SLOVENSKI STANDARD
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Stroji za zemeljska dela - Varnost - 3. del: Zahteve za nakladalnike

Earth-moving machinery - Safety - Part 3: Requirements for loaders

Engins de terrassement - Sécurité - Partie 3: Prescriptions applicables aux chargeuses

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Earth-moving machinery - Safety - Part 3: Requirements for loaders

Engins de terrassement - Sécurité - Partie 3: Prescriptions applicables aux chargeuses

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 474-3:2017) 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 document is currently submitted to the CEN Enquiry.

This document will supersede 474-3:2006+A1:2009.

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(s).

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

For bibliographic references, see prEN 474-1:2017.

prEN 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

— Part 13: Requirements for rollers

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

Introduction

This part of prEN 474 is a type C standard as stated in EN ISO 12100:2010.

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 document, together with part 1, deals with all significant hazards for earth-moving machinery – loaders when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer associated with the whole life time of the machine (see Clause 4).

The requirements of this part are complementary to the common requirements formulated in prEN 474-1. This document does not repeat the requirements from prEN 474-1, but adds or replaces the requirements for application for earth moving machinery – loaders.

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

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

prEN 474-1:2017, *Earth-moving machinery — Safety — Part 1: General requirements*

EN ISO 2867:2011, *Earth-moving machinery — Access systems (ISO 2867:2011)*

EN ISO 6165:2012, *Earth-moving machinery — Basic types — Identification and terms and definitions (ISO 6165:2012)*

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

EN ISO 3457:2008, *Earth-moving machinery — Guards — Definitions and requirements (ISO 3457:2003)*

EN ISO 7096:2008, *Earth-moving machinery — Laboratory evaluation of operator seat vibration (ISO 7096:2000)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

ISO 2330:2002, *Fork-lift trucks — Fork arms — Technical characteristics and testing*

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

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

ISO 14397-1:2007, *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 document, the terms and definitions given in prEN 474-1:2017, EN ISO 12100:2010 and the following apply.

Note 1 to entry: Terminology for loaders is specified in ISO 7131:2009 and the most common loaders are illustrated in Annex B of this European Standard.

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

3.1
loader
self-propelled crawler or wheeled machine, having a front-mounted equipment primarily designed for loading operation (bucket use), which loads or excavates through forward motion of the machine

Note 1 to entry: A loader work cycle normally comprises filling, elevating, transporting and discharging material.

Note 2 to entry: Derivative machinery; loaders can also be used for derivative application (see prEN 474–1:2017, 3.1.2)

3.2
compact loader
wheeled loader with an operating mass (see ISO 6016:2008) of ≤ 4 500 kg or less, or crawler loaders with an operating mass of ≤ 6 000 kg

3.3
skid steer loader
loader normally having an operator's station between attachment-supporting structures and steered by using variation of speed and/or direction of rotation between traction drives on opposite sides of a machine with fixed axles

3.4
swing loader
loader having a swing type lift arm with a swinging angle to the left and right from a straight position

Note 1 to entry: A swing loader work cycle is normally similar to a loader cycle but additionally work can be done offset of the machine track.

3.5
telescopic loader
loader having a centre mounted telescopic type lift arm with the pivot point in front of the operator's station

3.6
Longitudinal Load Moment
moment produced by the load, the attachment and the lifting means of the telescopic loader which acts at the load centre of gravity from the tipping line in the forward direction

[EN 15000:2008, 3.1; modified]

3.7
Longitudinal Load Moment Indicator
LLMI
device that warns the operator of a change to the load handling geometry which would increase the longitudinal load moment, beyond pre-determined limit(s)

[EN 15000:2008, 3.2]

3.8
Longitudinal Load Moment Control
LLMC
device that prevents the operator changing the load handling geometry in direction(s) which would increase the longitudinal load moment, beyond the allowable limit(s)

[EN 15000:2008, 3.3]

3.9
load handling geometry
relationship of points, lines and angles, described by the position of the load centre of gravity (the position of the boom, carriage and attachment) and tipping line

[EN 15000:2008, 3.4; modified]

3.10
boom float
operating mode that uses gravity to allow an attachment at the end of the boom to follow a contour (e.g. the ground)

[prEN 1459-1:2014, 3.17]

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

Loaders shall comply with the requirements of prEN 474-1:2017, as far as not modified or replaced by the requirements of this part.

