : Scissors lift pallet trucks</i>
EN 1525,	<i>Safety of Industrial trucks — Driverless trucks and their systems</i>
EN 1526,	<i>Safety of Industrial trucks — Additional requirements for automated functions on trucks</i>
EN 1175,	<i>Safety of Industrial trucks — Electrical requirements</i>
EN 1175-1,	<i>Part 1: General requirements for battery powered trucks</i>
EN 1175-2,	<i>Part 2: General requirements for IC engine powered trucks</i>
EN 1175-3,	<i>Part 3: Specific requirements for electrical power transmission systems of IC engine powered trucks</i>
EN 1755,	<i>Safety of Industrial trucks — Operation in potentially explosive atmospheres; use in flammable gas, vapour, mist and dust.</i>

- 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.

Introduction

This European Standard is a type C standard as stated in EN 292-1.

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, machinery shall comply as appropriate with EN 292 for hazards which are not covered by this standard.

1 Scope

1.1 This standard applies to self propelled lift trucks, the rated capacity of which exceeds 10 000 kg.

This standard does not cover:

- Trucks powered by natural gas.
- Trucks operated by remote control.
- Trucks with elevating operator position.

1.2 For the purposes of this standard, self propelled lift trucks (hereinafter referred to as “trucks”) are counterbalanced lift trucks, with masts, as defined in 3.1.3.1.1 of ISO 5053:1987; side loading trucks are defined in 3.1.3.1.7 of ISO 5053:1987 or rough terrain trucks, with masts, as defined in 3.1.3.1.8 of ISO 5053:1987.

1.3 This standard applies to industrial trucks equipped with load handling devices for normal industrial duties, e.g. fork arms or attachments for specified applications. Fork arms 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.

1.4 This European Standard contains the technical requirements to minimize the specific hazards listed in clause 4 which may occur during normal operation and maintenance of the trucks in accordance with the data given by the manufacturer or his authorized representatives.

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 the technical rules which are state of the art and which are applicable to the material used to construct the truck. Reference should be made to EN 292-2.

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

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the 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 controlled*
- EN 292-2:1991, *Safety of Machinery — Basic concepts, general principles of design — Part 1. Basic terminology, methodology*
- EN 292-1:1991, *Safety of Machinery — Basic concepts, general principles of design — Part 2. Technical principles and specifications*
- EN 1175-1:1998, *Safety of industrial trucks — Electrical requirements — Part 1: General requirements for battery powered trucks*
- EN 1175-2:1998, *Safety of industrial trucks — Electrical requirements — Part 2: General requirements for internal combustion engine powered trucks*
- EN 1175-3:1998, *Safety of industrial trucks — Electrical requirements — Part 3: Specific requirements for electrical power transmission systems of internal combustion engine powered trucks*
- EN 1526:1998, *Safety of industrial trucks — Additional requirements for automated functions on trucks*
- EN 1755:2000, *Safety of industrial trucks — Operation in potentially explosive atmospheres: Use in flammable gas, vapour mist and dust.*
- 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 industrial 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 — Access systems*
- ISO 3287:1999, *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 3874: 1997, *Series 1 Freight containers — Handling and securing*
- ISO 5053:1987, *Powered industrial trucks — Terminology*
- ISO 5767:1992, *Industrial trucks operating in special conditions of stacking with the mast tilted forward — Additional stability test*
- ISO 6055:1997, *High lift rider trucks — Overhead guards — Specification and testing*
- ISO 6292:1996, *Powered industrial trucks — Brake performance and component strength*

- ISO 10525:1997, *Counterbalanced trucks handling freight containers of 6m length and above — Additional stability tests*
- ISO 10658:1996, *Industrial trucks operating in special conditions of stacking with load laterally displaced by powered devices — Additional stability test*
- ISO/DIS 15870, *Powered industrial trucks — Safety signs and hazard pictorials – General principles*

3 Definitions

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

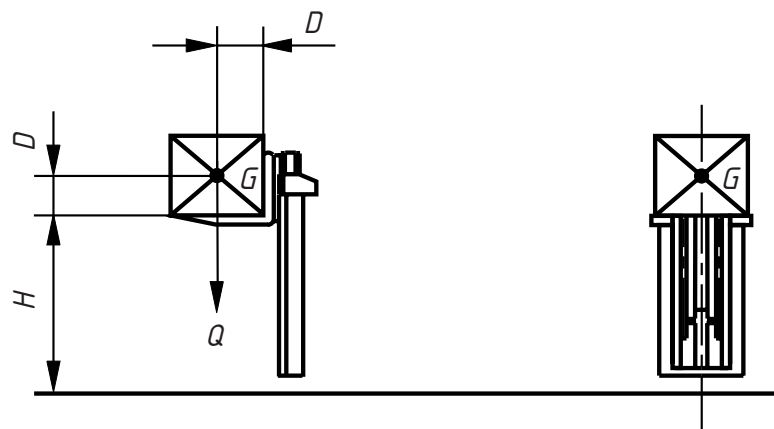
3.1

rated capacity of truck

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) positioned at the standard load centre D . (3.3).
- Load Q vertically stacked to the standard lift height (3.2).
- Truck 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 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

