
**Safety of machinery — Fire prevention
and protection**

Sécurité des machines — Prévention et protection contre l'incendie

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ISO 19353:2005

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 19353 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*.

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Introduction

The safety of machinery against fire involves fire prevention and protection and fire-fighting. In general, as shown in Figure 1, these include technical, structural, organizational, works and public fire-fighting measures. Effective fire safety of machinery can require the implementation of a single measure or a combination of measures.

ISO and IEC are producing a set of standards to assist designers, manufacturers and other interested bodies to interpret the essential safety requirements in order to achieve conformity with European Legislation. Within this series of standards, the European Committee for Standardization (CEN) undertook to draw up a standard to give guidance in the field of fire prevention and protection, as hazards from fire are to be considered in accordance with ISO 12100-1:2003, 4.8.

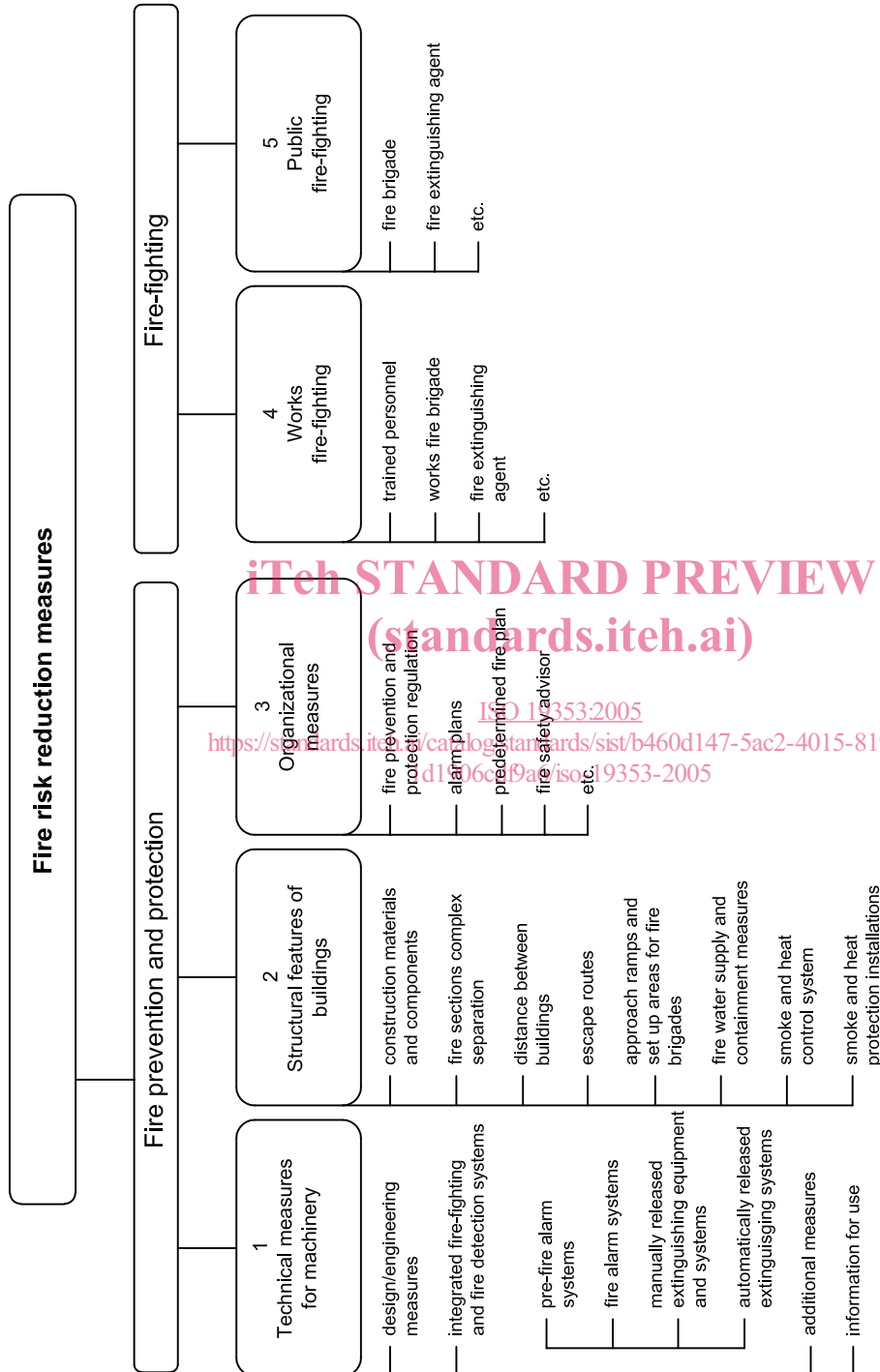
ISO 19353 is based on EN 13478:2001, published by CEN.

