Earth-moving machinery - Roll-over protective structures - Laboratory tests and performance requirements

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NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN ISO 3471:2008 sisaldab Euroopa standardi EN ISO 3471:2008 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 3471:2008 consists of the English text of the European standard EN ISO 3471:2008.
Standard on kinnitatud Eesti Standardikeskuse 25.09.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 25.09.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 15.08.2008.	Date of Availability of the European standard text 15.08.2008.
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Earth-moving machinery - Roll-over protective structures - Laboratory tests and performance requirements (ISO 3471:2008)

Engins de terrassement - Structures de protection au retournement - Essais de laboratoire et exigences de performance (ISO 3471:2008)

Erdbaumaschinen - Überrollschutzaufbauten - Laborprüfungen und Leistungsanforderungen (ISO 3471:2008)

This European Standard was approved by CEN on 8 May 2008.

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Foreword

This document (EN ISO 3471:2008) has been prepared by Technical Committee ISO/TC 127 "Earth-moving machinery" in collaboration with 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of an identical text or by endorsement, at the latest by February 2009, and conflicting national standards shall be withdrawn at the latest by February 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13510:2000.

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 EC Directive(s).

For relationship with EC Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document.

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, 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 and the United Kingdom.

Endorsement notice

The text of ISO 3471:2008 has been approved by CEN as a EN ISO 3471:2008 without any modification.

Annex ZA
(informative)

Relationship between this International Standard and the Essential Requirements of EU Directive 98/37/EC, amended by 98/79/EC

This International Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 98/37/EC, amended by 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard, except Clause 10 and Annex A, confers, within the limits of the scope of this standard, a presumption of conformity with the Essential Requirements 3.4.3 of that Directive and associated EFTA regulations.

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

Annex ZB
(informative)

Relationship between this International Standard and the Essential Requirements of EU Directive 2006/42/EC

This International Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard, except Clause 10 and Annex A, confers, within the limits of the scope of this standard, a presumption of conformity with Essential Requirement 3.4.3 of that Directive and associated EFTA regulations.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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Introduction

A review of the initial work on the criteria for roll-over protective structures (ROPS) indicated that these criteria were based on requirements for machines now identified as mid-range size machines. Since the ROPS criteria were established, both smaller and larger machines have become common within the size range of earth-moving machines.

The criteria are a combination of linear and exponential, with respect to mass. For small machines, the exponential criterion has been changed to a linear function with respect to machine mass. For larger machines, the exponential criterion was excessive at very large machine masses, and thus was changed to become a linear function with respect to machine mass.

The longitudinal force criteria were added as new data became available. Situations could arise where ROPS designs would meet the lateral and vertical loading requirements, but yet be considered as lacking sufficient performance capability in the longitudinal load direction. For this reason, this International Standard incorporates a ROPS longitudinal force criterion. The longitudinal force criterion has been established at 80 % of the lateral force requirement.

The evaluation procedure will not necessarily duplicate structural deformations due to a given actual roll. However, specific requirements are derived from investigations on ROPS that have performed the intended function in a variety of actual roll-overs, as well as analytical considerations based upon the compatibility of ROPS and the machine frame to which it is attached.

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1 Scope

This International Standard specifies performance requirements for metallic roll-over protective structures (ROPS) for earth-moving machinery, as well as a consistent and reproducible means of evaluating the compliance with these requirements by laboratory testing using static loading on a representative specimen.

NOTE 1 The structure can also provide FOPS (falling-object protective structure) protection.

This International Standard is applicable to ROPS intended for the following mobile machines with seated operator as defined in ISO 6165 and with a mass greater than or equal to 700 kg:

— dozer;

— loader;

— backhoe loader;

— dumper;

— pipelayer;

— tractor section (prime mover) of a combination machine (e.g. tractor scraper, articulated frame dumper);

— grader;

— landfill compactor;

— roller;

— trencher.

This International Standard is not applicable to training seats or additional seats for operation of an attachment.

NOTE 2 It is expected that reasonable crush protection for a seat-belted operator will be provided under at least the conditions of an initial forward velocity of 0 km/h to 16 km/h on a hard clay surface of 30° maximum slope in the direction of roll, and 360° of roll about the longitudinal axis of the machine without loss of contact with the slope.

NOTE 3 This International Standard can be used to provide guidance to the manufacturers of roll-over protective structures should it be decided to provide such protection for these or other machines for a particular application.

2 Normative references

The following referenced documents are indispensable for the application 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 148-1:2006, *Metallic materials — Charpy pendulum impact test (V-notch) — Part 1: Test method*

ISO 898-1:1999, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs*

ISO 898-2:1992, *Mechanical properties of fasteners — Part 2: Nuts with specified proof load values — Coarse thread*

ISO 3164:1995, *Earth-moving machinery — Laboratory evaluations of protective structures — Specifications for deflection-limiting volume*

ISO 5353:1995, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point*

ISO 6165:2006, *Earth-moving machinery — Basic types — Identification and terms and definitions*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
bedplate
substantially rigid part of the test fixture to which the machine frame is attached to conduct the test

3.2
boundary plane
BP
plane defined as the vertical projected plane of the back, side, or knee area of the DLV

NOTE The boundary planes are used to determine the load application point.

3.3
deflection-limiting volume
DLV
orthogonal approximation of a large, seated, male operator wearing normal clothing and a protective helmet

NOTE Adapted from ISO 3164:1995.

3.4
deflection of ROPS
movement of the ROPS, mounting system and frame section as measured at the load application point (LAP), excluding the effect of any movement of the test fixture(s)

3.5
falling-object protective structure
FOPS
system of structural members arranged in such a way as to provide operators with reasonable protection from falling objects (e.g. trees, rocks, small concrete blocks, tools)

3.6
head portion of DLV
upper 270 mm by 330 mm rectangular section of the DLV, whose dimensions are in accordance with ISO 3164

3.7
lateral simulated ground plane
LSGP
plane defined as where the machine comes to rest on its side, where the plane is 15° away from the DLV.

NOTE It is created by rotating a vertical plane parallel to the machine's longitudinal centreline about a horizontal line through the outermost point of the upper ROPS member, to which the lateral load is applied (see Figure 6). The LSGP is established on an unloaded ROPS and moves with the member to which the load is applied while maintaining its 15° angle with respect to the vertical.