3.2

standard lift height

height H from the ground to the upper face of the fork arm blade, which is 5 000 mm for all truck types

3.3

standard load centre distance

distance D for the centre of gravity G of the load measured horizontally to the front face of the fork arm shank and vertically to the upper face of the fork arm blade as specified in 3.3.1 for counterbalanced trucks and 3.3.2 for side loading trucks

3.3.1 Values for distance D are defined in Table 1.

Table 1

Rated load Q , kilograms		Standard load centre distance D , millimetres		
From (included)	To (excluded)	600	900	1 200
10 001	20 000	X	X	X
20 000	25 000		X	X
25 000 and above				X
NOTE: Counterbalanced trucks may be rated for special applications with load centre distances related to those applications.				

3.3.2 The distance D for side loading trucks is specified by the manufacturer.

3.4

actual capacity of the truck

the maximum load in kilograms permitted by the manufacturer, that the subject truck is capable of transporting or lifting in normal use (the use for which the truck is designed according to the manufacturer or his authorized representative)

Actual capacity will vary with the different types and heights of mast fitted, changes of fork arms or attachments and different load centre distances used in rating.

Additional actual capacity ratings with removable attachments may also be established where permitted by the appropriate stability specifications.

3.5

rated capacity of removable attachments

maximum load in kilograms, and load centre where applicable, that the attachment is capable of handling in normal operating conditions; as specified by the attachment manufacturer

3.6

operator

any trained person who is responsible for the movement and load handling of the industrial truck

3.7

normal operating position

position in which the operator shall be able to control all functions for driving and load handling. Additional positions may be needed if it is not possible to control all functions of the truck from one position

3.8

forward driving direction and the front end of the truck

the front end of the truck and the forward direction is the end nearest the arrow in Figures 2 and 3

3.8.1
counterbalanced truck

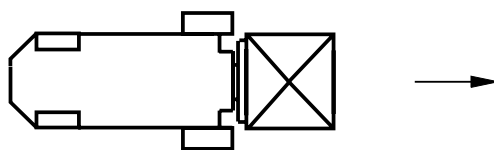


Figure 2

3.8.2
side loading truck

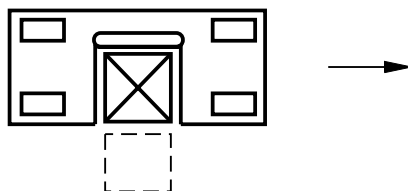


Figure 3

3.9
automatically acting brakes

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

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

3.10
normal operating conditions

are those described in the stability documents as shown in 5.8.

4 List of hazards

The following hazards from Annex A of EN 414:1992 are applicable in the situations described and could invoke 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 hazard		
4.1.1	Crushing hazard	5.3	Brakes
		5.4	Controls
		5.5.3	Engine access
		5.7	Operator position
		5.7.4	Protection from road wheels
		5.7.6	Protection against crushing, shearing and trapping
		5.9.1	Operators overhead guard
		5.9.2	Warning device
		5.10.1	Visibility
		5.11.1.1	Cab
		5.11.5	Transport
		7.2.2	Operation of the truck
		7.3.3.4	Warning symbols
4.1.2	Shearing hazards	5.3	Brakes
		5.4	Controls
		5.5.3	Engine access
		5.7	Operator position
		5.7.4	Protection from road wheels
		5.7.6	Protection against crushing, shearing and trapping
		5.9.2	Warning device
		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
		5.7.6	Protection against crushing, shearing and trapping
4.1.4	Entanglement hazard	5.5.3	Engine access

Hazard	Corresponding requirement
4.1.5 Drawing in or trapping hazard	5.5.3 Engine access 5.7.4 Protection from road wheels 5.7.6 Protection against crushing, shearing and trapping
4.1.6 Impact hazard - from mechanical failure	5.11.1.6 Operators cab/emergency exit 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 Fork arms 5.6.6 Fork carriers 5.6.7 Load handling attachments 5.9.1 Operators overhead guard 5.9.3 Load backrest 5.11.1.1 Operators cab
- from road debris	5.7.4 Protection from road wheels
- from lifting or transporting a truck	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 system 5.6.4.2 Pressure relief valves 5.6.7.3 Attachment hydraulic system 5.6.7.4 Combined hydraulic system 7.2.2 Operation of the truck

