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Industrial trucks — Safety rules for application, operation and maintenance

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Foreword

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

This document was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 2, *Safety of powered industrial trucks*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Industrial trucks — Safety rules for application, operation and maintenance

1 Scope

This document gives safety requirements for the application, operation, maintenance, transport, tow, assembly and storage of industrial trucks (hereafter referred to as trucks) as defined in ISO 5053-1.

It applies to the following truck types:

a) counterbalance lift trucks;

b) reach trucks (with retractable mast or retractable fork arm carriage);

c) straddle trucks;

d) pallet-stacking trucks;

e) platform trucks;

f) double stackers;

g) side-loading trucks (one side only);

h) lateral-stacking trucks (both sides), and lateral- and front-stacking trucks;

i) order-picking trucks;

j) bidirectional and multidirectional trucks;

k) counterbalance container handlers;

l) articulated counterbalance lift trucks;

m) variable-reach trucks;

n) pallet trucks;

o) platform and stillage trucks;

p) tractors with a drawbar pull up to and including 20 000 N;

q) burden and personnel carriers;

r) trucks powered by battery, diesel, gasoline or gas (e.g. LPG, CNG, LNG).

Automated functions and driverless variants of the above list of trucks are also considered part of this scope.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3691-1, *Industrial trucks — Safety requirements and verification — Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

ISO 3691-4, *Industrial trucks — Safety requirements and verification — Part 4: Driverless industrial trucks and their systems*

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

ISO 5057, *Industrial trucks — Inspection and repair of fork arms in service on fork-lift trucks*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053-1 and the following apply.

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

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

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

3.1
user
owner or hirer of trucks

3.2
operator
designated person, appropriately trained and authorized, who is responsible for the movement and load handling of a truck

Note 1 to entry: Depending on the truck type, the operator can be riding on the truck, on foot accompanying the truck (e.g. tiller-, cable-controlled) or remote from the truck (e.g. remote radio-controlled) or initiating automatic/driverless operations.

Note 2 to entry: If a driverless truck, the operator shall be the person appropriately trained and authorized to start automatic operation(s) of the truck.

3.3
hazard zone
danger zone
any space within and/or around machinery in which a person can be exposed to a hazard

Note 1 to entry: The zone which can be reached by goods, operating equipment or load carrying devices in the process of lowering or falling also belongs to hazard zone.

Note 2 to entry: If a driverless truck system is in use, the areas in which the truck(s) operate may be classified as operating, operating hazard or restricted.

[SOURCE: ISO 12100:2010, 3.11, modified — Notes 1 and 2 to entry have been added.]

3.4
trainer
person who conducts the training of the *operator* (3.2)

3.5
narrow aisle
traffic path for trucks where the limited distance between the outer parts of the truck including the load and fixed parts of the environment (e.g. racking) is a hazard

3.6
automated function
movement for transport or positioning of the truck and/or load initiated by the *operator* (3.2) but not requiring continued action by the operator

[SOURCE: ISO 24134:2006, 3.1]

3.7
driverless truck
powered truck, designed to operate automatically to transport loads

Note 1 to entry: Driverless trucks can have a manual mode where all operations are under the control of an *operator* (3.2).

[SOURCE: ISO 3691-4:2020, 3.7, modified — In the term, "industrial" has been omitted and Note 1 to entry has been added.]

3.8
competent person
person who has acquired, through training, qualification, experience or a combination of these, the knowledge and skill enabling that person to correctly perform the required tasks

[SOURCE: ISO 11525-1:2020, 3.4]

3.9
unattended
truck situation where the *operator* (3.2) is 7 m or more from the normal operating position and the truck remains in the operator's view, or the operator leaves the truck and it is not in the operator's view

4 Basic requirements

4.1 General requirements

4.1.1 The user shall specify and use the appropriate truck and equipment for the processes and operating environment. The user shall ensure that all information plate(s) (e.g. capacity) and markings are in place and are maintained in a legible condition.

4.1.2 The truck shall be used, operated and maintained in accordance with the manufacturer's instructions.

4.1.3 Only trucks of types approved for use in potentially explosive atmospheres shall be used in those environments.

4.1.4 If trucks are used in special areas, such as cold storage or public roads, additional requirements can apply.

4.1.5 Additional measures or equipment for fire protection may be requested by the user of the truck according to the environment(s) in which the truck is used.

4.1.6 The user shall ensure trucks used in work environments subject to hazard from static electrical discharge are equipped with anti-static devices.

4.1.7 When damage, or other defects which affect safety on a truck or attachment, is detected, the truck shall be taken out of service immediately. Trucks and attachments which are not safe to operate shall not be put into service until they have been properly repaired.

NOTE It is considered good practice to place temporary warnings to trucks indicating they are not safe to operate.

4.1.8 The user shall assess noise emissions to operator and other persons.

4.1.9 Except as in Clause 9, no person shall be permitted to stand or pass under the elevated part of any truck, regardless of whether the truck is laden or unladen.

4.1.10 Except as in Clause 9, no person shall allow any part of their body, such as arms, legs or head, to be put between working parts of the truck (e.g. mast).

4.1.11 The user shall provide monitoring and controls of the operating environment to ensure the safety of persons around the truck and the safe operation of truck (see Annex A).

4.1.12 The operator shall be trained in the operation of the truck including any attachments and any automated functions, and shall operate according to the manufacturer's operating instructions**.**

4.1.13 The operator shall be trained regarding their obligations and be familiar with all the safety information including operating instructions of the truck**.**

4.1.14 The user shall designate the person(s) responsible for supervising truck operator(s). The person(s) responsible for supervising powered truck operator(s) shall be trained in how to apply actions that:

— reinforce operator safety rules and practices; and

— correct unsafe operator behaviour or performance that does not conform to the requirements in 4.2.

4.1.15 The user shall not allow unauthorized persons to use the truck and shall take measures to prevent this (e.g. instruction for the operator on how to leave the truck).