5.2 Loaders with front access

5.2.1 General

For loaders with front access the reference to EN ISO 2867:2011 applies with the deviations given in 5.2.2 and 5.2.3.

5.2.2 Primary access opening

The primary opening shall not be less than:

— opening height 875 mm;

— opening width 550 mm.

5.3 Operator's seat

prEN 474-1:2017, 5.4.1.4 applies with the following modifications:

The seat shall meet the input spectral according to EN ISO 7096:2008:

— EM3 for wheel loaders greater than 4 500 kg;

— EM6 for crawler loaders;

— EM8 for compact wheel loaders less or equal than 4 500 kg;

— EM9 for skid steer loaders.

5.4 Rear window(s)

prEN 474-1:2017, 5.3.2.1.3 and 5.3.2.5 for the rear window(s) apply with the following modifications:

No motorized wiper(s) and washers are required for loaders with a cab width less than or equal to 750 mm measured outside of the cab in the height of SIP.

5.5 Protection

5.5.1 Falling object protective structures (FOPS)

prEN 474-1:2017, 5.3.4 applies with the following modifications:

— loaders, except compact loaders according to EN ISO 6165:2012 shall be fitted with FOPS, meeting the requirements of EN ISO 3449:2008 Level II;

— compact loaders according to EN ISO 6165:2012 shall be fitted with FOPS, meeting the requirements of EN ISO 3449:2008 Level I.

— compact loaders, if used in demolition application shall be fitted with FOPS, meeting the requirements of EN ISO 3449:2008 Level II.

5.5.2 Fenders

prEN 474-1:2017, 5.14.5 does not apply to compact loaders with front access.

5.5.3 Operator's controls and indicators

prEN 474-1:2017, 5.5 applies with the following modifications for compact loaders with front access:

Controls for lifting and lowering the loader linkage, machine movement and hydraulically controlled attachments (e.g. multi-purpose bucket) shall be either automatically mechanically secured, e.g. by a safety bar; or automatically deactivated when the operator leaves/enters the operator's compartment.

5.5.4 Guarding for loaders

Loaders shall be fitted with side and front protection protective structure that prevents the operator from reaching the trapping parts between the side lift arms and fixed parts of the machine when the operator is seated in the operator's position.

Opening in the side guards shall comply with EN ISO 3457:2008.

Front protection shall be provided for the operator's lower limbs if the lift arm componentry passes within 1,5 m in front of the SIP. The front protective structure shall have a minimum height of 200 mm from the floor plate. Restraint systems for machines with front access.

prEN 474-1:2017, 5.4.1.5 applies with the exception that the safety bar, see 5.5.4 of this European Standard, can be used as a restraint system provided that the test criteria of EN ISO 6683:2008 are met.

5.6 Stability

5.6.1 General

prEN 474-1:2017, 5.11 applies with the additions given in 5.6.2 to 5.6.7 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.

Loaders do not need to meet prEN 474-1:2017, 5.12.3, 5.12.4, 5.12.5, 5.12.6 and 5.12.7.

Telescopic loaders need to meet the requirements of Annex B.

To provide a sufficient stability the rated operating capacity in intended operations shall be determined as specified in 5.6.2 to 5.6.7

5.6.2 Bucket application

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

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

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.

5.6.3 Fork application

5.6.3.1 General

The rated operating capacity is based on the use of forks and shall be determined by the criteria specified in 5.6.3.2 to 5.6.3.4.

5.6.3.2 Rated load

The tipping load shall be determined according to ISO 14397-1:2007 (except for stability factor stated in 5.1) 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	
Ground condition	**Wheel loader**
Rough terrain	60
Firm and level ground	80

Stability factors to determine rated load of wheel loaders with skid steering shall not exceed 50 % and crawler loaders, or skid steer track loaders, shall not exceed 35 % of the tipping load.