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Fire detection and alarm systems —

Part 14: Design, installation, commissioning and service of fire detection and fire alarm systems in and around buildings

Systèmes de détection et d'alarme d'incendie —

Partie 14: Conception, installation, prise en charge et entretien des systèmes de détection d'incendie et d'alarme d'incendie à l'intérieur et autour des bâtiments

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

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. www.iso.org/directives

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

The committee responsible for this document is ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

This first edition cancels and replaces ISO/TR 7240-14:2003.

ISO 7240 consists of the following parts, under the general title *Fire detection and alarm systems*:

— *Part 1: General and definitions*

— *Part 2: Control and indicating equipment*

— *Part 3: Audible alarm devices*

— *Part 4: Power supply equipment*

— *Part 5: Point-type heat detectors*

— *Part 6: Carbon monoxide fire detectors using electro-chemical cells*

— *Part 7: Point-type smoke detectors using scattered light, transmitted light or ionization*

— *Part 8: Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor*

— *Part 9: Test fires for fire detectors* [Technical Specification]

— *Part 10: Point-type flame detectors*

— *Part 11: Manual call points*

— *Part 12: Line type smoke detectors using a transmitted light beam*

— *Part 13: Compatibility assessment of system components*

— *Part 14: Design, installation, commissioning and service of fire detection and fire alarm systems in and around buildings*

— *Part 15: Point type fire detectors using scattered light, transmitted light or ionization sensors in combination with a heat sensor*

— *Part 16: Sound system control and indicating equipment*

— *Part 17: Short-circuit isolators*

— *Part 18: Input/output devices*

— *Part 19: Design, installation, commissioning and service of sound systems for emergency purposes*

— *Part 20: Aspirating smoke detectors*

— *Part 21: Routing equipment*

— *Part 22: Smoke-detection equipment for ducts*

— *Part 23: Visual alarm devices*

— *Part 24: Sound-system loudspeakers*

— *Part 25: Components using radio transmission paths*

— *Part 27: Point-type fire detectors using a scattered-light, transmitted-light or optical or ionization smoke sensors, an electrochemical-cell carbon-monoxide sensor and a heat sensor*

— *Part 28: Fire protection control equipment*

The following part is under preparation:

— *Part 29: Video fire detectors*

Introduction

The installation of a fire detection and alarm system can only be successfully accomplished if the following conditions are fulfilled:

— materials are of a suitable quality;

— special knowledge in the field of fire detection and fire alarm;

— skilled personnel to carry out the work.

Although the quality of the material can be ensured by proper standards and quality audits, the overall effectiveness of an installation depends widely on the quality of work, the experience of the designer and installer, and regular service.

This part of ISO 7240 has been prepared by ISO/TC 21/SC 3. A number of existing national codes and standards were reviewed during the preparation of this edition of this part of ISO 7240. Although there are minor differences in, for example, detector spacing requirements, each code or standard has the same objective of early fire detection. This part of ISO 7240 specifies the minimum requirements for fire detection and alarm systems using equipment complying with ISO 7240.

Fire detection and alarm systems —

Part 14:
Design, installation, commissioning and service of fire detection and fire alarm systems in and around buildings

1 Scope

This part of ISO 7240 specifies the design, installation, commissioning, and service requirements for a fire detection and alarm system (FDAS) (see ISO 7240-1, Figure 1), which is primarily intended to provide early detection of fire and notification within one or more specified indoor or outdoor areas for the protection of lives. The FDAS includes automatic detection of a fire and manual initiation of a fire alarm, with audible and visual warning to people within the detection area.

This part of ISO 7240 also specifies requirements for FDAS capable of providing signals to audible warning systems in accordance with ISO 7240-19, to initiate the operation of ancillary technical services, such as fixed fire extinguishing systems, and to other precautions and actions.

The protection of property is outside the scope of this part of ISO 7240. However, the requirements specified herein may be used as recommendations for property protection.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7240 (all parts), *Fire detection and alarm systems*

ISO 8201, *Acoustics — Audible emergency evacuation signal*

ISO 21927 (all parts), *Smoke and heat control systems*

IEC 60331-23, *Tests for electric cables under fire conditions — Circuit integrity — Part 23: Procedures and requirements — Electric data cables*

IEC 60331-25, *Tests for electric cables under fire conditions — Circuit integrity — Part 25: Procedures and requirements — Optical fibre cables*

IEC 60364, *Electrical installations of buildings*

IEC 61672-1:2002, *Electroacoustics — Sound level meters — Part 1: Specifications*

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7240-1 and the following apply.