4.2 General requirements for the operator

4.2.1 The operator shall pay attention to the operating environment, including other persons, and fixed or movable objects in the vicinity of the truck and truck travel path.

4.2.2 If the operator's compartment floor height is 300 mm or higher, the operator shall use 3-point contact, such as maintaining contact with one hand and two feet or two hands and one foot at all times, when mounting or dismounting a truck. Keep hands free of items (e.g. food, beverage, tools, phones).

4.2.3 The operator shall always face the truck when getting on or off the truck.

4.2.4 The operator shall wear the protective equipment necessary for the specific type and operating conditions of the truck (e.g. safety footwear).

4.2.5 When leaving the truck, except pedestrian-propelled trucks, the operator shall secure it against unauthorized use.

4.2.6 Self-propelled trucks shall not be used to transport passengers unless they are specially equipped for this purpose and the number of permissible passengers on the truck shall not be exceeded.

4.2.7 Before starting the truck, the operator shall ensure that there are no persons in the hazard zone. When operating the truck, a warning signal shall be given if persons are in danger. The operator shall stop operating the truck immediately if persons do not leave the hazard zone despite an appropriate warning.

4.3 Training program

4.3.1 Personnel who have not been trained to operate powered trucks may operate a truck for the purposes of training only, and only under the direct supervision of the trainer. This training should be conducted in an area away from other trucks, obstacles, and pedestrians.

4.3.2 The training program shall emphasize safe and proper operation to avoid injury to the operator and others and prevent property damage, and shall cover the following areas:

a) fundamentals of the powered truck(s) the trainee will operate, including:

- characteristics of the powered truck(s) and attachments, including variations between trucks in the workplace;
- differences between automobiles and trucks;
- significance of nameplate data, including rated capacity, warnings, and the instructions affixed to the truck;
- operating instructions and warnings in the manufacturer's instruction handbook for the truck, and instructions for inspection and maintenance to be performed by the operator;
- type of motive power and its traction characteristics;
- method of steering;
- braking method and characteristics, with and without load;
- visibility, with and without load, forward and reverse;
- load handling capacity, weight and load centre;
- stability characteristics with and without load, with and without attachments;
- controls – location, function, method of operation, identification of symbols;
- load handling capabilities, forks, attachments;
- hazards due to production of carbon monoxide by internal combustion engines and common initial symptoms of exposure;
- refuelling and battery charging;
- guards and protective devices for the specific type of truck;
- other characteristics of the specific truck;
- what to do in an emergency (e.g. tip-over, off-dock);
- where installed, automated functions and their characteristics and basic operating principles;
- the procedure and sequence of operation for start-up and shut-down of the truck;

b) operating environment and its effect on truck operation including, as appropriate:

- floor or ground conditions including temporary conditions;
- ramps and inclines, with and without load;
- trailers, railcars and dockboards (including the use of wheel chocks, jacks, and other securing devices);
- refuelling and battery charging facilities;
- the use of "classified" trucks in areas classified as hazardous due to risk of fire or explosion, as appropriate;
- narrow aisles, doorways, overhead wires and piping, and other areas of limited clearance;
- areas where the truck may be operated near other powered trucks, other vehicles, or pedestrians;

— use and capacity of elevators;

— operation near edge of dock or edge of improved surface;

— other special operating conditions and hazards that can be encountered;

c) operation of the powered truck, including:

— preshift inspection and method for removing from operation a truck that is in need of repair;

— load handling techniques: lifting, lowering, picking up, placing, tilting;

— travelling, with and without loads; turning corners;

— parking and shutdown procedures;

— other special operating conditions for the specific application;

d) operating safety rules and practices including:

— provisions in Clauses 4 to 7 addressing operating safety rules and practices;

— provisions in Clauses 8 to 9 addressing care of the truck;

— other rules, regulations, or practices specified by the user at the location where the powered truck will be used.

4.3.3 Operational training practice shall:

— if feasible, be conducted in an area separate from other workplace activities and personnel;

— be conducted under the supervision of the trainer;

— include the actual operation or simulated performance of all operating tasks such as load handling, manoeuvring, travelling, stopping, starting, and other activities under the conditions that will be encountered in the use of the truck.

4.3.4 The trainer shall have received appropriate training in instructional techniques and skills assessment.

4.3.5 The trainer shall only give instruction on types of truck and attachments for which they have been trained and successfully tested as operators. The trainer shall have experience to enable them to put their instruction in context and have knowledge of the working environment in which the trainee will be expected to operate.

4.3.6 Appropriate training records shall be kept.

4.3.7 Operators shall be retrained when new equipment is introduced, existing equipment is modified, operating conditions are changed, or an operator's performance is unsatisfactory (periodic retraining as determined by the user).

4.3.8 Training shall be given on all types of trucks and attachments that the operator will be required to operate. If the operator is subsequently required to operate another type of truck or attachment, additional training shall be given.

NOTE Operators with some experience of trucks or relevant experience of similar vehicles can need less extensive training than those with no experience. However, the value of such experience is best not overestimated.

4.4 Operating condition

4.4.1 Travel surface

4.4.1.1 The operating area and travel surface for the truck shall conform to the specifications of the truck manufacturer.

4.4.1.2 The travel surface of the operating area shall be sufficiently firm, level and free of obstructions. If necessary, drain channels, railway crossings and other similar surfaces shall be covered with bridge plates or dockboards.

4.4.1.3 The gradient on which the truck can operate shall not exceed the limits specified by the truck manufacturer. Transitions at the upper and lower end of gradients shall be constructed to prevent the load from touching the floor or causing damage to the truck.

4.4.1.4 The travel surface where narrow aisle trucks are used shall be flat, dry, horizontal, and free of cracks or damage that would inhibit proper truck operation, and shall conform to the specifications of the truck manufacturer.

