TECHNICAL SPECIFICATION

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Refuse collection vehicles — Safety of manual and rear-loaded refuse collection vehicles

Véhicules de collecte de déchets — Sécurité des véhicules de collecte de déchets à chargement manuel et arrière

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Foreword

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This document was prepared by Technical Committee ISO/TC 297, *Waste collection and transportation management*.

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.

Introduction

Manual and rear-loaded refuse collection vehicles (RCVs) are used for waste collection when waste is loaded into vehicles manually, without lifting devices.

Manual and rear-loaded RCVs present specific risks to humans. Accidents have been reported during the operation of manual and rear-loaded RCVs, such as operators' bodies getting caught in vehicle parts while handling waste or maintaining the vehicle. Thus, there is a need for information on safety methods specifically for manual and rear-loaded RCVs. While there are International Standards on safety of machinery which provide safety requirements, there are alternative methods for when such International Standards do not fit with the situation and/or conditions of the operation of manual and rear-loaded RCVs.

This document provides support, advice and guidance to owners, waste-service providers, vehicle manufacturers, suppliers, maintenance providers, consultants, authorities and others related to manual and rear-loaded RCVs to improve the safety of waste-collection operators.

NOTE National or regional standards can specify more detailed requirements for specific markets.

Refuse collection vehicles — Safety of manual and rear-loaded refuse collection vehicles

1 Scope

This document provides general requirements, recommendations and examples of safety methods to ensure the safety of operation of manual and rear-loaded refuse collection vehicles (RCVs).

This document applies to manual and rear-loaded RCVs with rotating plate loading systems, compression plate loading systems and rotating drum loading systems, and covers methods for ensuring safety with regard to the loading systems and discharge systems.

This document applies to the design and manufacture of manual and rear-loaded RCVs to ensure that they can be operated, adjusted and maintained such that they function properly.

This document is not applicable to the handling of loads the nature of which can lead to dangerous situations (e.g. hot refuse, acids and bases, radioactive materials, contaminated refuse, especially fragile loads, explosives).

2 Normative references

ISO 24161,[1)] *Waste collection and transportation management — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 24161 and the following apply.

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

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

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

3.1
bodywork
assembly of all components fitted to the chassis of a refuse collection vehicle, which includes the *body* (3.4) itself

Note 1 to entry: The bodywork can be fixed or interchangeable. The bodywork also includes either a loading system or a footboard(s) or any combination of the two.

[SOURCE: EN 1501-1:2021, 3.4, modified — Note 1 to entry revised.]

3.2
cab
enclosure mounted on the chassis in front of the *bodywork* (3.1) where the operator drives and controls the refuse collection vehicle and where other potential operator(s)can sit

[SOURCE: EN 1501-1:2021, 3.3]

1) Under preparation. Stage at the time of publication: ISO/DIS 24161:2021.

3.3
manual and rear-loaded refuse collection vehicle
refuse collection vehicle into which waste is manually loaded into the *load opening* (3.6) on the rear and mechanically transferred into the *body* (3.4)

3.4
body
part of the *bodywork* (3.1) that retains the loaded waste

Note 1 to entry: It may be fixed or interchangeable or rotate as part of the loading system.

Note 2 to entry: To discharge the collected waste, the body is either tilted or rotated or an *ejection plate system* (3.19) is used.

Note 3 to entry: See Figures A.1 to A.3.

[SOURCE: EN 1501-1:2021, 3.5, modified — Definition revised.]

3.5
tailgate
structure connected to the rear of the *body* (3.4) that is equipped with a *load opening* (3.6) for loading waste and holds back waste retained inside the body

Note 1 to entry: See Figures A.1 to A.3.

3.6
load opening
opening for loading waste into the *tailgate* (3.5)

3.7
hopper
compartment where waste is loaded manually or mechanically into the *body* (3.4)

Note 1 to entry: See Figures A.1 and A.2.

Note 2 to entry: The hopper can be a separate compartment or part of the *bodywork* (3.1) or *tailgate* (3.5).

3.8
capacity of the hopper
volume of non-compacted waste the *hopper* (3.7) contains, measured in cubic meters rounded off to one decimal place

Note 1 to entry: If compression does affect the capacity of the hopper, the capacity of the hopper is measured when the sliding plate is in its fully retracted position.

[SOURCE: EN 1501-1:2021, 3.10, modified — definition revised, Note 1 to entry added.]

3.9
rotating plate
plate that rotates as it scrapes waste in the *tailgate* (3.5) upwards in preparation to be forced into the *body* (3.4) by the *push plate* (3.10)

Note 1 to entry: See Figure A.1.

