INTERNATIONAL STANDARD

ISO 20474-5

Second edition
2017-07

Earth-moving machinery — Safety —

Part 5: Requirements for hydraulic excavators

Engins de terrassement — Sécurité —

Partie 5: Exigences applicables aux pelles hydrauliques

Reference number
ISO 20474-5:2017(E)

© ISO 2017



COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **2**
4 Safety requirements and protective measures ... **4**
4.1 General ... 4
4.2 Operator station ... 4
4.2.1 Operator protection ... 4
4.2.2 Rear window defrosting system ... 5
4.3 Controls for driving and steering ... 5
4.4 Swing brakes ... 5
4.5 Stability and safety devices ... 5
4.5.1 General ... 5
4.5.2 Bucket and shovel applications ... 5
4.5.3 Object-handling applications ... 5
4.6 Specific requirements for walking excavators ... 6
4.6.1 Operator station ... 6
4.6.2 Wheel brake system ... 6
4.6.3 Operator protection ... 7
4.6.4 Stability ... 7
4.6.5 Retrieval and towing ... 9
5 Information for use ... **9**
Annex A (normative) **Requirements for excavator swing brakes** ... **10**
Annex B (informative) **Illustrations** ... **13**
Bibliography ... **16**

© ISO 2017 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety, ergonomics and general requirements*.

This second edition cancels and replaces the first edition (ISO 20474-5:2008), which has been technically revised with the following changes:

— normative references have been updated;

— references to national and regional provisions in the withdrawn ISO/TS 20474-14 have been deleted;

— new safety requirements and protective measures have been added, including requirements for load safety devices and the normative annex, *Requirements for excavator swing brakes*.

It is intended to be used in conjunction with ISO 20474-1.

A list of all parts in the ISO 20474 series, published under the general title, *Earth-moving machinery — Safety,* can be found on the ISO website.

© ISO 2017 – All rights reserved

Introduction

This document is a type-C standard as stated in ISO 12100.

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

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

ISO 20474 provides acceptable safety requirements for earth-moving machinery. This standard does not necessarily provide requirements to meet all national and regional regulatory provisions, e.g. Japan does not allow object handling with earth-moving machinery.

© ISO 2017 – All rights reserved

Earth-moving machinery — Safety —

Part 5: Requirements for hydraulic excavators

1 Scope

This document gives the safety requirements specific to hydraulic excavators as defined in ISO 6165. It is intended to be used in conjunction with ISO 20474-1, which specifies general safety requirements common to two or more earth-moving machine families. The specific requirements given in this document take precedence over the general requirements of ISO 20474-1.

This document deals with all significant hazards, hazardous situations and events relevant to the earth-moving machinery within its scope (see ISO 20474-1:2017, Annex A) when used as intended or under conditions of misuse reasonably foreseeable by the manufacturer. It specifies the appropriate technical measures for eliminating or reducing risks arising from relevant hazards, hazardous situations or events during commissioning, operation and maintenance.

This document is not applicable to machines manufactured before the date of its publication.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 3471, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements*

ISO 6165, *Earth-moving machinery — Basic types — Identification and terms and definitions*

ISO 6682, *Earth-moving machinery — Zones of comfort and reach for controls*

ISO 6683, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests*

ISO 7096, *Earth-moving machinery — Laboratory evaluation of operator seat vibration*

ISO 7135, *Earth-moving machinery — Hydraulic excavators — Terminology and commercial specifications*

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

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

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

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

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

© ISO 2017 – All rights reserved

ISO 12117, *Earth-moving machinery — Tip-over protection structure (TOPS) for compact excavators — Laboratory tests and performance requirements*

ISO 12117-2:2008, *Earth-moving machinery — Laboratory tests and performance requirements for protective structures of excavators — Part 2: Roll-over protective structures (ROPS) for excavators of over 6 t.* Amended by ISO 12117-2:2008/Amd 1:2016

ISO 20474-1:2017, *Earth-moving machinery — Safety — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20474-1, ISO 6165 and ISO 7135, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
excavator
hydraulic excavator
self-propelled machine on crawlers, wheels or legs, having an upper structure normally capable of a 360° swing with mounted *equipment* (3.3), 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 the discharging of material.

Note 2 to entry: An excavator can also be used for object or material handling/transportation.

Note 3 to entry: Unless specifically identified as a *cable excavator*, an excavator is commonly referred to as a *hydraulic excavator*.

Note 4 to entry: See Annex B for illustrations.

[SOURCE: ISO 6165:2012, 4.4, modified — By adding Note 4.]