4.4.1.5 There shall be adequate clearance between the truck, the load, and fixed object(s) of the surrounding areas.

4.4.1.6 Hazard areas (e.g. blind intersections, pedestrian traffic areas, doorways) in the operating area shall be secured or marked by appropriate signage.

4.4.2 Lighting

The truck shall only be operated in areas where lighting is adequate for the activity. Additional equipment shall be required to operate the truck in areas of insufficient lighting.

4.4.3 Aisles and obstructions

4.4.3.1 Permanent aisles, roadways or passageways, floors, and ramps shall be clearly defined or marked.

NOTE National legislation can exist.

4.4.3.2 Permanent or temporary protrusions of loads, equipment, material, and construction facilities into the usual operating area shall be guarded, clearly and distinctively marked, or clearly visible.

4.4.3.3 Where driverless trucks are operating, the permanent aisles, roadways or passageways, floors, and ramps shall be marked in accordance with ISO 3691-4.

4.5 Pre-shift checks

4.5.1 Before operating the truck, the operator or a person designated by the user shall check its operating condition in accordance with the manufacturer's instruction handbook. The items below, if applicable, shall be checked before the beginning of work:

— fuel system functions;

— power systems function;

— steering system function;

— load handling system functions (e.g. lift, lower, reach, tilt, side shift);

— hydraulic system for damage or leaks;

— service and parking brake functions;

— limit device to prevent fork arm from disengaging (e.g. positioning lock) for defects;

— load lifting device for damages (e.g. twists, cracks or wear and tear);

— wheel fasteners and pressure of pneumatic tyres and condition of tyres;

— warning devices function;

— lights function;

— meter display function;

— distance and angle sensors function;

— operator controls function;

— function of additional items, such as attachments or special equipment;

— emergency switch off/power disconnect function;

— operator restraint system (e.g. seatbelt);

— reversing switch function on the end of the tiller of pedestrian controlled trucks;

— operator fall protection system (e.g. guarding, fall protection device).

4.5.2 If the truck is found to be in need of repair or unsafe during the pre-shift check, the operator or designated person shall report the matter immediately to the user's designated authority, and the truck shall not be operated until it has been restored to a safe operating condition.

4.5.3 Repairs or adjustments shall only be carried out by competent persons specifically authorized to do so.

4.6 Travel requirements

4.6.1 General requirements

4.6.1.1 The operator shall comply with the relevant work place instructions when operating a truck.

4.6.1.2 The truck laden and unladen mass shall not exceed the admissible area and point load of the travel surface.

4.6.1.3 The operator shall adapt the travel speed of the truck according to local conditions (e.g. while turning, close to or in narrow passageways, through swinging doors, at blind intersections or on uneven surfaces).

4.6.1.4 The operator shall always keep a safe braking distance from vehicles or persons in the direction of travel. When travelling, the operator shall focus on the operation of the truck and shall ensure it is under control at all times.

NOTE The braking distance can vary depending on floor conditions (e.g. wet, dusty, sloping).

4.6.1.5 When travelling, the operator shall ensure the travel path is clear and shall look in the direction of travel. If other vehicles or pedestrians can be in the vicinity when turning, at aisle intersections, or at other points of limited visibility, the operator shall give audible signals, reduce the speed or stop the

truck, then pass slowly after security is confirmed. The operator shall look at the space between the truck, the load and possible obstructions before turning/manoeuvring to ensure there is adequate clearance.

4.6.1.6 If the load is obstructing the view, the operator shall drive the truck with the load trailing (except uphill), or the operator shall drive the truck at walking speed with particular caution under guidance of a spotter in a safe location.

4.6.1.7 If auxiliary visibility equipment (e.g. mirror, camera/monitor systems) are required to expand visibility, the operator shall be competent in the use of this equipment. The operator shall look in the direction of the travel path and keep a clear view of it.

4.6.1.8 The operator should not commence travel with the steered wheels at the full-lock position except where operating conditions require otherwise.

4.6.1.9 The operator shall make starts, stops, turns or direction reversals in a smooth manner. Sudden stops, quick turns or overtaking at dangerous or blind intersections shall be avoided.

4.6.1.10 For rider-controlled trucks, when the truck is travelling, the operator and passengers (if allowed) shall keep their whole body within the plan view of the truck.

Exception: Rider-controlled trucks with tiller arm, when the tiller arm is in the normal operating position, the arms/hands may be outside of the plan view of the truck.

4.6.1.11 When travelling, the height of the load or load carrying devices shall be kept at the travelling position as specified by the manufacturer to clear the travel path surface and obstructions, and where possible, tilted backwards with the mast or fork arms retracted (where applicable). The load shall not be elevated except during stacking. This does not apply to trucks specifically designed to travel with elevated loads.

4.6.1.12 Combined operation (travelling and load operating simultaneously) shall not be carried out unless specifically permitted by the truck manufacturer.

4.6.1.13 In the event of a failure (e.g. of the steering system or service brake system), the operator shall bring the truck to a standstill as quickly as is safely possible.

4.6.1.14 Trucks shall be operated in such a way that the risk of tip-over is avoided.

The following conditions can increase the risk of tip-overs:

— failure to slow down to a safe speed before making a turn both laden and unladen;

— quick turning;

— sudden stopping;

— driving with an elevated load or load carrying device;

— driving with a side-shifted load;

— turning on or traversing across a slope;

— driving with the load downslope on the upslope or downslope;

— driving with wide loads;

— driving with swinging loads;

— driving on the ramp edge or step;

— loading operation of a lorry (e.g. if the lorry or trailer starts to drive off during loading operation, the bridge plates or dockboards are not in the right position or one wheel of the truck is over the lorry edge);

— travelling with the load raised in areas other than in front of the stack or the racking in non-elevating operator trucks; travelling with the load raised outside of the aisles for elevating operator trucks;

— tilting the mast forward with elevated load;

— driving on uneven roads;

— overloading;

— handling loads in strong winds;

— when transporting liquids, the centre of gravity within a picked-up container can change because of the effect of inertia (e.g. when starting, braking, cornering).