Hazard	Corresponding requirement
4.1.10 Ejection of parts	See 4.10.2
4.1.11 Loss of stability	5.6.3.4 Hydraulic tilting system 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 7.2.2 Operation of the truck
4.2 Electrical requirements	
4.2.1 Electrical contact	5.1.1 Electrical requirements
4.2.2 Electrical 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 Exhaust system 5.7.5 Protection from burning 5.11.1.2 Cab material fire resistance
4.3.2 Severe climate conditions	– Not covered by this standard
4.4 Hazards generated by noise	
4.4.1 Hearing loss	5.11.2 Noise emission 7.2.1 Concerning the truck/attachment 7.2.2 Operation of the truck
4.4.2 Interference with speech	5.11.2 Noise emission 7.2.1 Concerning the truck/attachment 7.2.2 Operation of the truck

Hazard		Corresponding requirement	
4.5	Hazards generated by vibration	5.11.3 7.2.1	Vibration Concerning the truck/attachment
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 system Totally enclosed cab Effect of exhaust emissions
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 Cab material fire resistance Concerning the truck/attachment
4.7.3	Biological and microbiological hazards	–	Not applicable
4.8	Hazards due to neglect of ergonomics		
4.8.1	Unhealthy postures or excess effort	5.7.1 5.7.2 5.7.3 5.9.1.1 5.11.1.1 7.2.2	Operator position dimensions Operator access and egress Seat Overhead guard headroom Cab headroom Operation of truck
4.8.2	Inadequacy with human anatomy and comfort	5.5.1 5.11.1.3 5.11.1.4 7.2.2	Exhaust system Cab ventilation Cab heater 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 and underload	–	Not applicable

Hazard		Corresponding requirement	
4.8.6	Human errors	5.4.7	Marking of controls
		7.1	Residual hazards
		7.2	Instruction handbook
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	Steering power supply
		5.6.4.3	Supply to hydraulic circuit
4.10.2	Ejection of parts	—	Not applicable
	– Loss of load	7.2.2	Operation of truck
4.10.3	Failure of control system	5.1.1	Electrical requirements
		5.2.2	Unintended movement
		5.6.4	Hydraulic system
		5.6.7.3	Attachment hydraulic system
		5.6.7.4	Combined hydraulic system
		7.2.5	Service and maintenance
4.10.4	Errors of fitting	5.1.4	Stored energy components
		7.2.5	Service and maintenance
		7.2.6	Transportation
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

Hazard		Corresponding requirement	
4.12	Inadequate lighting of moving/working area	5.10.2	Truck lighting
4.13	Hazards due to sudden movement, Instability etc, during handling	5.2.1	Unintended starting
		5.8	Stability
		5.9.2	Warning device
		5.11.5	Transport
		6.3	Functional verification
		7.2.2	Operation of the truck
4.14	Inadequate/inergonomic design of driving position		
4.14.1	Hazards due to dangerous Environments (contact with moving parts, exhaust gases etc.)	5.5.1	Exhaust system
		5.5.3	Engine access
		5.7	Operator position
		5.7.4	Protection from road wheels
		5.11.4	Operation in potentially explosive atmospheres
4.14.2	Inadequate visibility from drivers Position	5.10.1	Visibility
		5.11.1.5	Windscreen wipers
4.14.3	Inadequate seat/seating	5.7	Operators position
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
	– Strength of brake components	5.3.1	Brakes
4.14.5	Starting/moving of self propelled machinery		
	– Layout of pedals	5.4.2.1	Layout of pedals
	– Additional operator positions	5.4.1.2	Additional operator positions

Hazard		Corresponding requirement	
4.14.6	Road traffic of self propelled machinery – Layout of pedals – Direction of movement	5.4.2.1	Layout of pedals
		5.4.2	Travel and braking controls
		5.4.3.1	Steering direction
		5.4.5	Multifunction controls
		5.10.2	Lighting
4.14.7	Movement of pedestrian controlled machinery	–	Not applicable
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	Leakage in hydraulic lift system
		5.6.3.4	Leakage in hydraulic tilt system
4.15.2	Hazards due to break up and/or ejection of parts	–	Not applicable
4.15.3	Hazards due to rollover	–	Not applicable
4.15.4	Hazards due to falling objects	5.9.1	Overhead guard
		5.9.3	Load backrest
		5.11.1.1	Operators cab
4.15.5	Inadequate means of access	5.7.2	Operator access and egress
4.15.6	Hazards due to towing, coupling, connecting transmission etc.	7.2.2	Operation of the truck
4.15.7	Hazards due to batteries, fire, Emissions etc.	5.1.1	Electrical requirements
		5.5.1	Exhaust system
		5.5.2	Fuel tanks
		5.5.4	LPG requirements
		7.2.1	Concerning the truck – Fire extinguisher
		7.2.3	Battery powered trucks – hydrogen accumulation
		7.2.4	Engine powered trucks – exhaust emissions

