

Earth-moving machinery — Safety —

Part 6: Requirements for dumpers

The European Standard EN 474-6:2006 has the status of a British Standard

ICS 53.100

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 474-6:2006. It supersedes BS EN 474-6:1997, which will be withdrawn on 1 November 2008.

The UK participation in its preparation was entrusted by Technical Committee B/513, Construction equipment and plant and site safety, to Subcommittee B/513/1, Earth moving machinery (International).

A list of organizations represented on B/513/1 can be obtained on request to its secretary.

The transition period is to allow stock of products manufactured to BS EN 474-6:1997 to be exhausted and for manufacturers to adopt the requirements of the revised standard.

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

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Foreword

This document (EN 474-6:2006) has been prepared by Technical Committee CEN/TC 151 "Construction equipment and building material machines — Safety", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2007, and conflicting national standards shall be withdrawn at the latest by November 2008.

This European Standard supersedes EN 474-6:1996.

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

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

For bibliographic references, see EN 474-1:2006.

EN 474 "Earth-moving machinery — Safety" comprises the following parts:

- Part 1: General requirements
- Part 2: Requirements for tractor-dozers
- Part 3: Requirements for loaders
- Part 4: Requirements for backhoe-loaders
- Part 5: Requirements for hydraulic excavators
- Part 6: Requirements for dumpers
- Part 7: Requirements for scrapers
- Part 8: Requirements for graders
- Part 9: Requirements for pipelayers
- Part 10: Requirements for trenchers
- Part 11: Requirements for earth and landfill compactors
- Part 12: Requirements for cable excavators

This European Standard is intended for use in combination with Part 1 of the series.

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

Introduction

This part of EN 474 is a type C standard as stated in EN ISO 12100-1:2003.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

1 Scope

This part of EN 474 deals with all significant hazards, hazardous situations and events relevant to wheel and crawler dumpers as defined in EN ISO 6165:2006, including compact dumpers, and compact dumpers with standing operator when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4). The requirements of this part are complementary to common requirements formulated in EN 474-1:2006.

This part does not repeat the requirements from EN 474-1:2006, but adds or replaces the requirements for application for dumpers.

This part specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards, hazardous situations and events during commissioning, operation and maintenance of dumpers.

Pedestrian controlled dumpers are excluded from the scope of this European Standard.

This European Standard is not applicable to dumpers, manufactured before the date of publication of this European Standard by CEN.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 474-1:2006, *Earth-moving machinery — Safety — Part 1: General requirements*

EN 13510:2000, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements (ISO 3471:1994, including Amendment 1:1997 modified)*

EN ISO 3449:2005, *Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance requirements (ISO 3449:2005)*

EN ISO 3164:1999, *Earth-moving machinery — Laboratory evaluations of protective structures — Specifications for deflecting-limiting volume (ISO 3164:1995)*

EN ISO 7096:2000, *Earth-moving machinery — Laboratory evaluation of operator seat vibration (ISO 7096:2000)*

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

ISO 10268:1993, *Earth-moving machinery — Retarders for dumpers and tractor-scrapers — Performance tests*

ISO 10570:2004, *Earth-moving machinery — Articulated frame lock — Performance requirements*

ISO 13333:1994, *Earth-moving machinery — Dumper body support and operator's cab tilt support devices*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 474-1:2006, EN ISO 12100-1:2003 and the following apply.

NOTE 1 Terminology for dumpers is specified in ISO 7132:2003 and is illustrated in Annex B of this European Standard.

NOTE 2 Definitions used in EN and ISO standards referred to in this European Standard are also valid for this document.

**3.1
dumper**
self-propelled crawler or wheeled machine, with an open body, which transports and dumps or spreads material (see EN ISO 6165:2006 and Figures B.1 and B.2)

NOTE Except for compact dumpers, loading is performed by other machines or equipment.

**3.2
rigid frame dumper**
dumper with a rigid frame and wheel or crawler steering (see EN ISO 6165:2006, Figure B.1 and Figure B.3)

**3.3
articulated frame dumper**
dumper with an articulated frame for steering (see EN ISO 6165:2006 and Figure B.2)

**3.4
swing dumper**
dumper having a 360° swing upper structure (see EN ISO 6165:2006)

NOTE The upper structure comprises a rigid frame, open body and operator's station; the under-carriage consists of a track type or wheeled unit.

**3.5
compact dumper**
articulated or rigid dumper having an operating mass (see ISO 6016:1998) of 4 500 kg or less (see EN ISO 6165:2006 and Figures B.4, B.5 and B.6)

NOTE A compact dumper may have integral self-loading equipment.