4.6.1.15 Before leaving the operator's position, the operator shall:

— bring truck to a complete stop;

— place the directional control in neutral;

— apply the parking brake if not automatically applied;

— lower load-carrying device (e.g. forks) fully, unless supporting an elevated work platform;

— if leaving the truck unattended, see 4.8.

4.6.1.16 Care shall be taken not to contact overhead installations such as lights, wiring, pipes, sprinkler systems, doorways, etc.

The operator shall ensure there are sufficient overhead clearances before activating any automated operations of the truck.

4.6.1.17 Emergency vehicles such as fire trucks and ambulances shall be given the right of way.

4.6.1.18 A traffic management plan shall be implemented by the user so that trucks and pedestrians interact safely.

4.6.1.19 Programming, configuring and execution of driverless truck system operation shall comply with 4.6.

4.6.2 Driving in narrow aisles

4.6.2.1 Operating in narrow aisles is only allowed with trucks intended for this purpose.

4.6.2.2 Entry of unauthorized persons to narrow aisles shall be prohibited. These areas shall be identified accordingly.

4.6.2.3 Before driving into a narrow aisle, the operator shall check whether there are persons or other trucks in the aisle. Where protective measures (e.g. warning signs at the entrance of narrow aisles) are not in place, trucks shall be prohibited from entering narrow aisles.

4.6.2.4 The existing safety equipment on trucks and/or the racking used to reduce risks and to protect persons shall not be made inoperative, misused, adjusted or removed.

4.6.2.5 If a narrow aisle truck is fitted with a non-mechanical guidance system, the truck shall only be driven out of the narrow aisle after slowing down and sounding the audible device.

4.6.2.6 If pedestrians are required to remain in narrow aisles, appropriate protective measures shall be provided (e.g. warning signs at the entrance of narrow aisles, trucks prohibited from entering and operating in aisles, etc).

4.6.3 Driving over bridge plates or dockboards

Before driving over a bridge plate or dockboard, the operator shall ensure that:

— the bridge plate or dockboard is properly mounted;

— the bridge plate or dockboard is secured;

— the bridge plate or dockboard has sufficient carrying capacity;

— measures have been taken to prevent the lorry connected with bridge plates or dockboards from rolling or driving off;

— a safe distance is maintained from the edge while on any ramp, elevated dock, or platform (see 7.1.2).

4.6.4 Driving in lift or elevator

4.6.4.1 Before entering the elevator (lift), the operator shall verify that the combined weight of the truck, including load, battery and attachment (if fitted), and the operator, does not exceed the capacity of the lift or elevator and floor capacity of the elevator.

When operating the truck, the operator shall approach the elevator slowly.

When entering the elevator, the operator shall ensure the truck with load enters squarely and the truck or load does not contact the sides of the elevator.

4.6.4.2 The truck shall be secured inside the lifts or elevators in such a way that no part can come into contact with the wall.

4.6.4.3 The truck shall be secured in such a way that it cannot be moved unintentionally.

4.6.4.4 Pedestrian-controlled trucks shall only be driven into a lift or elevator with the load carrying devices leading. Persons using the lift or elevator at the same time shall only enter the lift after the truck is stationary with the parking brake engaged and shall depart from the lift before the truck's brake is disengaged.

4.6.5 Driving on slopes

4.6.5.1 The truck shall only be operated on slopes which can be driven on safely in accordance with the truck manufacturer's specifications. The operator shall drive the truck straight up and down a slope and not traverse or turn on it.

4.6.5.2 Operator shall be trained to drive downhill with a maximum speed not more than the speed of the truck when driving uphill.

4.6.5.3 Parking trucks on slopes is not permitted. If the truck must be left unattended on a slope, the wheels shall be chocked.

4.6.5.4 The towing tractor shall not brake suddenly, when driving downhill towing trailer(s) without brakes.

4.6.5.5 A safe distance shall be maintained from the edge while on any slope, elevated dock, or platform.

4.6.5.6 For rider-controlled trucks, the operator shall travel with the load upslope when laden. In all other cases, the operator shall follow the information provided in the manufacturer's instruction handbook.

4.6.6 Driving in containers

4.6.6.1 The truck shall be suitable for driving in containers (e.g. size, weight).

4.6.6.2 When the truck is driven in containers, the operator shall ensure that security measures have been taken to prevent the containers from rolling.

4.6.6.3 If IC trucks are driven in containers, the provisions in 5.2.10 shall be observed.

4.7 Load handling

4.7.1 General requirements

4.7.1.1 The carrying capacity specified for the truck shall not be exceeded. It is affected by the load centre, lift height and other factors (e.g. the type of tyres, attachments). The corresponding warning labels on trucks shall be observed.

4.7.1.2 The operator shall ensure proper condition of the load to be handled. Only stable and safely arranged loads shall be handled.

4.7.1.3 The user shall ensure that loads to be handled by driverless trucks without systems for monitoring load stability are checked for suitability prior to automated operation and handling.

4.7.1.4 Unless otherwise permitted by the design of the truck or manufacturer's instructions, pallets (load units) shall be transported individually.

4.7.1.5 If a load or part presents a hazard of it falling toward the operator, an appropriate load backrest extension or a supplementary screen shall be used.

4.7.1.6 If there is a risk of small loads falling through the openings of the overhead guard or load backrest extension, an appropriate supplementary screen shall be used.

4.7.1.7 If the truck is fitted with an overhead guard and removal is permitted by the manufacturer, the user shall not use the truck without the overhead guard fitted unless the following conditions are met.