3.1.1
compact excavator
excavator (3.1) with an operating mass 6 000 kg or less

Note 1 to entry: See Annex B for illustrations.

[SOURCE: ISO 6165:2012, 4.4.4, modified — By adding Note 1.]

3.1.2
walking excavator
excavator (3.1) with three or more supporting legs which can be articulated, telescopic or both and which can be fitted with wheels

Note 1 to entry: See Annex B for an illustration.

[SOURCE: ISO 6165:2012, 4.4.2, modified — By adding Note 1.]

3.2
extra-long reach equipment application
application of *hydraulic excavator* (3.1) equipped with extra-long reach equipment

Note 1 to entry: Extra-long reach equipment application includes the following:

© ISO 2017 – All rights reserved

— extra-long front equipment application consisting of an extra-long boom and an extra-long arm with lighter duty bucket for extra wide working range purpose;

— telescopic arm application;

— telescopic arm with clamshell bucket application;

— extra-long front equipment demolition application consisting of an extra-long boom (multi-booms), extra-long arm and demolition attachment.

3.3
material handling
moving of scrap and loose bulk material, e.g. scrap iron, demolition debris and mulch

3.4
material handling excavator
hydraulic excavator (3.1) purpose-built for material handling and typically equipped with an elevated (fixed or movable) operator station

3.5
demolition application
demolishing by pushing or pulling, or fragmenting by crushing or shearing, buildings or other civil engineering structures and their component parts

3.6
swing
rotation of the upper structure of an excavator in relation to a fixed reference frame on the ground

3.7
working swing revolution speed
turntable-swing speed, reached in a 180° revolution of the upper structure with maximum rotation command input starting from a still position

Note 1 to entry: It is expressed in revolutions per minute (r/m).

3.8
deceleration swing angle
angle measured in degrees of swing while the swing motion is decelerated from working swing revolution speed to a complete stop (halt)

3.9
swing torque
torque which propels the upper structure relative to the undercarriage

Note 1 to entry: It is expressed in newton metres (N · m).

3.10
swing service brake
device or system to decelerate the rotation of the upper structure and to bring it to a stop in any position

EXAMPLE Frictional brake, electrically operated brake, hydrostatically or other hydraulically operated brake.

Note 1 to entry: See Annex A.

3.11
swing parking brake
device or system to hold the stopped upper structure in a stationary position

Note 1 to entry: See Annex A.

© ISO 2017 – All rights reserved

3.12
swing lock
mechanically engaged device designed to block the upper structure in a fixed position with respect to the undercarriage

Note 1 to entry: See Annex A.

4 Safety requirements and protective measures

4.1 General

Hydraulic excavators shall comply with the safety requirements and protective measures of ISO 20474-1, in as far as those are not modified by the specific requirements of this clause.

4.2 Operator station

4.2.1 Operator protection

4.2.1.1 Operator protective guard

Excavators with an operating mass greater than 1 500 kg shall be designed so that an operator protective guard can be fitted. The manufacturer, according to the intended use of the machine, shall offer a protective guard. The protective guard shall be in accordance with ISO 10262.

NOTE For excavators used in demolition applications, additional requirements exist.

4.2.1.2 Roll-over protective structures (ROPS) and tip-over protective structures (TOPS)

4.2.1.2.1 General

Except for walking excavators (see 4.6.3), ISO 20474-1:2017, 4.3.3 does not apply.

Hydraulic excavators with an operating mass of 1 000 kg up to 6 000 kg shall be equipped with a TOPS in accordance with ISO 12117. If the structure is compliant with the performance requirements given in both ISO 12117 (TOPS) and ISO 12117-2 (ROPS), the manufacturer may identify both standards (TOPS and ROPS) on the label.

Hydraulic excavators with an operating mass greater than 6 000 kg and less than 50 000 kg shall be provided with a ROPS in accordance with ISO 12117-2.

Material-handling excavators with fixed cab risers and with an operating mass greater than 1 000 kg and less than 50 000 kg shall be fitted with a TOPS.

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, U_S:

$$U_S = 6{,}500 \times (M/10\,000)^{1,25}$$

The TOPS shall be labelled in accordance with ISO 12117-2:2008, Clause 9, as amended by ISO 12117-2:2008/Amd 1:2016, except that the reference shall be made to ISO 20474-5.

Alternatively, in fulfilling this requirement a manufacturer may provide a ROPS in accordance with ISO 12117-2. In such cases, the labelling may either be in accordance with ISO 12117-2 for ROPS or modified as specified above for TOPS. Where a structure complies with both ROPS and TOPS

© ISO 2017 – All rights reserved