**3.6
self-loading equipment**
integral mounted bucket-supporting structure and linkage permanently fitted to the dumper enabling it to fill its own open body with material (see Figure B.6)

4 List of additional significant hazards

See Annex A.

NOTE Annex A (normative) contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this European Standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

5 Requirements and/or measures

5.1 General

Dumpers shall comply with the requirements of EN 474-1:2006, as far as not modified or replaced by the requirements of this part.

5.2 Dump body

5.2.1 Control device

When the content of the body can be dumped manually, the control device shall be designed and placed so that the opening and closing can be actuated safely, e. g. from the operator's position or from a side different from the tipping direction.

5.2.2 Body lowering

In case of loss of energy, lowering the body to the transport position (frame) shall be possible in a safe way without special tools, e. g. by a manually operated valve.

5.2.3 Body down indicator

Dumpers shall have the following provisions:

- a device preventing travelling with a speed higher than 10 km/h when the body is not completely lowered;
- an audible and/or visible warning device functioning when the body is not in a lowered position and the transmission is engaged.

Compact dumpers are excluded from this requirement.

5.2.4 Body support device

A mechanical body support device shall be provided to support the body in lifted position during service, maintenance and other non-operational purposes. The device shall meet the requirements in ISO 13333:1994.

5.2.5 Sticking load

Where there is a risk of losing stability while dumping due to the load freezing to the body, provisions shall be made to assist discharge of the load.

NOTE A solution is to provide an exhaust heating system for the dump body.

Compact dumpers are excluded from this requirement.

5.3 Retarder

Dumpers, except compact dumpers and crawler dumpers, shall be equipped with a retarder system, which meets the requirements of ISO 10268:1993.

5.4 Articulated frame lock

EN 474-1:2006, 5.14.5 applies with the following exceptions:

The articulated frame lock device shall meet the requirements in ISO 10570:2004 except that the requirement for articulated dumpers is limited to a steering torque (expressed in Newton per metre) of 4,0 times the steering torque for the unloaded machine.

This articulated frame lock device shall be tested to withstand a force of 1,2 times or more of the steering force calculated from the maximum force of the calculated steering moment.

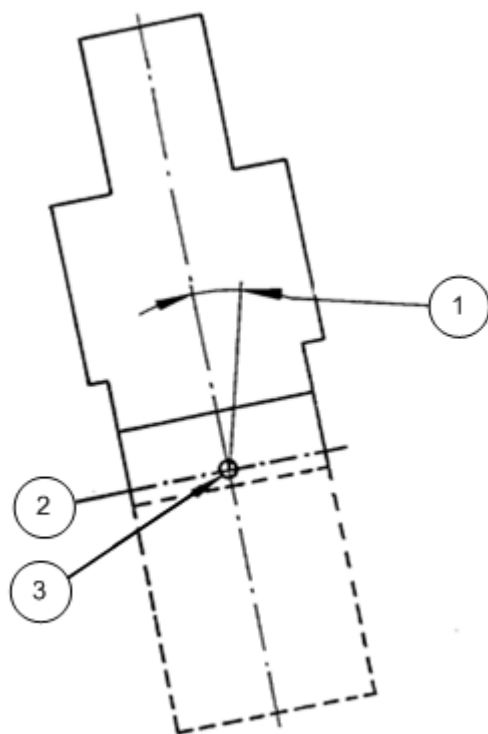
5.5 Roll-over protective structures (ROPS)

EN 474-1:2006, 5.3.3 applies with the following additions/exceptions for compact dumpers:

Compact dumpers with seated operator shall have ROPS according to EN 13510:2000.

The test procedure of EN 13510:2000 applies but modified as follows:

The portion of deflection-limiting volume (DLV) above the LA (SIP) line according to EN ISO 3164:1999 is allowed to deviate (lean) up to 15° laterally as shown in Figure 1, when the minimum energy requirement is met. Portion below the LA (SIP) line of DLV can be disregarded.



Key

- 1 up to 15°
- 2 LA
- 3 Seat index point (SIP)

Figure 1 — Deflection-limiting volume (DLV), front view

5.6 Falling object protective structure (FOPS)

5.6.1 General

EN 474-1:2006, 5.3.4 applies with the additions/exceptions in 5.6.2 and 5.6.3.

5.6.2 FOPS level (other than compact dumpers)

Dumpers other than compact dumpers shall be fitted with FOPS meeting level II (see EN ISO 3449:2005).

5.6.3 Compact dumper

5.6.3.1 Compact dumper equipped with a cab

Compact dumper equipped with a cab shall be designed and built so that a FOPS can be fitted which shall meet the requirements of EN ISO 3449:2005, level I.