The structure of safety standards in the field of machinery is as follows.

- a) type-A standards (basis standards) give basic concepts, principle for design, and general aspects that can be applied to machinery;
- b) type-B standards (generic safety standards) dealing with one or more safety aspect(s) or one or more type(s) of safeguards that can be used across a wide range of machinery:
 - type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);
 - type-B2 standards on safeguards (e.g. two-hands controls, interlocking devices, pressure sensitive devices, guards),
- c) type-C standards (machinery safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

ISO 19353 is a type-B standard as stated in ISO 12100-1.

ISO/TC 199 has a mandate in this area to produce A-type and B-type standards, which will allow verification of conformity with the essential safety requirements.



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Figure 1 — Fire risk reduction measures

Safety of machinery — Fire prevention and protection

1 Scope

This International Standard specifies methods for identifying fire hazards resulting from machinery and performing a corresponding risk assessment. It gives the basic concepts and methodology of technical fire prevention and protection measures to be taken during the machinery's design and construction. Its purpose is the attainment of the required safety level according to the intended use of the machinery by application of technical measures for machinery—such measures being mainly integrated in the machinery and preferably implemented by the use of safety components. It does not cover machinery designed to contain controlled combustion processes (e.g. internal combustion engines, furnaces), unless those processes could constitute the ignition source of a fire in other parts of the machinery or outside the machine.

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 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

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ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*

ISO 14121, *Safety of machinery — Principles of risk assessment*

3 Terms and definitions

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

3.1

combustibility

property of a material capable of burning

NOTE Accurate assessment of the combustibility characteristics of a material will depend on the operational conditions of the machinery and the form of the material (e.g. shavings, dusts).

3.2

combustible

capable of burning with or without flame

[ISO 13943:2000]

3.3

combustion

exothermic reaction of a substance with an oxidizer, generally accompanied by flames and/or glowing and/or emission of smoke

[ISO 13943:2000]

**3.4
damaging fire**

fire which causes harm to people, buildings, machinery and/or environment

**3.5
fire-extinguishing agent**

agent which is appropriate to extinguish fire

**3.6
fire protection**

measures such as design features, systems, equipment, buildings, or other structures to reduce danger to persons and property by detecting, extinguishing or containing fires

[ISO 8421-1:1987]

**3.7
fire prevention**

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

[ISO 8421-1:1987]

**3.8
fire load**

sum of the calorific energies which could be released by the complete combustion of all the combustible materials involved in the machine and process, including raw and process materials

[ISO 13943:2000]

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**3.9
fire hazard**

potential for loss of life (or injury) and/or damage to property and/or environment by fire

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[ISO 13943:2000]

**3.10
fire**

general term for intended combustion (useful fire) as well as for uncontrolled combustion (damaging fire)

**3.11
fire alarm system**

system which detects the onset of fire and initiates an emergency response

**3.12
fire risk**

combination of the probability of occurrence of harm from fire and the severity of that harm

**3.13
fire safety advisor**

employee or consultant who assesses the fire prevention and protection measures for all or parts of business undertaking

**3.14
flame retardant**

substance added or treatment applied to a material in order to suppress or delay the appearance of a flame and/or reduce its propagation rate

**3.15
flame**

zone of combustion in the gaseous phase from which light is emitted

[ISO 13943:2000]

3.16**flammability**

ability of a material or product to burn with a flame under specified conditions

[ISO 13943:2000]

NOTE Accurate assessment of the ignition characteristics of material will depend on the operational conditions of the machinery.

3.17**glow**

combustion of a material in the solid phase without flame but with emission of light from the combustion zone

3.18**harm**

physical injury and/or damage to health or property

[ISO 14121:1999]

3.19**ignition source**

source of energy that initiates combustion

3.20**ignition**

initiation of combustion

[ISO 13943:2000]

3.21**ignition energy**

energy necessary to initiate ignition

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3.22**organizational measures**

all fire prevention and protection measures applied to assign tasks and responsibilities, to manage the emergency plan in case of fire; and assist the fire brigade in developing and implementing its own fire-fighting procedures

3.23**overheating**

uncontrolled temperature increase

3.24**pre-fire alarm system**

system which detects the potential onset of fire and initiates an emergency response in respect of this

3.25**public fire-fighting**

all measures implemented by a community to fight fires by means of the fire brigades with capacities in accordance with the local conditions

