



**SLOVENSKI STANDARD**  
**SIST EN 474-6:2000**

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**Earth-moving machinery - Safety - Part 6: Requirements for dumpers**

Earth-moving machinery - Safety - Part 6: Requirements for dumpers

Erdbaumaschinen - Sicherheit - Teil 6: Anforderungen für Muldenfahrzeuge

Engins de terrassement - Sécurité - Partie 6: Exigences applicables aux tomberaux

**Ta slovenski standard je istoveten z: EN 474-6:1996**

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Erdbaumaschinen - Sicherheit - Teil 6:  
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European Committee for Standardization  
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## FOREWORD

This European Standard 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of an identical text or by endorsement, at the latest December 1996, and conflicting national standards shall be withdrawn at the latest by December 1996.

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

The Annex A is normative and contains "List of additional hazards" and Annex B is informative and contains "Illustrations".

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 tractor-scrappers
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.

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

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## 0 Introduction

This European Standard is a Type C-standard in the structure of A-/B-/C-standards as defined in EN 292-1:1991.

The machinery concerned and the extent to which hazards are covered is indicated in the scope of this standard.

## 1 Scope

This standard specifies additional requirements to and/or exceptions from EN 474-1:1994 "Earth-moving machinery - Safety - Part 1: General requirements".

This standard applies to wheel dumpers as defined in ISO/DIS 6165:1994.

This standard applies also for crawler dumpers and compact dumpers as defined in 3.2.1 and 3.2.4 and figures B.3, B.4, B.5 and B.6.

This standard deals with the significant hazards pertinent to dumpers when they are used as intended and under the conditions foreseen by the manufacturer (see Annex A of this standard and Annex C of EN 474-1:1994).

## 2 Normative references

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

EN 292-1:1991	Safety of machinery - Basic concepts - General principles for design - Part 1: Basic terminology, methodology
EN 292-2:1991	Safety of machinery - Basic concepts - General principles for design - Part 2: Technical principles and specifications
EN 474-1:1994	Earth-moving machinery - Safety - Part 1: General requirements
ENV 1070:1993	Safety of machinery - Terminology
EN 23411:1988	Earth-moving machinery - Human physical dimensions of operators and minimum operator space envelope
EN 25353:1988	Earth-moving machinery and tractors and machinery for agriculture and forestry - Seat index point
EN 60204-1:1992	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 3164:1992	Earth-moving machinery - Laboratory evaluations of roll-over and falling object protective structures - Specifications for deflection-limiting volume

- ISO 3449:1992 Earth-moving machinery - Falling Object Protective Structures - Laboratory test and performance requirements
- ISO 3471:1994 Earth-moving machinery - Roll-over Protective Structures - Laboratory test and performance requirements
- ISO 4250-2:1991 Narrow and wide base off-road tyres and rims - Part 2: Loads and inflation pressures
- ISO/DIS 4250-3:1993 Earth-mover tyres and rims - Part 3: Rims
- ISO 5006-1:1991 Earth-moving machinery - Operator's field of view - Part 1: Test method
- ISO 5006-2:1993 Earth-moving machinery - Operator's field of view - Part 2: Evaluation method
- ISO 5006-3:1993 Earth-moving machinery - Operator's field of view - Part 3: Criteria
- ISO 6016:1982 Earth-moving machinery - Method of measuring the masses of whole machines, their equipment and components
- ISO/DIS 6165:1994 Earth-moving machinery - Basic types - Vocabulary
- ISO 6393:1985 Acoustics - Measurement of airborne noise emitted by earth-moving machinery - Method of determining compliance with limits for exterior noise - Stationary test condition
- ISO 6682:1986 Earth-moving machinery - Zones of comfort and reach for controls
- ISO 7096:1994 Earth-moving machinery - Operator seat - Transmitted vibration
- ISO 7132:1990 Earth-moving machinery - Dumpers - Terminology and commercial specifications
- ISO 9244:1995 Earth-moving machinery - General principles for safety signs and hazard pictorials
- ISO/DIS 9249:1995 Earth-moving machinery - Engine test code - Net power
- ISO 10263-2:1994 Earth-moving machinery - Operator enclosure environment - Part 2: Air filter test
- ISO 10263-4:1994 Earth-moving machinery - Operator enclosure environment - Part 4: Operator enclosure ventilation, heating and/or air-conditioning test method
- ISO 10268:1993 Earth-moving machinery - Retarders for dumpers and tractor-scrappers - Performance tests
- ISO 10570:1992 Earth-moving machinery - Articulated frame lock - Performance requirements
- ISO 10968:1995 Earth-moving machinery - Operator's controls
- ISO 12509:1995 Earth-moving machinery - Lighting, signalling and marking lights, and reflex-reflector devices