1) Vertical movement of the lifting mechanism is restricted to 1 800 mm or less from the ground for all rider trucks. As an exception, double stack trucks according to ISO 5053-1:2020, 3.17, may provide a lift height up to and including 2 300 mm when fitted with a load backrest extension to allow safe load handling. The load backrest extension shall be constructed according to ISO 3691-1. The user shall refer to the manufacturer's instruction handbook for information of the specific requirements when using load backrest extensions.

2) The truck shall be operated only in areas where:

— the bottom of the top tier load is not higher than 1 800 mm and the top is not more than 3 000 mm from the ground when tiered;

— only stable (preferably interlocked, unitized, or containerized) loads are handled;

— there is a means of protection against falling objects from adjacent high stack areas.

4.7.1.8 Where overhead obstructions limit the overall height of the truck, the normal overhead guard height and the vertical clearance under the guard may be reduced, where approved by the manufacturer. Restrictions on use due to the reduced vertical clearance shall be identified on the truck.

NOTE ISO 6055 provides further information.

4.7.1.9 When operating in aisles, only pallets which do not exceed the specified largest size may be stacked.

4.7.1.10 When operating the truck with the load carrying device in an elevated position while manoeuvring during stacking, regardless of with or without load, caution shall be used when operating the steering and braking controls.

4.7.1.11 When the load carrying device is elevated, it should only be tilted forward in front of or over the stack, if the truck is intended for this purpose. Where tilt is provided, carefully tilt the load backward to stabilize the load. Caution shall be used in tilting backward with high or segmented loads. When stacking or tiering, use only enough backward tilt to stabilize the load.

4.7.1.12 The load should be visually centred when picked up and transported. When handling off-centred loads that cannot be centred, operate with caution.

4.7.1.13 Completely engage the load with the load-carrying device. Fork length shall be sufficient to ensure load stability at all times.

NOTE National requirements can exist for the relationship between the fork length and the load length.

4.7.1.14 Loads shall not be pushed or pulled by the fork arms, attachments, or carriage, or supported by other parts of the truck, except as permitted by the truck manufacturer.

4.7.1.15 Supplementary counterweights or additional personnel shall not be used to increase the load capacity of any truck.

4.7.1.16 Irregular load units shall not be stacked.

4.7.1.17 Load units shall not be stored in such a way that they project into and occupy the aisle.

4.7.1.18 Where driverless truck systems are used, only loads which conform to the size specification as defined by the manufacturer shall be handled and transported.

NOTE Driverless truck protection systems can be configured to specific dimensions. The use of oversized loads can project beyond the boundaries of protection system monitoring.

4.7.2 Picking up or depositing a load

4.7.2.1 In order to ensure a secure positioning of the load, the operator shall spread the fork arms sufficiently far apart, and insert the fork arms under the load as far as possible (care being taken that

items beyond the load are not disturbed by the fork tips), then raise the fork arms sufficiently to pick the load up.

4.7.2.2 When handling high centre of gravity or segmented loads, lesser backward tilt (where available) shall be used to stabilize the load.

4.7.2.3 When depositing a load, it shall be lowered carefully. After lowering, tilt forward, if available, to facilitate placement of the load and withdrawal of the fork arms.

4.7.3 Stacking loads

When stacking loads, the following procedure shall be observed:

— slowly approach the stack with the load lowered (travelling height) and tilted backward and retracted, if applicable;

— adjust the mast to vertical position when the truck is close to and facing the stack;

— raise the load slightly above the stacking height;

— drive the truck carefully to approach the stack. If necessary, position the load (e.g. reach the fork arm in the case of a reach truck);

— lower the fork arms, tilt the mast slightly forward as required, then deposit the load;

— after ensuring the load is securely stacked and looking in the intended travel path to make sure that it is clear, reverse the truck (retract the fork arms in the case of a reach truck) to the place where the fork arms can be lowered without touching the stack;

— lower the fork arms to the travelling position, tilt the mast backward (where available), then drive the truck away after ascertaining the way is clear.

4.7.4 Handling of suspended and liquid loads

4.7.4.1 The handling of suspended or liquid loads is only permitted with the approval of the truck manufacturer.

4.7.4.2 The following points shall be observed when handling suspended loads.

— Drive at low speed. Brake and steer carefully.

— Driving on slopes with a suspended load is forbidden.

— Swinging of the load shall be avoided.

— Ensure that the fastening means of the suspended load cannot be unintentionally moved or loosened.

— Ensure that there are no persons in the driving route and in the driving direction.

— Ensure that no persons are in danger as a result of swing of the suspended loads.

— If necessary, appropriate aids (e.g. tag or guy lines or bars) shall be provided to the persons for guiding the load.

— The load shall be restricted depending on the length of the suspended load according to the manufacturer's instruction.

4.7.4.3 The following points shall be observed when handling liquid loads:

— drive at low speed. Brake and steer carefully. Spillage of the load shall be avoided;

— driving on ramps with liquid loads is forbidden;

— lowering speed shall be limited to avoid the spillage of the load;

— ensure that there are no persons in the driving route and in the driving direction.

4.8 Parking the truck

4.8.1 At the end of the work shift or when the operator is going to leave the truck unattended, the operator shall:

— bring the truck to a complete stop;

— set all control levers to the neutral position;

— apply the parking brake, unless automatically applied;

— lower load carrying device fully, unless supporting an elevated platform;

— switch off the truck;

— remove ignition key or access authorization card. The operator shall not give the ignition key or the access authorization card to other unauthorized persons.

The service valve of the gas container (e.g. LPG, CNG, LNG, hydrogen) shall be closed, if equipped.

4.8.2 Additional safety measures (e.g. use wheel chocks) shall be taken to avoid the truck moving after parking if necessary.

4.8.3 The truck shall not be parked on a slope.

4.8.4 Gas powered trucks (e.g. LPG, CNG, LNG, hydrogen) shall not be parked near sources of heat, open flames or similar sources of ignition, nor open pits, underground entrances, elevator shafts or other similar areas.