3.10
push plate
plate that forces waste scraped upwards by the *rotating plate* (3.9) into the *body* (3.4)

Note 1 to entry: See Figure A.1.

3.11
press plate
plate that scrapes waste in the *tailgate* (3.5) upwards after it is compressed to prepare it to be forced into the *body* (3.4)

Note 1 to entry: See Figure A.2.

3.12
sliding plate
plate that moves the *press plate* (3.11) downwards to compress the waste in the *hopper* (3.7) and forces the waste in the upper movement into the *body* (3.4)

Note 1 to entry: See Figure A.2.

3.13
ejection plate
plate that pushes waste retained in the *body* (3.4) out the rear of the body for discharge

Note 1 to entry: See Figure A.2.

Note 2 to entry: An ejection plate can also be used to improve the compression ratio.

3.14
rotating plate loading system
mechanism and action of a *rotating plate* (3.9) and *push plate* (3.10) forcing waste that is transferred from the *tailgate* (3.5) into the *body* (3.4)

Note 1 to entry: See Figure A.1.

3.15
compression plate loading system
mechanism and action of a *sliding plate* (3.12) and *press plate* (3.11) compressing waste that is transferred from the *tailgate* (3.5) into the *body* (3.4)

Note 1 to entry: See Figure A.2.

3.16
rotating drum loading system
mechanism and action of a drum rotating to transfer waste from the *tailgate* (3.5) into the *body* (3.4) with or without compaction

Note 1 to entry: See Figure A.3.

3.17
discharge system
mechanism and movement for emptying the *body* (3.4)

EXAMPLE *Ejection plate system* (3.19), *rotating drum discharge system* (3.20), *tipping system* (3.18).

[SOURCE: EN 1501-1:2021, 3.19, modified — Examples revised.]

3.18
tipping system
mechanism and action to discharge waste from inside the *body* (3.4) to the rear by raising the *tailgate* (3.5) first and tipping the body afterwards

3.19
ejection plate system
mechanism and action of emptying the *body* (3.4) by moving the *ejection plate* (3.13) to the rear after opening the *tailgate* (3.5) or the discharge door if needed

3.20
rotating drum discharge system
mechanism and action to discharge waste in the *bodywork* (3.1) by tipping the body and/or rotating drum after opening the *tailgate* (3.5) or the discharge door, if needed

3.21
safety device for preventing the tailgate from falling
safety device which prevents accidents in which the lifted or tilted *tailgate* (3.5) falls accidentally

EXAMPLE *Safety bar* (3.25).

3.22
emergency stop function
device for stopping loading system operations in emergencies

3.23
single-cycle mode
mode in which the operation of loading waste into the *body* (3.4) is stopped after each cycle of a *rotating plate loading system* (3.14) and *compression plate loading system* (3.15)

3.24
continuous operation mode
mode in loading systems that allows continuous operation of loading waste into the *body* (3.4)

3.25
safety bar
bar which acts as a safety device to prevent the lifted parts of a refuse collection vehicle from unintentional lowering

Note 1 to entry: See Figure 3.

4 Structural and operational safety guidance and preventive measures

4.1 Loading system

4.1.1 Loading system controls

The rotating plate loading system and compression plate loading system shall operate either in single-cycle mode or with a choice between single-cycle mode and continuous operation mode. The rotating drum loading system shall operate in continuous operation mode. In both modes, activating the emergency stop function shall suspend operations.

Button switches or levers for loading operations shall be installed on the loading control panel on the rear of the manual and rear-loaded RCV. Button switches or levers for loading operations should be located in only one place on each vehicle and shall be structured such that they cannot launch operations when they are touched accidentally.

An emergency stop function shall be provided and the controls for this function shall be located in at least two locations close to the load opening, for example left, right or below. These should make it possible to suspend operations from the cab (optional).

EXAMPLE Button switches are recessed and cannot launch operations unless they are pushed down fully. The levers are placed further inside the shape of the body, so they cannot launch operations unless they are purposely moved.

4.1.2 Load opening height

The load opening should be at a height that facilitates the work of manually loading waste into the load opening.

4.1.3 Capacity of the hopper and dimensions

The capacity and dimensions of the hopper should be such that loaded waste does not spill out or fall from the hopper.

Information about the capacity of the hopper should be given in the instructions or the data sheet.