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

### 3 Definitions

For the purposes of this standard the definitions stated in ENV 1070:1993 apply.

Additional definitions specifically needed for this standard are added below:

#### 3.1 Common definitions

Terminology and commercial specifications for dumpers are specified in ISO 7132:1990 and illustrated in Annex B of this standard.

Definitions used in EN and ISO standards referred to in this standard are also valid for this standard.

#### 3.2 Additional definitions

**3.2.1 Dumper:** self-propelled wheeled or crawler machine, having an open body, which transports and either dumps or spreads material.

NOTE: Loading is performed by means external to the dumper (see figures B.1 and B.2).

**3.2.2 Rigid frame dumper:** dumper having a rigid frame and wheel steering (see figure B.1).

**3.2.3 Articulated frame dumper:** dumper having an articulated frame and articulated steering (see figure B.2).

**3.2.4 Compact dumper:** Rigid or articulated frame dumper, having an operating mass (see ISO 6016:1982)  $\leq 4500$  kg. Compact dumpers may have integral self loading equipment (see figures B.4, B.5 and B.6).

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**3.2.5 Self loading equipment:** an 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).

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**3.2.6 Operating mass:** the combined mass of the base machine with linkage and attachment if relevant, and standard equipment as specified by the manufacturer, full fuel tank, all fluid systems at their specified levels and operator (75 kg).

**3.2.7 Gross machinery mass:** the combined mass of the machine's operating mass and the rated load.

**3.2.8 Rated load:** the maximum load permitted and specified by the manufacturer.



## 4 Safety requirements

### 4.1 General

#### 4.1.1 Operator's station

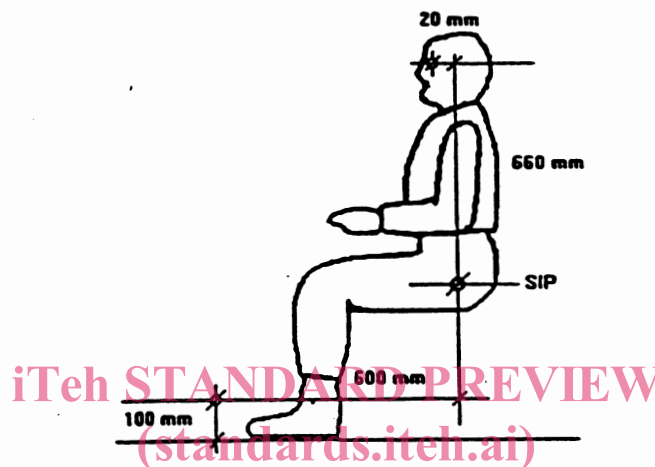
##### 4.1.1.1 Heating and ventilation system

If a heating and ventilation system according to EN 474-1:1994, clause 4.2.2.6, is required the following applies. The heating and ventilation system shall:

- either comply with ISO 10263-4:1994
- or have the capacity of increasing the temperature of the air inside the cab and maintain a temperature of +18 °C at prevailing ambient temperature. The minimum capacity of the heating system shall have a  $\Delta T$  of 25°C measured at -10°C ambient temperature.

Measurement of the system capacity shall be made at three points. The three points shall be located in a vertical plane through the SIP and parallel to the longitudinal axis of the machine as follows (see figure 1):

- at the filament position centre-point as defined in ISO 5006-1:1991;
- at the SIP as defined in EN 25353:1988;
- 100 mm above floor plate and 600 mm in front of the SIP.



**Figure 1: Location of measuring points**

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Alternatively the heating capacity can be determined by calculation.