4.8.5 The parked truck shall not inhibit access to walkways, doors, stairways, emergency exits or fire safety equipment.

4.8.6 Locations should be specified for driverless trucks to allow them to park and wait while not carrying out active operations.

5 Additional requirements according to truck type

5.1 Electric trucks

5.1.1 General requirement for all battery type

5.1.1.1 The charging, servicing and changing of batteries shall only be carried out by competent authorized personnel in accordance with the instructions of the manufacturer of the battery, the charger and the truck. Appropriate protective equipment shall be used when handling batteries. The handling instructions for the battery and the operating instructions of the battery charger shall be observed.

5.1.1.2 If work such as charging, servicing and changing are being carried out on the battery, the truck shall be shut down and secured (see 4.8). The truck shall only be restarted when the covers, connections and retention device have been returned to their normal operating condition.

5.1.1.3 Changing the battery shall include:

— covering open poles or terminals and connectors to avoid short circuits;

— use of non-metallic or insulated tools and objects to avoid short circuit;

— use of an insulated spreader bar to avoid compression or damages on housing if hoisted;

— when using attachment hooks, care shall be taken to avoid damages on cell when hoisting gear is slack;

— trolley (if used) and truck shall be secured from unintentional movement while sliding the battery;

— when removing and installing batteries, care shall be taken to ensure that the battery cables are not damaged;

— the battery securing means shall be checked after each battery change.

5.1.1.4 The weight and dimensions of the battery have an effect on the stability of the truck. Only batteries meeting the truck manufacturer's specifications shall be used.

Batteries with the same voltage but with a weight below the truck manufacturer's minimum requirement may be used with additional counterweight(s) with the truck manufacturer's approval.

Additional weights shall not be removed or placed in a different position when changing the battery.

5.1.1.5 Batteries in the truck shall be secured as specified by the truck manufacturer.

5.1.1.6 When accessing the battery, care shall be taken to ensure that the battery cables are not damaged.

5.1.1.7 Battery leads and charger cables and connectors shall be examined for damage and replaced if necessary.

5.1.1.8 The battery charger connector and battery connector shall only be separated after the battery charger has been switched off.

5.1.1.9 The charger connector shall not be plugged into the truck connector under any circumstances.

5.1.1.10 If the battery charger is located in the truck (e.g. onboard the truck), the AC plug of the battery charger shall be disconnected after charging and the cable shall be stowed away in a safe place before the truck is started.

5.1.1.11 Where automatic charging systems are used, equipment shall only be active when the corresponding charging interfaces are present and correctly coupled. Automatic charging systems shall be kept clean and maintained in accordance with the manufacturer's instructions.

5.1.2 Requirement for flooded Lead-acid battery

5.1.2.1 Lead-acid battery charging installations shall be located in areas designated for that purpose. Facilities shall be provided for safely dealing with spilled electrolyte, for adequate ventilation for dispersal of fumes from gassing batteries, for fire protection and for protecting charging apparatus from damage by trucks. Precautions shall be taken to prevent open flames, sparks, or electric arcs in battery charging areas. Smoking shall be prohibited in charging areas and this shall be indicated by signs.

5.1.2.2 During charging of a lead acid battery, there shall be no ignition sources (e.g. smoking, open flames, and sparking sources) within 2,5 m of the battery. No flammable material shall be stored within 2,5 m of the charger or the battery being charged.

5.1.2.3 The cell covers of the battery shall be kept dry and clean. If battery acid is spilled, it shall be neutralized immediately. Clamps and cable connectors shall be kept clean and maintained per the instructions of the battery manufacturer.

5.1.2.4 When charging lead-acid batteries, the vent caps shall be kept in place to avoid electrolyte spray. Care shall be taken to ensure that the vent caps are functioning properly.

5.1.2.5 Adequate ventilation of the battery compartment shall be ensured during the lead-acid battery charging process, such as opening the battery cover (or compartment).

5.1.3 Requirement for lithium ion

5.1.3.1 Batteries that show mechanical damage or signs of gaseous or liquid discharge shall immediately be removed from service

5.1.3.2 Do not connect a charger of unknown or incompatible type to a lithium ion battery.

5.1.3.3 A safe location for charging should be identified where equipment and cables do not cause an obstruction.

5.1.3.4 Lithium-ion cells, battery packs and battery management systems (BMS) are not interchangeable at component level. Different systems and chemistries have different performance characteristics and operating voltages. Replacement with an incompatible cell or BMS can result in extreme hazard.

5.1.3.5 Do not store discharged or damaged batteries as the battery can become unstable. Inspect regularly (at least every 3 months) and maintain greater than 50 % charge.

5.1.3.6 The user shall have a battery management plan in place in case of emergency.

5.1.4 Requirement for fuel cell

5.1.4.1 During refuelling of a fuel cell, there shall be no ignition sources (e.g. smoking, open flames, and sparking sources) within 2,5 m of the fuel cell. No flammable material shall be stored within 2,5 m of the fuel cell being refuelled.

5.2 IC trucks

5.2.1 Only the fuels specified in the operating instructions shall be used.

5.2.2 Trucks shall be refuelled only at locations designed for that purpose. The locations shall be ventilated to minimize the accumulation of flammable gases. Before refuelling, the engine shall be stopped, the brakes shall be applied and the operator shall leave the truck. When refuelling and when checking the fuel tank and its accessories, smoking and open flames shall be forbidden and this shall be indicated by signs in the refuelling areas.

5.2.3 When filling liquid fuels, care shall be taken to ensure that no fuel is spilled, in particular that no fuel comes into contact with hot components. The engine shall not be restarted until the fuel-filling equipment has been removed from the truck, the filler cap has been replaced on the tank and any spilled fuel or additives disposed of.

5.2.4 Filling or exchanging gas containers (e.g. LPG, LNG, or CNG) shall be carried out by trained and designated personnel. Personnel engaged in filling or exchanging gas containers shall wear appropriate protective clothing (e.g. long sleeves and gloves). Gas containers shall not be overfilled.

