SLOVENSKI STANDARD
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Stroji za zemeljska dela - Varnost - 4. del: Zahteve za bagre

Earth-moving machinery - Safety - Part 4: Requirements for backhoe loaders

Erdbaumaschinen - Sicherheit - Teil 4: Anforderungen für Baggerlader

Engins de terrassement - Sécurité - Partie 4: Prescriptions applicables aux chargeuses-pelleteuses

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Earth-moving machinery - Safety - Part 4: Requirements for backhoe loaders

Engins de terrassement - Sécurité - Partie 4: Prescriptions applicables aux chargeuses-pelleteuses

Erdbaumaschinen - Sicherheit - Teil 4: Anforderungen für Baggerlader

This European Standard was approved by CEN on 17 April 2006 and includes Amendment 1 approved by CEN on 20 December 2008 and Amendment 2 approved by CEN on 22 November 2011.

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Foreword

This document (EN 474-4:2006+A2:2012) 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of an identical text or by endorsement, at the latest by July 2012, and conflicting national standards shall be withdrawn at the latest by July 2012.

This document includes Amendment 1, approved by CEN on 2008-12-20 and Amendment 2, approved by CEN on 2011-11-22.

This document supersedes ⟦A2⟩ EN 474-4:2006+A1:2009 ⟨A2⟩⟧.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟦A1⟩ ⟨A1⟩⟧ and ⟦A2⟩ ⟨A2⟩⟧.

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.

⟦A2⟩ For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document. ⟨A2⟩⟧

For bibliographic references, see ⟦A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟩⟧.

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, Bulgaria, Croatia, 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, Turkey 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 European Standard.

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 backhoe loaders as defined in EN ISO 6165:2006, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This part also deals with fork application, object handling application and log handling.

The requirements of this part are complementary to the common requirements formulated in ▌A1⟩ EN 474-1:2006+A1:2009 ⟨A1▌.

This does not repeat the requirements from ▌A1⟩ EN 474-1:2006+A1:2009 ⟨A1▌, but adds or replaces the requirements for application for backhoe loaders.

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 backhoe loaders.

This European Standard is not applicable to machinery 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.

▌A1⟩ EN 474-1:2006+A1:2009 ⟨A1▌, *Earth-moving machinery — Safety — Part 1: General requirements*

▌A1⟩ EN ISO 3164:2008 ⟨A1▌, *Earth-moving machinery — Laboratory evaluations of protective structures — Specifications for deflection-limiting volume (ISO 3164:1995)*

▌A1⟩ EN ISO 3449:2008, *Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance requirements (ISO 3449:2005)* ⟨A1▌

▌A1⟩ EN ISO 6682:2008 ⟨A1▌, *Earth-moving machinery — Zones of comfort and reach for controls (ISO 6682:1986 including Amendment 1:1989)*

▌A1⟩ EN ISO 7096:2008 ⟨A1▌, *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 2330:2002, *Fork-lift trucks — Fork arms — Technical characteristics and testing*

▌A1⟩ ISO 6016:2008 ⟨A1▌, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*

▌A1⟩ ISO 7451:2007, *Earth-moving machinery — Volumetric ratings for hoe-type and grab-type buckets of hydraulic excavators and backhoe loaders* ⟨A1▌

▌A1⟩ ISO 7546:1983 ⟨A1▌, *Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings*

ISO 8643:1997, *Earth-moving machinery — Hydraulic excavator and backhoe loader boom-lowering control device — Requirements and tests*

ISO 9248:1992, *Earth-moving machinery — Units for dimensions, performance and capacities, and their measurement accuracies*

[A1] ISO 14397-1:2007 [A1], *Earth-moving machinery — Loaders and backhoe loaders — Part 1: Calculation of rated operating capacity and test method for verifying calculated tipping load*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in [A1] EN 474-1:2006+A1:2009 [A1], EN ISO 12100-1:2003 and the following apply.

