

Second edition
2017-04

Corrected version
2017-07

**Earth-moving machinery — Operator's
field of view — Test method and
performance criteria**

*Engins de terrassement — Visibilité de l'opérateur — Méthode d'essai
et critères de performance*



Reference number
ISO 5006:2017(E)

© ISO 2017

This document is a preview generated by EBS



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	1
4 Basic dimensions	5
4.1 Light spacing dimensions	5
4.2 Masking dimensions	5
4.3 Reference dimensions for measurement purposes	5
5 Test apparatus	5
6 Machine test configuration	6
7 Performance criteria for indirect visibility	6
7.1 Visibility aids	6
7.2 Position of display devices	6
7.3 Performance criteria for mirrors	6
7.4 Performance criteria for CCTV system	7
8 Measurement procedure	7
8.1 Test-surface marking and machine location on test surface	7
8.2 Positioning of test apparatus	7
8.3 Measurement of maskings	8
8.3.1 General	8
8.3.2 Measurement at the VTC	9
8.3.3 Measurement at RB	9
9 Calculation method	11
9.1 Calculation procedure for determining maskings at VTC or RB	11
9.2 Computer-simulation	12
10 Evaluation method and performance criteria	12
10.1 Visibility performance criteria on VTC	12
10.2 Visibility performance criteria for RB	17
10.3 Visibility maskings that exceed visibility performance criteria with direct view	18
10.4 Requirements for larger, derivative and other types of earth-moving machinery not covered in Table 1 and Table 2	19
10.4.1 Larger machines	19
10.4.2 Derivative and other types of earth-moving machinery	20
10.4.3 Risk assessment process for larger, derivative or other types of earth-moving machinery not covered in Table 1 and Table 2	20
10.4.4 Visibility test circle and allowed masking width	20
11 Test report	20
11.1 Machine details	20
11.2 Drawing	21
12 Visibility information for operator's manual	21
Annex A (normative) Dimensions and position of HH and rectangular boundary (RB)	22
Bibliography	29

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 1, *Test methods relating to safety and machine performance*.

This second edition cancels and replaces the first edition (ISO 5006:2006), which has been technically revised. It also incorporates the Technical Corrigendum ISO 5006:2006/Cor 1:2008. The changes from the previous edition include the following:

- improved guidance on the use of mirrors;
- new guidance on maskings caused by moving excavator linkages;
- enhancement of visibility at the rectangular boundary;
- general improvements and clarifications in the language.

This corrected version of ISO 5006:2017 incorporates the following corrections:

- the second paragraph of [8.3.3.3](#) has been modified by the deletion of the phrases “in the forward direction” and “at the same height”.

Introduction

The purpose of this document is to address the operator's visibility in such a manner that the operator can see around the machine to enable proper, effective and safe operation that can be quantified in objective engineering terms. The test method uses two lights placed at the location of the operator's eyes. The maskings due to the machine, its components and attachments are determined around the machine, on a boundary line 1 m away from the smallest rectangle that encompasses the machine and on a visibility test circle (VTC) of 12 m radius. The test method used does not include all aspects of the operator's visibility, but provides information to assist in determining the acceptability of visibility from the machine. Criteria are included in this document to provide guidance for designers as to the extent of visibility maskings that are acceptable.

Allowing for operator capability and the operation mode of the machine, the test method divides the area around the machine into six sectors: the front (sector A), to the front sides (sectors B and C), to the rear sides (sectors D and E), and to the rear (sector F).

For each of the sectors, the operator's physical characteristics are considered. Besides eye spacing of 65 mm — the nominal binocular eye spacing of a medium operator — additional adjustments can be made considering that the operator is able to turn the head and move the body torso from side to side. This allows the range of eye spacing to be enlarged up to 405 mm for the sectors A, B and C. For the sectors D, E and F, the turning of the operator's head and the rotation of the body torso are restricted by the physical aspects of the seated operator. Thus the maximum achievable eye spacing is 205 mm for sectors D, E and F. For certain machine types, the eye spacings used are less than the maximum permitted values, based on the ergonomics of the operator. This is done to maintain the current state-of-the-art of machines.

The 300 mm masking dimension on the rectangular boundary represents approximately the chest depth of personnel working in the near field of earth-moving machinery (see, for example, 2D in ISO 3411).

The established visibility performance criteria are based on the physical aspects of the human operators and ground personnel using various representative dimensions and the design of machines that have provided acceptable visibility. To establish the visibility criteria, a combination of eye spacings and masking widths are used. Multiple maskings in sectors are acceptable where there is adequate spacing between the individual maskings.

Where the direct visibility is considered inadequate, additional devices for indirect visibility [mirrors or closed-circuit television cameras (CCTV)], can be used to achieve acceptable visibility. For the rectangular boundary (RB) additional devices for indirect visibility (mirrors or CCTV) are preferred. Other aids (see ISO 16001) can be used exceptionally.

Jobsite organization can be an additional effective measure to compensate for remaining visibility maskings.

Earth-moving machinery — Operator's field of view — Test method and performance criteria

1 Scope

This document specifies a static test method for determining and evaluating the operator's field of view on a rectangular boundary around the machine and on a 12 m visibility test circle (VTC).

It is applicable to the earth-moving machines as defined in ISO 6165 that have a seated operator, and which are intended to operate on work sites and travel on public roads. It provides visibility performance criteria for machines up to the maximum operating mass according to ISO 6016, depending on the type of machine family listed in [Table 1](#). For those machines not listed — including larger machines, derivative and other types of earth-moving machinery — the visibility test procedures can be used along with the risk assessment process defined in [10.4](#).

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 3411, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope*

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

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

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

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

ISO 16001, *Earth-moving machinery — Hazard detection systems and visual aids — Performance requirements and tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6165 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

test surface

area that forms the ground reference plane for the visibility measurements