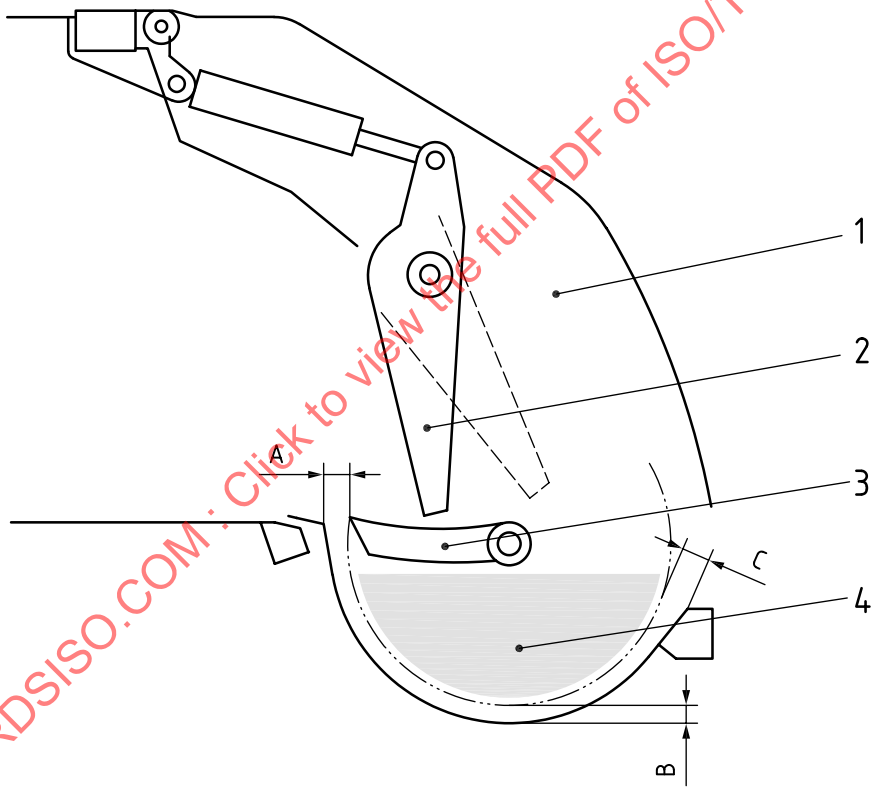
4.1.4 Rotating plate loading system

4.1.4.1 Structure to prevent waste from becoming jammed in the equipment

Rotating plate loading systems shall have a structure that ensures space between the plates and the bottom of the hopper to prevent waste from becoming jammed during loading and other times when the plates are moving.

EXAMPLE In Figure 1, length A is equal to or bigger than length B.

NOTE See Part A and Part B in Figure 1.



Key

1 tailgate
2 push plate
3 rotating plate
4 hopper
A space between rotating plate and hopper
B space between rotating plate and hopper
C space between rotating plate and hopper

Figure 1 — Example structure of a rotating plate loading system

4.1.4.2 Space between rotating plate and hopper opening

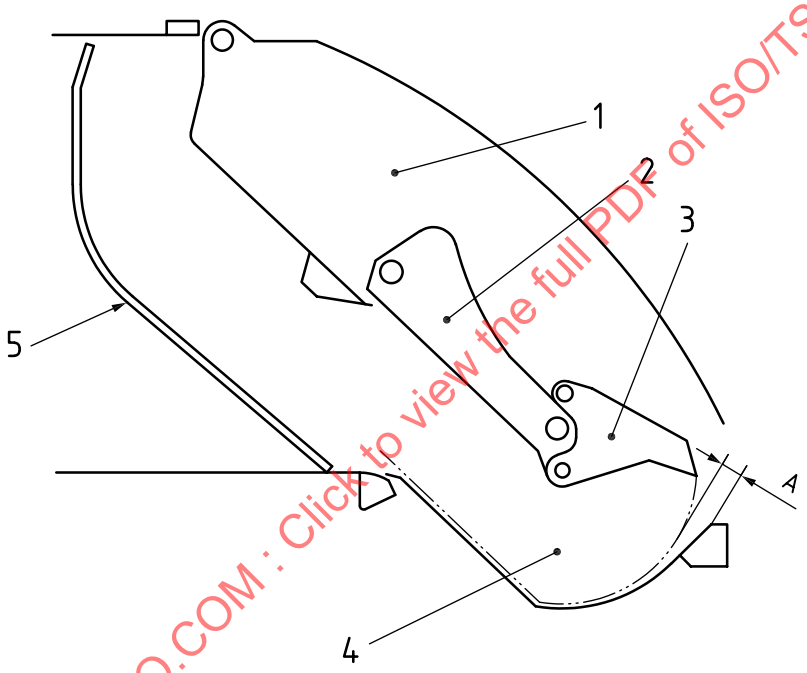
There shall be space between the rotating plate and the hopper opening to prevent operators' hands from becoming caught. The distance between the rotating plate and the opening of the hopper should be at least 50 mm. The distance can be less than 50 mm if the area around the hopper opening is detected by sensors or other means to ensure no injuries occur.