5.2.5 All gas containers (e.g. LPG, LNG, or CNG) shall be inspected before filling, and all removable gas containers shall be inspected before reuse, for the following defects or damage:

— dents, scrapes and gouges of the pressure vessel;

— damage to the various valves and liquid level gauge;

— debris in the relief valve;

— damage to or loss of relief valve cap;

— indications of leakage at valves or threaded connections;

— deterioration, damage or loss of flexible seals in the filling or servicing connections.

5.2.6 The gas container shall also be examined according to the inspection date on the gas container.

5.2.7 If any irregularities occur during the filling process, stop filling and notify the proper authorities.

5.2.8 Gas containers with defects and/or damage shall not be used until the necessary repairs have been made.

5.2.9 Changing of removable gas containers near sources of heat, open flames or similar sources of ignition, near open pits, underground entrances, elevator shafts or other similar areas, and in enclosed areas is forbidden.

5.2.10 Ventilation shall be provided in enclosed areas where IC trucks are used. A truck is permitted to be used in wholly or partially enclosed areas (e.g. in trailers, containers, coolers, freezers and rooms or buildings) if no inadmissible concentrations of hazardous exhaust gas components are created in the breathing air. Particulate filters shall be used with diesel trucks if necessary.

NOTE National regulations can exist.

5.3 Towing tractors and trucks with trailers

5.3.1 Towing tractors and trucks may only be used to tow trailers if they are intended for this purpose by the manufacturer and if they are fitted with an appropriate trailer coupling.

5.3.2 The technical data of the tow tractor or truck required for determining the permissible trailer load shall be taken from the operating instructions, the truck data plate, or requested from the manufacturer. The maximum specified or calculated trailer load for non-braking and braking trailers shall not be exceeded. The tow tractor or truck shall be operated in such a way that safe driving and braking of the towed vehicle is ensured.

5.3.3 After connecting each trailer, before driving, the operator shall check to ensure:

— the trailer coupling is secured against becoming loose;

— brakes and lighting are functioning, if equipped;

— the existing brake power regulator has been adjusted to the actual trailing load, if equipped.

5.3.4 Disconnected trailers shall be secured against unintentional movement (e.g. with wheel chocks).

5.3.4.1 Where automated un-hitching by driverless trucks is used, the trailer shall only be un-hitched when the trailer is in the correct location and is safeguarded from unintentional movement.

5.3.4.2 Areas designed for intentional roll-back of trailers, shall be monitored for the presence of persons and un-hitching authorized only when it is confirmed that the area is clear.

5.3.5 If the tow tractor or truck to be connected is operated from outside of the plan view of the tow tractor or truck, it shall be equipped for this purpose and the operator shall not step between the tow tractor or truck and the trailer. If an assistant is used to connect trailers, the operator shall ensure that the person is not endangered during the coupling process.

5.3.6 When driving, the dimensions of the trailer and the load shall be observed. In the case of a tow tractor or truck with several trailers, an adequate distance to fixed objects shall be ensured when turning and manoeuvring.

5.3.7 The permissible length of a tow tractor or truck with several trailers depends on the trailer or the tow tractor or truck and on the route to be driven and shall be determined by means of a trial run if necessary. The user shall determine the allowable number of trailers and, if necessary, any speed reduction required for the operating area and shall instruct the operator.

5.3.8 Adequate trial runs to confirm safe operation shall be carried out before commencing towing operations.

5.4 Pedestrian-controlled truck

5.4.1 For safe operation of pedestrian-controlled trucks, the following requirements shall apply:

— do not ride on the truck or allow others to do so unless it is intended by the manufacturer;

— the function of safety device(s) on the tiller shall be checked before operation;

— existing protective devices (e.g. mesh screens, transparent panes) shall not be removed or made ineffective;

— transparent panes shall be regularly cleaned in order to ensure good visibility at all times;

— when operating with the load end leading, always place both hands on the control handle (tongue, tiller, steering arm);

NOTE If space is limited (e.g. manoeuvring), pedestrian-controlled trucks can be operated from the side.

— when travelling load end trailing, always operate with one hand on control handle (tongue, tiller, steering arm), and walk ahead and to the side;

— on double-stackers, the upper load unit shall be lowered as close as possible to the lower load unit. If only one load is taken at the top, the truck shall only be driven with the load lowered;

— on double-stackers, when transporting two loads at the same time, the heavier load should be transported at the bottom;

— avoid coming into contact with surrounding objects.

5.4.2 In addition, the following operation requirements shall be observed:

— wear appropriate protective equipment (e.g. safety shoes);

— do not operate with greasy hands;

— keep feet clear of truck frame while operating;

— always keep hands and fingers inside the protected area of the control handle according to the manufacturer's instruction;

— be cautious when travelling with load end leading due to steering characteristics;

— be careful of drive end swing when turning while operating with load end leading;

— use caution when turning into an aisle, the load wheels tend to cut the corner.

5.5 Counterbalance lift trucks up to 10 000 kg capacity, side-loading trucks and variable-reach trucks

Before operation of the truck is permitted, the operator restraint system (e.g. safety belt) shall be used. If a cabin is used as operator restraint system, the doors shall not be taken out or remain open

5.6 Trucks with elevating operator position and trucks specifically designed to travel with elevated loads

5.6.1 With the operator platform in an elevated position, the operator shall not leave the truck. The only exception is when using trucks which are specifically equipped for such a use (e.g. trucks for use in furniture warehouses with operators wearing fall protection equipment).

This situation is to be evaluated by the user. Any new fall hazards with this situation are to be addressed by the user before the operator encounters them. New or additional safety measures in this situation address the fall hazard.

5.6.2 Safety devices (e.g. guard rails, fall protection) of the elevating platform shall be in place and properly used and shall not be made ineffective, misused or removed.

