



BSI Standards Publication

Earth-moving machinery — Fire prevention guidance

National foreword

This British Standard is the UK implementation of ISO 13649:2024.

The UK participation in its preparation was entrusted to Technical Committee B/513/1, Earth moving machinery (International).

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2024
Published by BSI Standards Limited 2024

ISBN 978 0 539 20993 8

ICS 53.100

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2024.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------



**International
Standard**

ISO 13649

Earth-moving machinery — Fire prevention guidance

*Engins de terrassement — Lignes directrices pour la prévention
des incendies*

**First edition
2024-09**

Reference number
ISO 13649:2024(en)

Full document details: BS ISO 13649:2024

© ISO 2024  **Documents**
Document Sharing Hub



COPYRIGHT PROTECTED DOCUMENT

© ISO 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

iv

1

Scope

1

2

Normative references

1

3

Terms and definitions

1

4

Fire hazards

2

4.1

General

2

4.2

Fuel sources

3

4.2.1

General

3

4.2.2

Machine components

3

4.2.3

Machine fluids, gases and other onboard substances

3

4.2.4

Environmental debris

3

4.3

Oxidizers

3

4.4

Ignition sources

3

4.4.1

General

3

4.4.2

Thermal energy ignition sources

4

4.4.3

Electrical energy ignition sources

4

4.4.4

Mechanical energy ignition sources

4

5

Strategy for risk assessment and risk reduction

4

6

Design guidance for fire risk reduction

5

6.1

General

5

6.2

Ignition sources

5

6.2.1

Mechanical and thermal ignition sources

5

6.2.2

Electrical ignition sources

5

6.3

Fuel sources

6

6.4

Segregation of fuel and ignition sources

7

6.5

Fire extinguishers and fire suppression

8

7

Information for use

8

7.1

General

8

7.2

Fire prevention

8

7.2.1

Operation

8

7.2.2

Fuelling

9

7.2.3

Starting

9

7.2.4

Maintenance and inspection

9

7.2.5

Service and repair

11

7.3

Fire safety

11

Annex A (informative)

Examples of fuel sources

13

Annex B (informative)

Examples of ignition sources

15

Bibliography

17

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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

For an explanation of 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 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*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Earth-moving machinery — Fire prevention guidance

1 Scope

This document provides guidance on protective measures for consideration in fire risk reduction through machine design and operation and maintenance instructions for earth-moving machinery, as defined in ISO 6165, during their intended use.

NOTE The information in this document presumes that fire hazards for the normal applications anticipated for the machine family by the machine manufacturer have been analysed. This analysis can be done as part of the ISO 12100 machine risk assessment or as a separate fire hazard risk assessment conducted in accordance with ISO 12100 or ISO 19353:2019, 5.1, 5.2, 5.3 and 5.4.

This document also provides the basic concept of fire hazards and examples of typical fuel sources and ignition sources found in earth-moving machinery and earth-moving machinery applications.

This document does not cover all specific aspects of fire prevention for battery electric powertrains (e.g. fire prevention for batteries, battery management systems) due to the evolving development of such technology. However, the guidance in this document can still be beneficial. Additional guidance can also be found in the ISO 14990 series and ISO/DIS 23285.¹⁾

This document does not cover the additional risks for machines operating in potentially explosive atmospheres.

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 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100, and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

explosive atmosphere

atmospheres containing substances or gases at concentrations that will burn or explode if ignited

[SOURCE: ISO/TR 19591:2018, 3.112]

3.2

fire prevention

measures to prevent the outbreak of a fire and/or to limit its effects

[SOURCE: ISO 8421-1:1987, 1.21]

1) Under preparation. Stage at the time of publication: ISO/DIS 23285:2024

3.3

ignition energy

energy necessary to initiate combustion

[SOURCE: ISO 19353:2019, 3.8]

3.4

ignition source

source of energy that initiates combustion

[SOURCE: ISO 13943:2023, 3.244]

3.5

combustible

capable of burning

[SOURCE: ISO 8421-1:1987, 1.9]

3.6

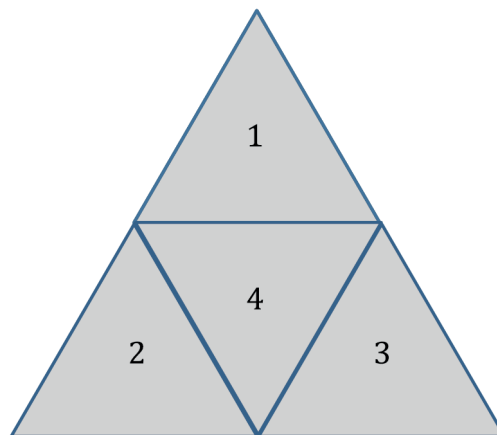
firewall

wall or partition designed to inhibit or prevent the spread of fire

4 Fire hazards

4.1 General

A fire hazard exists if combustible materials (fuel), oxidizer (oxygen) and ignition energy (heat) are available in sufficient quantities at the same place and at the same time. A fire is an interaction of these three components in the form of an uninhibited chemical chain reaction. See [Figure 1](#).



Key

- 1 heat (see [4.3](#))
- 2 oxygen
- 3 fuel (see [4.2](#))
- 4 uninhibited chemical chain reaction

Figure 1 — Fire tetrahedron

A fire can be prevented or suppressed by controlling or removing one or more of the components of the fire tetrahedron.