

**Mullatöömashinad. Ümberkukkumise  
puhul kaitsvad konstruktsioonid.  
Laborikatsed ja jõudlusnõuded (ISO  
3471:1994, kaasa arvatud parandus  
1:1997)**

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

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 13510:2000 sisaldab Euroopa standardi EN 13510:2000 + AC:2002 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 17.07.2000 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 13510:2000 consists of the English text of the European standard EN 13510:2000 + AC:2002.</p> <p>This document is endorsed on 17.07.2000 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b> This European Standard establishes a consistent and reproducible means of evaluating the load-carrying characteristics of Roll-Over Protective Structures (ROPS) under static loading, and prescribes performance requirements for a representative specimen under such loading.</p>	<p><b>Scope:</b> This European Standard establishes a consistent and reproducible means of evaluating the load-carrying characteristics of Roll-Over Protective Structures (ROPS) under static loading, and prescribes performance requirements for a representative specimen under such loading.</p>
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**ICS** 53.100

**Võtmesõnad:**

ICS 53.100

**English version**

**Earth-moving machinery – Roll-over protective structures**

Laboratory tests and performance requirements  
(ISO 3471 : 1994, including Amendment 1 : 1997, modified)

Engins de terrassement – Structures de protection au retournement – Essais de laboratoire et critère de performance (ISO 3471 : 1994, Amendement 1 : 1997, modifié, inclus)	Erdbaumaschinen – Überrollschutzaufbauten – Prüfungen und Anforderungen (ISO 3471 : 1994, einschließlich Änderung 1 : 1997, modifiziert)
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This European Standard was approved by CEN on 1999-11-12.

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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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

**Central Secretariat: rue de Stassart 36, B-1050 Brussels**

## Foreword

The text of the International Standard ISO 3471:1994 + Amendment 1:1997 from Technical Committee ISO/TC 127 "Earth-moving machinery" of the International Organization for Standardization (ISO) has been taken over with modifications as a European Standard 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 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.

This European Standard 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 standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

### Endorsement notice

The text of the International Standard ISO 3471:1994 and Amendment 1:1997 has been approved by CEN as a European Standard with agreed common modifications as given below:

- Scope is modified
- Normative references are updated
- Based on the revised scope the technical content of some clauses was modified
- Annex A is amended to include some further means of verification.

## Introduction

A review of the initial work on the ROPS criteria indicated that the criteria were based on requirements for machines now identified as mid-range size machines. Over a period of 20 years, since the ROPS criteria were established, both smaller and larger machines have become common within the size range of earth-moving machines. Thus it was necessary to change the criteria for the lower and upper mass machines.

The criteria are a combination of linear, with respect to mass, 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.

A second criterion of longitudinal force was added as a new generation of ROPS designers became active, some of the early expertise that was developed through the process of establishing the criteria being lost. Situations could arise where ROPS designs would meet the lateral and vertical loading requirements, but yet be considered to lack sufficient performance capability in the longitudinal load direction. For this reason this European Standard now incorporates a ROPS longitudinal force criterion. The longitudinal force criterion was established at 80 % of the lateral force requirement.

## 1 Scope

This European Standard establishes a consistent and reproducible means of evaluating the load-carrying characteristics of Roll-Over Protective Structures (ROPS) under static loading, and prescribes performance requirements for a representative specimen under such loading.

It applies to the following seated design operator-controlled machines as defined in ISO 6165:

- dozers (crawler and wheeled);
- graders;
- loaders (crawler and wheeled);
- earth- and landfill compactors;
- skid-steer loaders and backhoe loaders
- tractor portion (prime mover) of scrapers and articulated steer dumpers;
- rollers;
- rigid frame dumpers.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 20898-1:1991	Mechanical properties of fasteners - Part 1: Bolts, screws and studs
EN 20898-2:1993	Mechanical properties of fasteners - Part 2: Nuts with specified proof load values - Coarse thread
ISO 148:1983	Steel - Charpy impact test (V-notch)
ISO 3164:1995	Earth-moving machinery - Laboratory evaluations of roll-over and falling-object protective structures - Specifications for deflection-limiting volume
ISO 6165:1997	Earth-moving machinery - Basic types - Vocabulary
ISO 9248:1992	Earth-moving machinery - Units for dimensions, performance and capacities, and their measurement accuracies

## 3 Definitions

For the purposes of this European Standard, the following definitions apply.

**3.1 Roll-over protective structure (ROPS):** System of structural members whose primary purpose is to reduce the possibility of a seat-belted operator being crushed should the machine roll over. Structural members include any subframe, bracket, mounting, socket, bolt, pin, suspension or flexible shock absorber used to secure the system to the machine frame, but exclude mounting provisions that are integral with the machine frame.

**3.2 Machine frame:** Main chassis or main load-bearing member(s) of the machine which extend(s) over a major portion of the machine and upon which the ROPS is directly mounted.

**3.3 Rollbar ROPS:** One- or two-post ROPS without FOPS or any cantilevered load-carrying structural members.

**3.4 Bedplate:** Substantially rigid part of the test fixtures to which the machine frame is attached for the purpose of the test.

**3.5 Deflection-limiting volume (DLV):** Orthogonal approximation of a large, seated, male operator wearing normal clothing and a hard hat. (See ISO 3164:1992, figure 1.)

**3.6 Representative specimen:** ROPS, mounting hardware and machine frame (complete or partial) for test purposes that is within the manufacturer's specifications.