[ISO 13943:2000]

3.26**safety component**

component of the machinery, provided that it is not interchangeable equipment, which fulfils a safety function when in use, and the failure or malfunctioning of which endangers the safety or health of exposed persons

3.27

self-ignition

ignition resulting from self-heating

[ISO 13943:2000]

3.28

self-heating

exothermic reaction within a material resulting in a rise in temperature in the material

[ISO 13943:2000]

3.29

smoke

visible suspension of solid and/or liquid particles in gases resulting from combustion or pyrolysis

[ISO 13943:2000]

3.30

structural features of buildings

all fire prevention and protection measures related to the design, construction and functional planning of a building to reduce fire spread, facilitate escape of occupants, provide access to the fire brigade and safe fire-fighting conditions, and reduce damage to the building, its contents and the environment

3.31

works fire-fighting

all measures implemented by plant management for the user of the machinery to fight any outbreak of fire using own personnel

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4 Requirements for hazard identification

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4.1 General

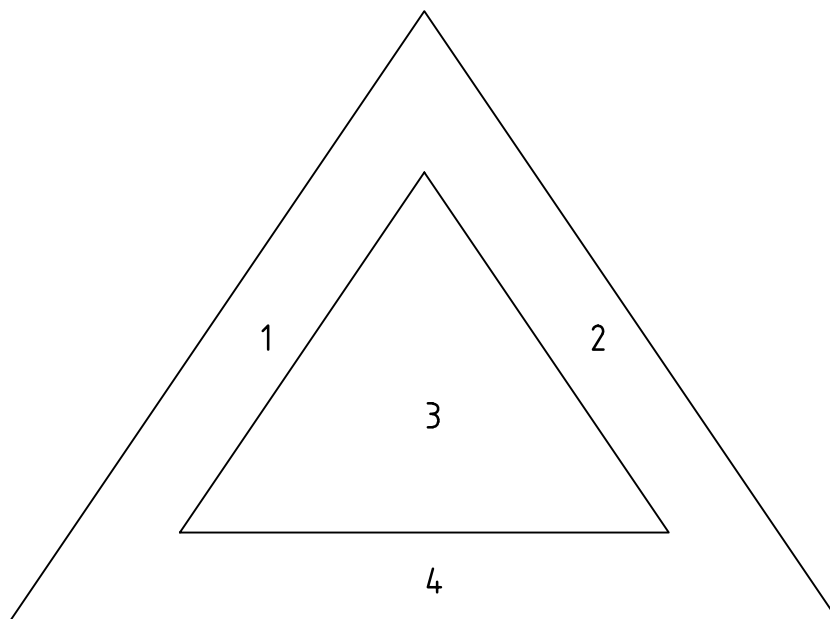
WARNING — An explosion hazard can exist in addition to the fire hazard (see EN 1127-1 and EN 1127-2).

A fire hazard occurs if combustible materials, oxidizer and ignition energy are available in sufficient quantities at the same place and at the same time. The fire hazard depends on the interaction of these three items. See Figure 2.

Certain materials are inherently unstable, extraordinary oxidizers or capable of self-heating. This affects the fire hazard.

Variation in oxygen concentration (e.g. oxygen enrichment) can also significantly affect the fire hazard.

The fire hazard can arise from the materials processed, used or released by the machinery, from materials in the vicinity of the machinery, or from materials used in the construction of the machinery.

**Key**

- 1 combustible materials
- 2 ignition energy
- 3 fire
- 4 oxidizer

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Figure 2 — Fire triangle

4.2 Combustible materials

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Combustible materials can occur as solids, liquids or gases. It shall be determined whether combustible materials exist or can exist and in what quantity and distribution.

The ease of combustion of materials is affected by the size, shape and deposition of the materials. For example, small pieces of a material loosely collected together can be more easily ignited than a large piece of the same material. Also, the combination of materials can have an influence on the ignitability and the burning behaviour.

Consideration shall be given as to whether the properties of the materials can change over time or with use. Such changes can include the possibility of decomposition of the material releasing combustible gases and vapours. This can lead to an increased fire hazard.

4.3 Oxidizers

In assessing the fire hazard, the existence and quantity of fire-supporting substances, e.g. oxygen-producing substances, and the probability of their occurrence shall be determined. The most common oxidizer is air. But there are other oxidizers which support combustion e.g. potassium nitrate (KNO_3), potassium permanganate (KMnO_4), perchloric acid (HClO_4), hydrogen peroxide (H_2O_2), nitrous oxide (N_2O).