Additional hazards due to lifting operations

Hazard	Corresponding requirement
4.16.1 Lack of stability	5.8 Stability
4.16.2 Derailment of machinery	– Not applicable
4.16.3 Loss of mechanical strength	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 Load handling attachments
	6.1 Verification, general
4.16.4 Hazards caused by uncontrolled movement	5.4.2 Travel and braking controls
	5.4.4 Load handling controls
	5.4.5 Multifunction controls
	5.6.3 Hydraulic lifting and tilting system
	5.4.6 Controls for automated functions
	5.6.2 Mechanical lifting system
	5.6.4 Hydraulic system
	5.6.7.2 Clamping devices
	5.6.7.3 Attachment hydraulic system
4.17 Inadequate view of the trajectories of moving parts	5.6.7.4 Combined hydraulic system
	5.6.7.5 Spreader
4.17 Inadequate view of the trajectories of 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 relief valve
	5.8 Stability
	6.1 Verification, general
	G 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 1175-1:1998, EN 1175-2:1998 and EN 1175-3:1998.

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

The truck shall be provided with a device (e.g. a key) which prevents unintended starting by unauthorized persons.

5.2.2 Unintended 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. With the transmission engaged, the 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 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.

5.3 Brakes

5.3.1 Service and parking brakes shall comply with ISO 6292.

5.3.2 For trucks with capacities greater than 50 000 kg, brakes shall also comply with ISO 6292.

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

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.

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.

A suitable safeguard shall be specified to ensure that the change over from one control position to another is done safely.

5.4.2 Travel and braking controls

5.4.2.1 Pedal layout

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

5.4.2.2 Differential locking

For trucks fitted with a differential lock which is pedal operated, depression of the pedal shall lock the differential.

It shall be possible to unlock the differential when the truck is moving.

5.4.2.3 Hand operated direction control lever

The movement of a direction control lever shall correspond to the required direction of travel.

5.4.2.4 Hand operated accelerator control lever

The control lever shall be a hold to run control, on release of the control its action shall return to minimum speed. The movement of an accelerator control lever shall be parallel to the longitudinal axis of the truck. Movement towards the front of the truck shall increase speed.

5.4.3 Steering controls

5.4.3.1 Steering direction

Clockwise rotation of the steering wheel shall steer the truck to the right when the truck is travelling in the forward direction. If a reversible control unit or multiple controls are fitted, clockwise rotation of a steering wheel shall also steer the truck to the operators right when the truck is travelling in reverse with the operator facing in that direction.

5.4.3.2 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 The steering system shall be non reactive, full power or power assisted.

5.4.4 Load handling controls

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

Controls for lift and tilt shall preferably be located to be operable by the operators right hand and clearly separate from the driving controls.

The control closest to the operator shall preferably be for lift.

5.4.5 Multi function controls

Where a control is designed and constructed to perform more than one function each separate function shall be clearly marked.

5.4.6 Controls for automated functions

The controls shall comply with EN 1526.

5.4.7 Marking

For marking controls graphic symbols complying with 7.3.1.3 are sufficient.

5.5 Power systems and accessories

5.5.1 Exhaust system

The exhaust system shall be so designed that the health of the operator is not impaired by temperature rises (see 5.7.5) or exhaust gases (see 7.2.4).

5.5.2 Fuel tanks

5.5.2.1 If a fuel tank is within or contiguous with the engine compartment and excessively high temperatures may occur, the tank and/or filling arrangement shall be isolated from the electrical and exhaust system 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 or operators 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.

Access from underneath is considered guarded if the access underclearance is less than 600 mm between the underside of the truck and level ground.

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

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

5.5.4.1 Containers

- 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 adequately protected against mechanical damage when used as specified by the container manufacturer.
- d) Containers, whether fixed or removable, shall be equipped with a device to prevent the 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 direct vapour withdrawal.
- g) Containers to be filled by the user shall have the following fitted:
 - 1) 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.
 - 2) 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 at a readily visible position on the outside of the truck, as follows:
 - 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 diameter and also so that the parts of the device cannot be completely withdrawn in normal gauging operations.
 - All 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 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 a spare or 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.