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Stroji za zemeljska dela - Varnost - 5. del: Zahteve za hidravlične bagre

Earth-moving machinery - Safety - Part 5: Requirements for hydraulic excavators

Engins de terrassement - Sécurité - Partie 5 : Prescriptions applicables aux pelles hydrauliques

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Earth-moving machinery - Safety - Part 5: Requirements for hydraulic excavators

Engins de terrassement - Sécurité - Partie 5 :
Prescriptions applicables aux pelles hydrauliques

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 151.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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prEN 474-5:2017 (E)**European foreword**

This document (prEN 474-5:2017) 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 EN 474-5:2006+A1:2013.

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 – hydraulic excavators 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 – hydraulic excavators.

This part also deals with derivated machinery and derivated use, e.g. lifting operation application, shovel application, log application, grapple application, magnetic plate application.

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

2 Normative references

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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 12643:2014, *Earth-moving machinery — Rubber-tyred machines — Steering requirements (ISO 5010:1992 modified)*

EN 13531:2001+A1:2008, *Earth-moving machinery — Tip-over protection structure (TOPS) for compact excavators — Laboratory tests and performance requirements (ISO 12117:1997 modified)*

EN ISO 3471:2008, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements (ISO 3471:2008)*

EN ISO 5353:1998, *Earth-moving machinery and tractors and machinery for agriculture and forestry - Seat index point (ISO 5353:1995)*

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

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

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

ISO 5006:2009, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

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

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

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

ISO 10262:1998, *Earth-moving machinery — Hydraulic excavators — Laboratory tests and performance requirements for operator protective guards*

ISO 10567:2007, *Earth-moving machinery — Hydraulic excavators — Lift capacity*

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 hydraulic excavators are specified in ISO 7135:2009 and illustrated in Annex D 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**hydraulic excavator**

self-propelled machine on crawler, wheels or legs, having an upper structure normally capable of 360° swing with mounted equipment, primarily designed for excavating with bucket, without moving the undercarriage during the work cycle

Note 1 to entry: An excavator work cycle normally comprises excavating, elevating, swinging and discharging material (see EN ISO 6165:2012). Hydraulic excavators can also be used for material handling/transportation.

3.1.1**minimal swing radius excavator (MSRX)**

excavator for operation in confined space having an upper structure with a short swing radius (equipment and attachment swing within 120 % of the width of the undercarriage)

3.1.2**compact excavator**

excavator and minimal swing radius excavator with an operating mass (see ISO 6016:2008) of less than or equal to 6 000 kg

3.2**walking excavator**

excavator with three or more supporting legs which may be articulated, telescopic or both and which can be fitted with wheels

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

Hydraulic excavators 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 Operator's station

5.2.1 Minimum space envelope

On excavators with retractable front window, the cab height above SIP (see EN ISO 5353) shall not be less than 920 mm measured with the window retracted into the cab.

5.2.2 Operator's protection

5.2.2.1 Roll over and tip over protective structures (ROPS and TOPS)

prEN 474-1:2017, 5.3.3 does not apply for hydraulic excavators except for walking excavators, see 5.7.3. prEN 474-1:2017, Annex B, B.7.1 does not apply for hydraulic excavators with moveable cabs.

Compact excavators with an operating mass greater than 1 t and less than or equal to 6 t according to ISO 6016:2008 shall be equipped with a tip-over protective structure (TOPS).

TOPS shall meet the requirements of EN 13531:2001+A1:2008.

Machines with no cab riser or with fixed cab riser up to 500 mm and with an operating mass greater than 6 t and less than or equal to than 50 t according to ISO 6016:2008 shall be equipped with ROPS.

ROPS shall meet the requirements of ISO 12117-2:2008 and its Cor 1:2010.

Machines with fixed cab riser above 500 mm or with movable operator's station and with an operating mass greater than 6 t and less than or equal to 50 t according to ISO 6016:2008 shall, where the risk of rolling over exists, based on the intended use of the machine as specified by the manufacturer in the operator's manual, be equipped with a roll over protective structure (ROPS). ROPS shall meet the requirements of ISO 12117-2:2008 and its Cor 1:2010. Where ROPS is not required a tip-over protective structure (TOPS) shall be fitted. For evaluation of the performance of the TOPS, ISO 12117-2 shall be used in respect of lateral loading only and with the following lateral load energy:

Lateral load energy U_s (J) = 6 500 x (M/10 000)^{1,25}.

For machines with a movable operator's station as defined in prEN 474-1:2017, Annex B, the ROPS and TOPS tests shall be performed with the operator station in the machine travel position. The operator station mounted to the moving linkage components shall be attached to the upper swing frame. The boom and any boom lift cylinders shall be attached to the upper swing frame as applicable based on potential contact with them during the test. The test load(s) shall be applied to the operator's station structure as specified in ISO 12117-2.

NOTE The test includes the whole lifting configuration (e.g.cab riser frame and mounted cab). The test load is not directly applied at the cab riser frame.

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TOPS shall be labelled in accordance with ISO 12117-2:2008, Clause 9, except that the standard referred to shall be prEN 474-5:2017.

5.2.2.2 Operator's protective guard

prEN 474-1:2017, 5.3.4 shall be replaced by the following:

For excavators with an operating mass less than or equal to 1 500 kg Operator's Protective Guard requirements do not apply.