NOTE 1 Terminology for backhoe loaders is specified in ISO 8812:1999 and most common backhoe loaders are illustrated in Annex C 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
backhoe loader
self-propelled crawler or wheeled machine having a main frame designed to carry both front-mounted equipment and rear-mounted backhoe equipment, normally with stabilisers or outriggers (see EN ISO 6165:2006)

NOTE 1 When used in backhoe mode, the machine is stationary and normally digs below ground level, but when used in loader mode (bucket use), the machine loads through forward motion.

NOTE 2 A backhoe work cycle normally comprises excavating, elevating, swinging and discharging material. A loader work cycle normally comprises filling, elevating, transporting and discharging material.

3.2
compact backhoe loader
backhoe loader with an operating mass (see [A1] ISO 6016:2008 [A1]) of 4 500 kg or less, designed to work in confined spaces with the associated needs for greater manoeuvrability

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 Safety requirements and/or measures

5.1 General

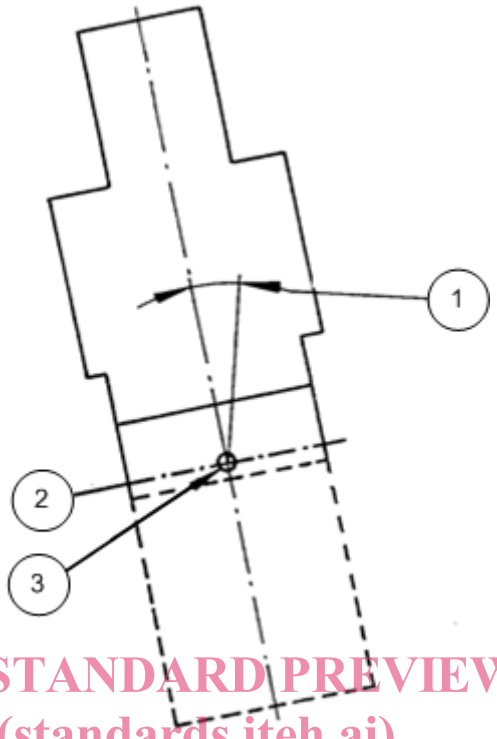
Backhoe loaders shall comply with the requirements of [A1] EN 474-1:2006+A1:2009 [A1], as far as not modified or replaced by the requirements of this part.

5.2 Protection

5.2.1 Roll-over protective structures (ROPS)

[A1] EN 474-1:2006+A1:2009 [A1], 5.3.3 applies with the following addition for compact backhoe loaders:

The portion of deflection-limiting volume (DLV) above the LA (SIP) line according to ⟩A1⟨ EN ISO 3164:2008 ⟩A1⟨ 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

5.2.2 Falling object protective structures (FOPS)

⟩A1⟨ EN 474-1:2006+A1:2009, 5.3.4 applies with the following additions for backhoe loaders. Machines with an operating mass less than or equal to 700 kg according to ISO 6016:2008 shall be fitted with a falling-object protective structure (FOPS), when they are intended for applications where there is a risk of falling objects. If FOPS is fitted, it shall meet the performance requirements of EN ISO 3449:2008 Level 1. ⟩A1⟨

5.3 Operator's station

5.3.1 Minimum space envelope

⟩A1⟨ EN 474-1:2006+A1:2009 ⟩A1⟨, 5.3.2.5 applies with the following additions:

On backhoe loaders with retractable rear window, the cab height above SIP shall not be less than 920 mm measured with the window retracted into the cab.

NOTE This requirement is at present under consideration. In the future this exception will disappear.

5.3.2 Operator's controls

⟩A1⟨ EN 474-1:2006+A1:2009 ⟩A1⟨, 5.5 applies with the following additions:

— on backhoe loaders equipped with outriggers, an acoustic and visual warning device shall be installed to warn the operator when the travel motion is engaged with lowered outriggers;

NOTE Preferably an interlocking device should be provided, which makes it impossible to raise the outriggers if the travel motion is engaged.