The ventilation system shall be capable of providing the cab with filtered fresh air at the minimum of 43 m<sup>3</sup>/h. The filter should be tested according to ISO 10263-2:1994.

NOTE: The filter element selection depends on the operating environment conditions.

#### 4.1.2 Operator's controls

Operator's controls shall comply with ISO 10968:1995.

The normal engine stopping device shall be within the zone of reach (see ISO 6682:1986).

#### 4.1.3 Remote control

EN 474-1:1994, clause 4.4.2.6 applies with the following additions:

##### 4.1.3.1 Control box

Activation of controls shall only be possible from a portable remote control box.

The remote control box shall have a key switch for activating/deactivating the remote control.

##### 4.1.3.1.1 General requirements

By design the control box shall not obstruct the machine operator's freedom of movement and not be affected by impact and shock which could cause inadvertent machine movements.

##### 4.1.3.1.2 Emergency stop

The remote control box shall be fitted with an emergency stop that fulfils the requirements of 10.7 of EN 60204-1:1992.

##### 4.1.3.1.3 Controls

The control box shall have clearly marked directions of movements for the machine and its attachment and be safeguarded against unintentional actuation e.g. pushbuttons with protective collars. It shall be possible to lock the controls in the deactivated mode against unintentional or unauthorized actuation.

##### 4.1.3.2 Selecting switch

A selecting switch shall be located at the operator's station of the machine for selecting main or remote controlled mode.

##### 4.1.3.3 Warning devices

When activated a visual warning shall indicate to the bystanders that the machine is remote controlled and it shall be possible to operate the audible warning device of the machine from the control box.

##### 4.1.3.4 Travelling

The machine travelling speed shall not exceed 10 km/h. When travelling the attachment, steering and brake systems shall be remote controlled.

##### 4.1.3.5 Instructions

The instruction handbook for remote controlled machines shall contain information about the safe distance from which the operator can control the machine with the control box.

**NOTE:** This standard does not prescribe technical design requirements for remote control systems.

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#### 4.1.4 Lighting, signalling and marking lights, and reflex-reflector devices

EN 474-1:1994, clause 4.7.2 applies with the following additions:

Lighting, signalling and marking lights and reflex-reflector devices shall comply with the appropriate clauses of ISO 12509:1995.

#### 4.1.5 Airborne noise

EN 474-1:1994, clause 4.10.1 applies with the following addition:

The sound power level or airborne noise shall be measured according to ISO 6393:1985. The targets for achievable sound power level are shown in table 1.

**Table 1: Achievable sound power levels for airborne noise**

Engine power P according to ISO/DIS 9249:1995 kW	Achievable sound power level dB(A)/1pW
$P \leq 70$	106
$70 < P \leq 160$	108
$160 < P \leq 350$	113
$350 < P \leq 700$	118
$P > 700$	120

NOTE: Achievable sound power levels do not constitute limit values of exposure for persons, but are the emission values from a machine under defined test conditions. They are not a barrier to innovation and they should not prevent the achievement of lower levels.

#### 4.1.6 Dump body

##### 4.1.6.1 Opening device

If the dump body can be opened manually the opening control device shall be designed and placed so that opening and closing can be actuated safely e.g. from the operator's position or from a side different from the tipping direction.

##### 4.1.6.2 Body lowering

Lowering the body to the transport position (frame) shall be possible with the engine stopped.

##### 4.1.6.3 Body down indicator

If the dumper body is not visible to the operator in his seated position, a body down indicator shall be provided which indicates that the dumper body is not in the down position.

##### 4.1.6.4 Body support device

A mechanical body support device shall be provided to support the body in lifted position. The device shall meet the requirements of ISO 13333:1994.

##### 4.1.6.5 Sticking load

Where there is a risk of losing stability while dumping due to the load freezing or sticking to the body, provision shall be made to assist discharge of the load e.g. by heating.

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#### 4.2 Rigid frame and articulated frame dumpers

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##### 4.2.1 Tyres and rims

Tyre and rim manufacturers shall be consulted to determine if the tyre and rim are of sufficient strength (inflation pressure and load performance) for the intended operating conditions, see ISO 4250-2:1991.

Rims shall be easy to identify (see e. g. ISO/DIS 4250-3:1993, clause 2).