5.6.3.2 Compact dumper with a self loading equipment

Compact dumper with self-loading equipment shall be fitted with a FOPS structure of level II of EN ISO 3449:2005, if the load passes over the operator's station.

5.7 Operator's station

5.7.1 Cab

EN 474-1:2006, 5.3.2 applies with the exception that compact dumpers do not need a cab, except when they are used in conditions detrimental to the operator's health.

5.7.2 Operator's seat

EN 474-1:2006, 5.4.1 applies with the addition that the seat shall meet the requirements of the following input spectral class according to EN ISO 7096:2000:

- class EM1 for wheeled dumpers;
- class EM7 for compact dumpers;
- class EM6 crawler dumpers.

5.7.3 Compact dumpers with a standing operator position

5.7.3.1 General

Compact dumpers with a standing operator position, shall have a travel speed not exceeding 4 km/h.

5.7.3.2 Controls

Machine movements shall be controlled with hold-to-run controls.

A suitable device allowing the operator to hold, and support himself during machine travel shall be provided. If a ride on platform is fitted, the device shall not restrict or impede the operator's access to and from the platform.

Travel and directional controls shall be designed to allow the operator to have one hand free to support himself, reducing the risk of inadvertent contact with the controls.

5.7.3.3 Operator's station

Provisions shall be made to ensure that the operator, in the normal driving position, is contained within the overall plan dimensions of the machine.

If a ride on platform is fitted for the operator, it shall be possible to fix it in a vertical position. A device shall be provided to prevent machine travel when the operator is not on the platform, or when the platform is in the vertical position.

The platform shall have a surface area of at least 1 400 cm² and shall be capable of containing a circle with a minimum diameter of 360 mm. The platform shall have a non-slip surface and a maximum height from the ground level of 250 mm.

The platform shall be designed to withstand a compressive force equal to 2,5 times the gross machinery mass, applied to its edge when travelling in the rearward direction. The platform shall not sustain any permanent deformation or change in position.

5.8 Steering system

5.8.1 General

EN 474-1:2006, 5.6.1 apply with the addition in 5.8.2 and 5.8.3.

5.8.2 Steering controls for machines with swivelling seats

For dumpers equipped with a swivelling seat (180°) the steering system shall be such that the movement of the steering control corresponds to the intended direction in both seat positions.

5.8.3 Controls for steering and driving of machines with turnable upper structure

The movement of the control for the driving and the steering do not need to correspond to the intended direction of movement if the upper structure is not in normal driving direction.

6 Information for use

EN 474-1:2006, 7.2, applies with the following additions:

- instructions that an articulated dumper shall be placed in a straight position when unloading;
- instructions that, when tipping a load from a dumper, the centre of gravity will change continuously and the condition of the ground will determine the stability of the machine. There are special hazards for wheel dumpers working on soft ground and when the load is sticking to the body e. g. wet clay or freezing material;
- instructions that, when loading compact dumpers fitted with self-loading equipment, the machine shall be placed on firm level ground for stability reasons. Loading shall be avoided on soft and uneven ground;
- instructions of the procedure to obtain the maximum braking performance (e. g. applying the longitudinal differential lock) at downhill operation during ice or slippery conditions shall be described;
- instructions of the use of a retarder during downhill operations (e. g. full use of a retarder shall be made before applying service brakes).

Annex A (normative)

List of additional significant hazards – Dumpers

The list of hazards in EN 474-1:2006, Annex A, applies with the following additions:

Table A.1 — List of additional significant hazards

No. ¹⁾	Hazard	Relevant clauses of this European Standard
	Hazards, hazardous situations and hazardous events	
1	Mechanical hazards due to: — machine parts of working tools, e. g.: stability self-loading equipment	
1.1	Crushing hazard	5.2, 5.4, 5.5, 5.6
	Additional hazards, hazardous situations and hazardous events due to mobility	
18	Relating to travelling functions	
18.1	Travelling functions	5.2.3, 5.3, 5.8
19	Linked to the operator's station on the machine	5.2.3, 5.7.3.2, 5.7.3.3
19.4	Mechanical hazards at the operator's station(s): a) rollover; b) fall of objects, penetration by objects	5.5 5.6
19.7	Inadequate seating	5.7.2
20	Due to the control system	
20.3	Inadequate design of manual controls and their mode of operation	5.7.3.2, 5.8.2, 5.8.3
24	Insufficient instructions for the operator (operation manual, signs, warnings and markings)	6

1) Number refers to Annex A of EN 474-1:2006.