— if the backhoe loader is provided with an alternative operator position with alternative travel controls, there shall also be control devices for braking and steering at this alternative position, which meet the performance requirements for the primary functions.

5.3.3 Operator's seat

〚A1〛 EN 474-1:2006+A1:2009 〚A1〛, 5.4.1, applies with the addition that the seat shall meet the requirements of the following input spectral class according to 〚A1〛 EN ISO 7096:2008 〚A1〛:

— EM5 for backhoe loaders;

— EM8 for compact backhoe loaders.

5.4 Warning devices

〚A1〛 EN 474-1:2006+A1:2009 〚A1〛, 5.9, first indent, applies with the addition that the sound level shall also be greater than or equal to 93 dB (A) at 7 m distance from backhoe swing centre to the rear. The operator shall be able to activate the warning device also from the backhoe operation position.

5.5 Stability

5.5.1 General

〚A1〛 EN 474-1:2006+A1:2009 〚A1〛, 5.11 applies with the additions given in 5.5.2 to 〚A1〛 5.5.3 〚A1〛 below.

All rated capacities as defined hereafter are based on tests and/or calculations of machines being on level and firm supporting surface.

The mass of the load, its density and the location of its centre of gravity as well as the mass of the attachment and the attachment bracket, if fitted, shall be included in the determination of the rated operating capacity and the size/capacity of the attachment.

Hoses shall withstand four times the operating pressure.

To provide a sufficient stability the rated operating capacity/rated lift capacity in intended operations shall be determined as specified in 〚A1〛 5.5.2 and 5.5.3 〚A1〛.

5.5.2 Loader portion

5.5.2.1 General

The rated capacities of the backhoe loader used in loader application shall be determined as follows with the backhoe in its transport position as specified by the manufacturer.

The loader portion of backhoe loaders do not need lowering control device as defined in ISO 8643:1997

5.5.2.2 Bucket application

The rated operating capacity shall be determined according to 〚A1〛 ISO 14397-1:2007 〚A1〛.

The volumetric rating of bucket shall be determined according to ISO 7546:1983.

NOTE The mass, volumetric rating of bucket and density of the material have to be taken into account when the bucket capacity is selected for a specific application.

5.5.2.3 Fork application

5.5.2.3.1 General

The rated operating capacity is based on the use of forks and shall be determined by the criteria specified in 5.5.2.3.2 to 5.5.2.3.5.

5.5.2.3.2 Rated load

The tipping load shall be determined according to ▌A1⟩ ISO 14397-1:2007 ⟨A1▌ (except for stability factor stated in 4.1) and with the fork in a horizontal position. The rated load as a percentage of tipping load shall not exceed the applicable value specified in Table 1.

Table 1 — Stability factors in fork application

Rated load as a percentage of tipping load for loader portion	
Ground condition	**Wheel loader**
Rough terrain	60
Firm and level ground	80

Stability factors to determine rated load of crawler backhoe loader shall not exceed 35 % of the tipping load.

5.5.2.3.3 Hydraulic lift capacity

It shall be possible to control the rated load in all positions foreseen by the manufacturer, considering all relevant hydraulic circuits involved.

NOTE The hydraulic lift capacity is the maximum mass that can be lifted in any arm position with the fork in horizontal position limited by the hydraulic circuit working pressure according to ▌A1⟩ ISO 14397-2:2007 ⟨A1▌.

5.5.2.3.4 Rated operating capacity

The rated operating capacity shall be determined either by:

— the rated load specified in 5.5.2.3.2 or

— the hydraulic lift capacity specified in 5.5.2.3.3,

whichever is less.

5.5.2.3.5 Fork size

To select the fork arm size and to determine the load centre gravity distance (D) as shown in Figure 2, the specifications in Table 2 shall be followed.