NOTE See Part C in Figure 1.

4.1.5 Compression plate loading system

There shall be space between the press plate and the hopper opening to prevent operators' hands from becoming caught. The distance between the press plate and the opening of the hopper should be at least 50 mm. The distance can be less than 50 mm if the area around the hopper opening is detected by sensors or other means to ensure no injuries occur.

NOTE See Part A in Figure 2.



Key

1 tailgate
2 sliding plate
3 press plate
4 hopper
5 ejection plate
A space between press plate and hopper

Figure 2 — Example structure of a compression plate loading system

4.2 Discharge system

4.2.1 Tailgate controls

Raising and lowering of the tailgate shall be operated by switches installed in the cab and by hold-to-run controls.

For closing the tailgate, tailgate controls shall include a function that gives a signal to the driver when tailgate lowing is incomplete.

The operator should be able to interrupt the lowering movement while observing the shear trap.

EXAMPLE The lock lamp goes out when the tailgate is closed and the lock is completely engaged.

4.2.2 Operating conditions for tipping discharge system

The tipping of the body should be operated by switches installed in the cab and shall be operated by hold-to-run controls.

NOTE National and regional requirements for operating switches can differ.

4.2.3 Operating conditions for ejection plate discharge system

The ejection plate shall be moved forward or backward by operating the switches installed in the cab and shall be operated by hold-to-run controls only when the tailgate is completely raised. When the tailgate is closed, only a forward movement is allowed.

NOTE See Figure A.2.

4.2.4 Operating conditions for rotating drum discharge system

Rotating the drum shall only be controlled by the operating switches installed in the cab or on the side of the body.

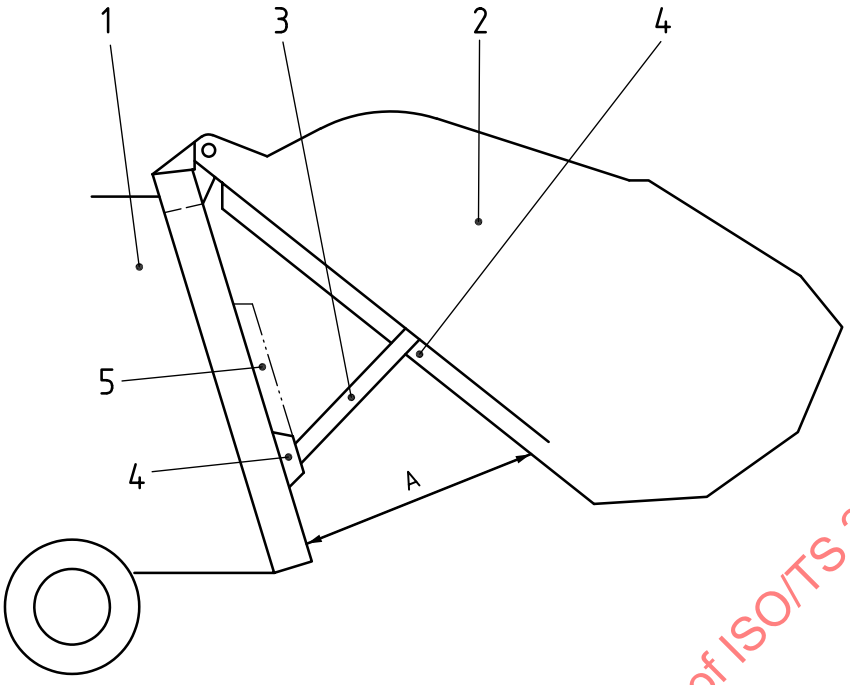
4.3 Tailgate structure for fall and opening prevention

The tailgate shall be locked to prevent operation from the cab while it is stopped in a raised position with operators underneath the tailgate or inside the body. The tailgate shall also be prevented from falling while it is being raised. Additionally, the tailgate shall have a function that prevents it from opening due to impact after it has been closed. This can be technically achieved in the following ways:

— When using a hydraulic system to move the tailgate up and down, devices shall be installed to detect, for example, drops in hydraulic pressure to the cylinders due to damage to the hydraulic hoses or pipes or separation of joints, and to prevent the tailgate from falling.

— Valves, safety bars in prominent colours or other devices shall be installed to reliably prevent the tailgate from falling.

— A locking device shall be installed to prevent the tailgate from separating from the body while it is closed.



Key

1 body
2 tailgate
3 safety bar
4 safety bar mount
5 position of safety bar when folded in
A space between tailgate and body

Figure 3 — Example of a safety device for preventing the tailgate from falling