If an Operator's Protective Guard needs to be fitted, the following applies:

- excavators with an operating mass greater than 1 500 kg according to ISO 6016:2008 shall be fitted with Operator's Protective Guard meeting the requirements of ISO 10262:1998, Level I;
- excavators if used in demolition application shall be fitted with Operator's Protective Guard meeting the requirements of ISO 10262:1998, Level II;
- excavators with an operating mass greater than 6 000 kg according to ISO 6016:2008 shall be fitted with Operator's Protective Guard meeting the requirements of ISO 10262:1998, Level II.

5.2.3 Operator's seat**5.2.3.1 Seat adjustment for compact excavators**

prEN 474-1:2017, 5.4.1.3 shall apply with the following modification:

prEN 474-1:2017, 5.4.1.3, 2nd paragraph applies to excavators with an operating mass (see ISO 6016:2008) of less than 3 000 kg. (standards.iteh.ai)

5.2.3.2 Vibration

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

For excavators greater than 6 000 kg the seat shall comply with spectral class EM 6 of EN ISO 7096:2008.

NOTE Even there is no requirement on seat suspension for seats used in excavators (see EN ISO 7096:2008, 1.4), this clause makes reference to EN ISO 7096:2008.

5.3 Defrosting system

prEN 474-1:2017, 5.3.2.1.3 shall be replaced by the following:

A system shall be provided to defrost the front windscreen for example by means of a heating system or a particular defrosting device.

The defrosting system for the front windscreen shall meet the requirements specified in ISO 10263-5:2009.

A system shall be provided to defrost the rear window, when visibility (see ISO 5006) through the rear window is needed, for example by means of a heating system or a particular defrosting device.

The defrosting system for the rear window shall meet the requirements specified in ISO 10263-5:2009.

5.4 Operator's controls and indicators

prEN 474-1:2017, 5.5.1 d) shall be replaced by the following:

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

5.5 Steering system

prEN 474-1:2017, 5.6.1 shall be replaced by the following:

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

prEN 474-1:2017, 5.6.2 shall apply with the following addition:

For machines with a travel speed equal to or lower than 20 km/h shall comply with EN 12643:2014, except for the requirements for emergency steering.

5.6 Swing brakes

Swing brakes shall comply with the requirements as defined in Annex C.

5.7 Stability and safety devices

5.7.1 General

prEN 474-1:2017, 5.11 shall apply with the additions given in 5.7.1 to 5.7.4.

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

The mass of the intended 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 lift capacity and the size/capacity of the attachment.

To provide a sufficient stability, the rated lift capacity in intended operations shall be determined in accordance with 5.7.2 to 5.7.4.

5.7.2 Bucket and shovel application

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The rated lift capacity for an excavator used in bucket or shovel application shall be determined either by:

- rated tipping load according to ISO 10567:2007, 3.8, in the most unfavourable position, or
- hydraulic lift capacity according to ISO 10567:2007, 3.11

whichever is less.

The volumetric rating of the bucket or shovel shall be determined according to ISO 7451:2007 or ISO 7546:1983.

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

5.7.3 Log application

The rated lift capacity in stationary log application shall be determined either by:

- rated tipping load according to ISO 10567:2007, 3.8, with a log in the most unfavourable position, or
- hydraulic lift capacity according to ISO 10567:2007, 3.11

whichever is less.

The rated lift capacity in moving (driving with load, oscillating axle locked) log application shall be determined either by:

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- rated tipping load as 60 % of the tipping load according to ISO 10567:2007, 3.7, with a log in the most unfavourable position, or
- hydraulic lift capacity according to ISO 10567:2007, 3.11

whichever is less.

5.7.4 Lifting operation application**5.7.4.1 General**

prEN 474-1:2017, 5.12 shall apply to all machines which can be fitted with a lifting device even if the initial intended use does not involve a lifting operation and where:

- a) the maximum rated lift capacity according to prEN 474-1:2017, 3.6 is greater than or equal to 1 000 kg, at a minimum lift point radius as defined in ISO 10567:2007, 3.5
- or
- b) an overturning moment greater than or equal to 40 000 Nm,
- and
- c) where the operating mass, according to ISO 6016:2008 is lower or equal to 50 000 kg.

prEN 474-1:2017, 5.12 shall also apply to machines where the operating mass is greater than 50 000 kg according to ISO 6016:2008 and intended for use in lifting operations.

5.7.4.2 Rated lift capacity in lifting operation

The rated lift capacity in lifting operation shall be determined according to ISO 10567:2007, 3.13.

5.7.4.3 Lowering control device

prEN 474-1:2017, 5.12.3 shall apply to excavators according to prEN 474-5:2017, 5.7.4.1.

5.7.4.4 Overload warning device

prEN 474-1:2016, 5.12.4 shall apply to excavators according to prEN 474-5:2017, 5.7.4.1.

5.7.4.5 Load capacity indicator

prEN 474-1:2017, 5.12.5 does not apply.

5.7.4.6 Rated capacity limiting device

prEN 474-1:2017, 5.12.6 does not apply.

5.7.4.7 Rated lift capacity chart in lifting operation

prEN 474-1:2017, 5.12.7 shall apply to excavators according to prEN 474-5:2017, 5.7.4.1 of with the following addition:

A chart of the rated lift capacity in lifting operation in relation to the reach and turntable position, established by the manufacturer, shall be provided. Annex B gives an example for such a chart.

The chart(s) shall be available at the operator's station for each lifting configuration specified in the operator's manual.