5.6.3 The operator shall be trained in the use of the emergency lowering device and retrained in the setting and operation of the emergency lowering device at least once a year. If the emergency lowering device is operated manually by an assistant from the floor below, the operator and the assistant shall communicate with each other. Both shall be in a safe location to avoid injury.

NOTE National legislation can exist.

5.7 Trucks for handling containers

5.7.1 In the case of trucks for handling tank containers, any strenuous shaking movements of the liquid shall be avoided by driving at low speed, braking and steering carefully.

5.7.2 In the case of trucks for handling refrigeration containers, the centre of gravity of the container shall be located in the longitudinal centre plane of truck by adjusting the centre of gravity or sideshifter.

5.7.3 In the case of trucks approved for driving with raised containers, the containers shall be lifted to the designated travel position as defined by the manufacturer.

5.8 Low-lift order-picking trucks

When operating a low-lift order-picking truck with a coasting system feature engaged, the operator shall take the following precautions.

— The coasting system shall be used only on a level surface free of debris.

— The coasting system shall not be used to permit the truck to coast into a cross aisle.

— The coasting system shall not be used in pedestrian walkways.

— Care shall be taken to walk along the side of the lift truck and not into the path of the coasting truck.

— If the automatic emergency stop device is activated (e.g. if a person steps into the hazard zone, the guidance is lost or the electric steering is defective, etc), the truck is brought to a standstill. The cause of the defect shall be identified and the fault rectified before restarting the truck according to the specification in the operating instructions.

5.9 Trucks operating in potentially explosive areas

Only trucks and attachments shall be used which are fit for operation in potentially explosive areas. In the case of a truck used in a combustible dust area, it shall be cleaned regularly to prevent the accumulation of combustible dust.

6 Use of attachments on the truck

6.1 If the truck is fitted with an attachment that can be laterally displaced (e.g. a sideshifter), the operator should centre the attachment or load when travelling. Caution shall be exercised when handling off-centre loads which cannot be centred.

6.2 Attachments shall comply with the truck manufacturer requirements.

6.3 The attachment manufacturer's specification and instructions shall be observed.

6.4 A capacity plate for the combination of truck and attachment shall be affixed to the truck.

6.5 The fitting of attachment(s) and the connection of hydraulics and power supply for powered attachments shall only be made by an authorized person(s) in accordance with the specifications of the manufacturer.

6.6 When operating the truck with attachment(s), the specifications of the capacity plate for the combination of truck and attachment shall be observed.

6.7 Loads shall only be transported with attachments if they can be picked up safely and clamped (where available) and held securely.

6.8 Non-integrated work platforms shall only be used when approved by the manufacturer.

NOTE National regulations can apply.

7 Transport, towing, assembly and storage of the truck

7.1 Transport of the truck

7.1.1 When lifting a truck or related attachments, the hoisting equipment shall be attached at the points specified by the manufacturer and shall have the capacity for the load being lifted.

7.1.2 When driving onto a means of transport (e.g. road vehicle, railway car), care shall be taken to ensure that a safe distance is kept from the edges of bridge plates or dockboards, platforms or other similar work area edges.

7.1.3 Before the truck(s) are driven onto the means of transport, it shall be ensured that the floor can support the total weight of the truck, load and the operator. Ramps with adequate carrying capacity shall be used. In addition, the floor shall be checked for damage, holes or other defects.

7.1.4 Before the truck(s) drive on (or off) the means of transport (e.g. road vehicle, railway car), the necessary measures (e.g. applying brakes or adding wheels chocks) shall be used to prevent movement of road vehicle or railway car. Wheel chocks may not be required when the road vehicle is equipped with automatic positive locking spring-applied parking brakes.

7.1.5 Before the truck(s) drive on (or off) a semi-trailer not coupled to a tractor, it shall be ensured that supports to prevent upending are in position.

7.1.6 Communication and procedures shall be instituted to prevent inadvertent movement of the means of transport during loading and unloading operations.

7.1.7 While being operated on an elevated dock or platform, the truck shall not be used for moving other vehicles. The truck shall not be used for opening or closing railway car doors unless the truck utilizes a device specifically designed for that purpose and the operator has been trained in its use.

7.1.8 The truck shall be secured during transport by means of applying the parking brake, wheel chocks and chains or similar means, according to the manufacturer's instructions.

7.2 Towing of the truck

7.2.1 The truck shall be towed according to the manufacturer's instruction. Steering and braking of the towed vehicle can be affected. The truck shall be towed with a rigid connection (towing bar) if the brakes of the towed truck are not functioning properly. The towing vehicle shall have an adequate towing and braking performance for the non-braking truck being towed.

7.2.2 The load shall be removed before towing and the fork arms shall be lowered to approximately 300 mm above the ground. An operator shall be in the normal operating position on the towed truck.

7.2.3 The towing distance shall be kept as short as possible. The towing speed shall be slow enough to ensure the towing and towed trucks are stable.

7.2.4 After the towing procedure, the truck shall be secured against movement.

7.3 Assembly of the truck

If parts of the truck or attachments are assembled at the place of use, the information in the instruction handbooks shall be observed. The proper functioning of the truck and attachments (if fitted) shall be checked by a competent authorized person before first operation.

7.4 Storage of the truck

7.4.1 Measures shall be taken to avoid damage if the truck is not to be used for an extended period (e.g. more than 1 month). The relevant information in the instruction handbook shall be observed. In general, the following measures are necessary:

— rust protection (e.g. on lift chains);

— regular charging of batteries, etc.

7.4.2 If the truck is to be out of service for more than 6 months, further measures according to the manufacturer's information in the instruction handbook can be necessary.

7.4.3 Whenever trucks using gases (e.g. LPG, CNG, LNG, hydrogen) as a fuel are to be stored with a gas container in place, the service valve of the gas container shall be closed.