3.1.1
alarm zone
DEPRECATED: emergency loudspeaker zone
geographic subdivision of the premises in which one or more alarm devices are installed and for which a common zonal alarm indication is provided

3.1.2
area of coverage
area, inside and/or outside a building or structure, where the FDAS meets the requirements of this part of ISO 7240

Note 1 to entry: Certain parts of an area can be excluded (see 6.7.3).

3.1.3
contiguous
adjacent to, and mutually accessible

3.1.4
designated entry point
location where access is gained to the building in an emergency

3.1.5
detection zone
geographic subdivision of the premises in which one or more points are installed and for which a common zonal detection indication is provided

3.1.6
enclosure
space defined by boundary elements

[SOURCE: ISO/TR 13387-6:1999, 3.2]

Note 1 to entry: Typical enclosures are walls, floors, and ceilings of buildings and do not refer to cabinets used to house equipment.

3.1.7
escape route
path of escape from any part of a building to a final exit

3.1.8
extra-low voltage
any voltage which cannot exceed AC 50 V or DC 120 V

3.1.9
fire compartment
reference volume delimited by construction elements for which fire resistance has been chosen according to the plausible fire that could break out within this volume or penetrate into it

[SOURCE: ISO 26802:2010, 3.20]

3.1.10
level surface
surface, roof, or ceiling with a gradient less than or equal to 1 in 8

3.1.11
monitoring service provider
agency or organization that receives FDAS signals

3.1.12
quiescent condition
functional condition characterized by the absence of the alarm, fault warning and disabled and test conditions

3.1.13
sloping surface
surface, roof, or ceiling with a gradient greater than 1 in 8

Note 1 to entry: A sloping surface may not be flat and includes barrel-vaulted ceilings.

3.1.14
sole occupancy unit
room or other part of a building for occupation by one or joint owners, lessees, tenants, or other occupiers to the exclusion of any other owner, lessee, tenant, or other occupiers

3.2 Abbreviated terms

CO carbon monoxide

EMC electromagnetic compatibility

FDAS fire detection and alarm system

FACIE fire alarm control and indicating equipment

FDCIE fire detection control and indicating equipment

4 Equipment and material

4.1 Quality of components

4.1.1 Components used as part of the FDAS shall be designed and manufactured in accordance with a recognized quality system.

4.1.2 The equipment manufacturer shall make available to the FDAS designer information about the manufacturer's quality assurance system to satisfy the designer that the components selected for the FDAS are suitable for the application.

4.2 Standards

4.2.1 Where available, components of the FDAS shall comply with equipment specified in ISO 7240. If International Standards do not exist, then the equipment shall comply with standards permitted by national requirements.

4.2.2 Equipment used in the FDAS shall be certified for compliance with the relevant part of ISO 7240 or other International Standards, as appropriate, by a testing laboratory that is accredited by a national body to assess equipment in accordance with the relevant standard. Where assessment has not been made by an independent party, the designer shall identify the components and describe why assessment has not been undertaken.

4.3 Environmental requirements

Each item of equipment shall be installed within an environment for which it has been certified. Additional requirements may apply in special cases, e.g.:

— potentially explosive atmospheres;

— special EMC requirements;

— extreme climatic conditions.

4.4 Additional equipment

4.4.1 Additional equipment (e.g. remote terminals or graphic displays) may be included in the design of, or connected to the FDAS.

4.4.2 The operation of the FDAS shall not be reliant on the additional equipment.

4.4.3 Failure of any additional equipment shall not affect the correct operation of the FDAS.

4.5 Installation materials

4.5.1 Installation material (e.g. cable clamps, centenary cables, and cable trays) shall be of a suitable rating, size, and strength to meet the design load requirements.

4.5.2 Connectors and distribution boxes shall be suitable for the size of cables used in the FDAS.

5 Compatibility

5.1 Responsibility

5.1.1 The designer shall ensure that equipment complying with ISO 7240 used in the FDAS has been independently assessed as compatible with the FDCIE, in accordance with ISO 7240-13.

5.1.2 Where the design of the FDAS allows the use of additional equipment connected to the FDCIE (e.g. remote terminals or graphic displays), the designer shall ensure that the equipment has been assessed as compatible with the FDCIE, in accordance with ISO 7240-13.

5.1.3 Where the requirements of ISO 7240-13 do not directly apply, then it may be used as a guide to prepare a suitable compatibility assessment procedure.

5.2 Documentation

The designer shall prepare a list of all components used in the FDAS and identify which components are compatible.

5.3 Certification

5.3.1 Certification of compatibility of equipment used in the FDAS shall be included in the design documentation for the FDAS.