Annex B (informative)

Illustrations

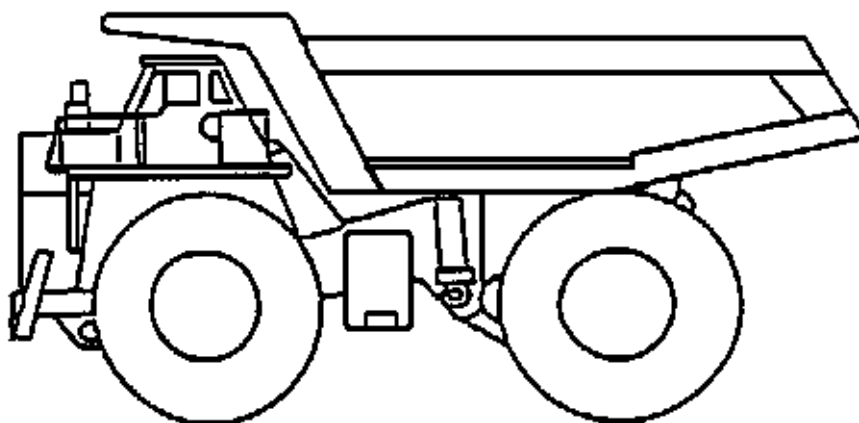


Figure B.1 — Rigid frame dumper

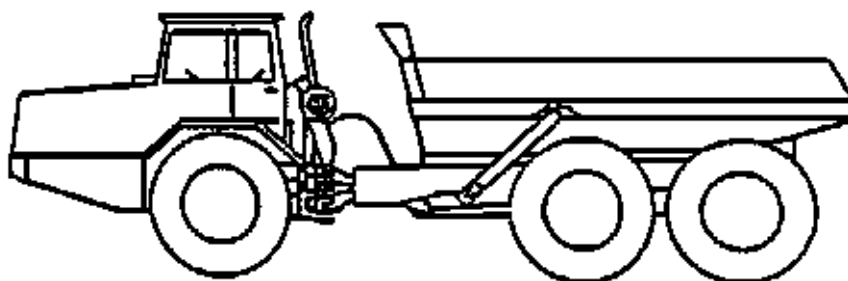


Figure B.2 — Articulated frame dumper

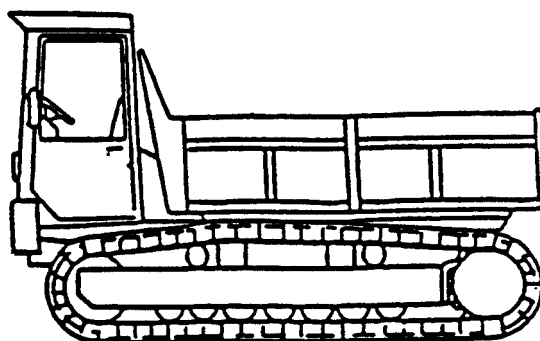


Figure B.3 — Crawler dumper

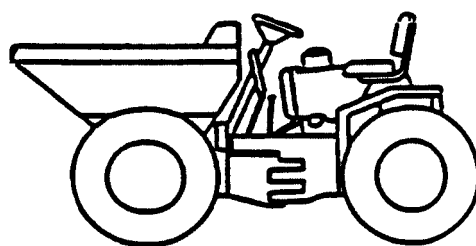


Figure B.4 — Wheel compact dumper

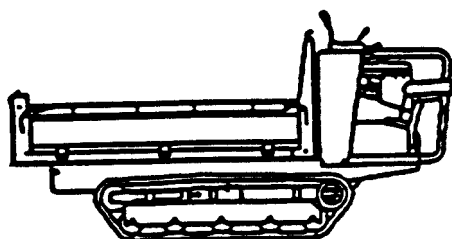


Figure B.5 — Crawler compact dumper

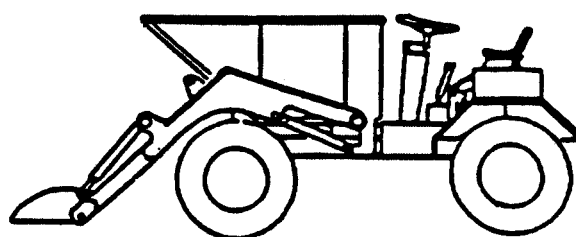


Figure B.6 — Compact dumper with self-loading equipment

Annex ZA
(informative)

**Relationship between this European Standard and the Essential
Requirements of EU Directive 98/37/EC**

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive Machinery 98/37/EC, amended by 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

- [1] EN ISO 6165:2006, *Earth-moving machinery — Basic types — Identification and terms and definitions (ISO 6165:2006)*
- [2] ISO 5006-2:1993, *Earth-moving machinery — Operator's field of view — Part 2: Evaluation method*
- [3] ISO 6016:1998, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*
- [4] ISO 7132:2003, *Earth-moving machinery — Dumpers — Terminology and commercial specifications*

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