5.3.2 Where assessment has not been made by an independent party, the designer shall identify the components and describe why assessment has not been undertaken.

5.3.3 Where the FDAS interfaces to another system (e.g. building-management system) using voltage-free relay outputs, then self-assessment may be made by the designer and documented accordingly.

5.3.4 Where the fire detection system interfaces to another system (e.g. fire alarm system) using a high-level link (e.g. serial data communication), the designer shall prepare a suitable test plan to ensure reliable interfacing, including the testing of failure and fault modes. This may be done in conjunction with the equipment manufacturer.

6 Design

6.1 Responsibilities

Design of the FDAS, including components and usage requirements, shall be undertaken in a systematic process in accordance with a quality system. A document shall be signed by a responsible person

describing the field of responsibility in such detail that undefined areas and areas overlapping with other responsibilities are avoided.

6.2 Qualifications

The design of the FDAS shall be undertaken by persons having professional qualifications or experience relevant to the scope of the particular design requirements. Experience may include

— an engineer with proven experience in the field of fire detection and alarm technology,

— an experienced consulting company, or

— an experienced FDAS designer.

NOTE National regulations might exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition might form part of a recognized competency framework.

6.3 Documentation required for the design

6.3.1 The designer shall have access to documentation necessary to design the FDAS, in accordance with the requirements of this part of ISO 7240. Documentation shall include the following:

— plans of the building;

— use of the building (where known);

— occupancy of the building (where known);

— description of the hazard, including proposed use of detection zones and alarm zones;

— description of the environmental conditions, such as

  — temperature,

  — humidity,

  — corrosive atmosphere,

  — electromagnetic influences (e.g. areas subject to severe thunderstorms);

— description of the environment where the equipment is installed (e.g. occupancy of the building, hazardous locations);

— description of the infrastructure of the environment (e.g. traffic conditions, communications, electricity supply, fire brigade access, water supply, etc.).

6.3.2 The designer shall state any assumptions made and provide justifications for solutions selected.

6.4 Fire detection and alarm system design

6.4.1 An FDAS shall be designed in accordance with requirements of this part of ISO 7240. The design criteria shall satisfy national fire safety objectives and include

— environmental conditions,

— type of occupancy,

— probability of ignition,

— rate of fire growth,

— rapid detection of fire,

— timely evacuation of people (including the use of alarm zones, phased evacuation, or other evacuation strategies), and

— minimization of unwanted alarms.

NOTE Where national fire safety objectives or regulations do not exist, it is important that the designer applies fire safety engineering principles and a risk-based approach to the design.

6.4.2 The design may exclude from the area of coverage defined areas rarely or never occupied by people or combustible material.

6.4.3 Where complete fire detection coverage (with excluded areas identified in 6.4.2) is not required, and as permitted by national regulations, the following areas may be included within the scope of the design (see 6.3):

— one or more fire compartment(s);

— part of a fire compartment;

— escape route(s); and

NOTE 1 Escape route coverage may not detect a fire at the source of the fire.

— equipment within a building.

NOTE 2 Detectors are typically mounted within or adjacent to the equipment cabinet.

6.4.4 Where automatic detection is not required, and as permitted by national regulations, a system of manual call points may be installed (see 6.9).

6.4.5 Where the design of the FDAS includes the use of optional functions specified in the relevant equipment standards, the use of the option and the reason shall be included in the design documentation.

NOTE National regulations might require the use of some optional functions or might prohibit the use of some optional functions.

6.4.6 The design shall consider any national regulations that place other limitations on the design, such as

a) the size of detection zones and alarm zones;

b) the maximum number of points installed in a detection zone;

c) limitations of circuits including automatic and manual initiating devices;

d) interface requirements to a sound system for emergency purposes;

e) special requirements for circuits having both detectors and alarm devices;

f) special requirements for the combination of initiating and alarm circuits;

g) requirements for fire alarm and fault warning transmission systems;

h) use of installation material, such as shielded cable, conduits, etc;

i) installations in explosive atmospheres.

6.5 Detection zones

6.5.1 General

The building shall be divided into detection zones so that the origin of the alarm can be quickly determined from the indications at the FDCIE and on the detectors.

6.5.2 Detection zone limitations

6.5.2.1 A detection zone shall be limited to no more than 2 000 m^2 of contiguous floor area or 2 000 m^2 of non-contiguous floor area with no entrances to adjacent areas being separated by more than 10 m and visible from each other. The longest dimension shall not exceed 100 m and shall be confined to one storey. Areas with no access from inside the building shall be displayed as separate detection zones from those having internal access. For an example of detection zone allocation, see Figure 1.