



BSI Standards Publication

Fire detection and fire alarm systems

Part 1: Introduction

National foreword

This British Standard is the UK implementation of EN 54-1:2021. It supersedes BS EN 54-1:2011, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/12, Fire detection and alarm systems.

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

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Published by BSI Standards Limited 2021

ISBN 978 0 539 04920 6

ICS 13.220.20

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2021.

Amendments/corrigenda issued since publication

Date	Text affected
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EUROPEAN STANDARD

EN 54-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2021

ICS 13.220.20

Supersedes EN 54-1:2011

English Version

Fire detection and fire alarm systems - Part 1: IntroductionSystèmes de détection et d'alarme incendie - Partie 1 :
Introduction

Brandmeldeanlagen - Teil 1: Einleitung

This European Standard was approved by CEN on 23 May 2021.

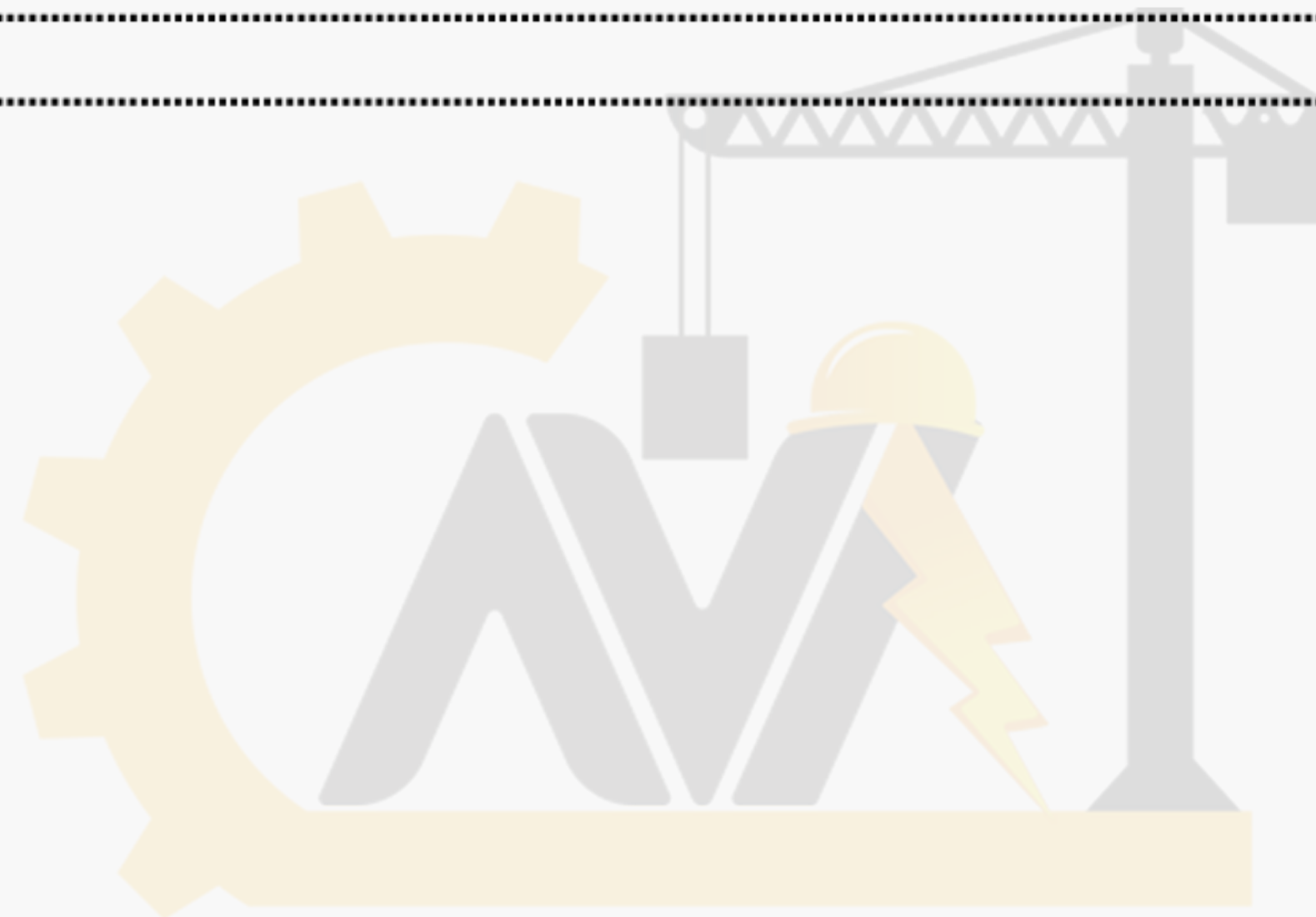
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European foreword

This document (EN 54-1:2021) has been prepared by Technical Committee CEN/TC 72 “Fire detection and fire alarm systems”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by December 2021, and conflicting national standards shall be withdrawn at the latest by December 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 54-1:2011.

The main changes compared to the previous edition are listed below:

- a) addition of further terms;
- b) deletion of Section 5 (Compliance);
- c) addition of informative Annex B with examples of distributed CIE, distributed VACIE and network of CIEs;
- d) editorial changes.

EN 54, *Fire detection and fire alarm systems*, is currently composed of the following parts:

- *Part 1: Introduction*
- *Part 2: Control and indicating equipment*
- *Part 3: Fire alarm devices — Sounders*
- *Part 4: Power supply equipment*
- *Part 5: Heat detectors — Point heat detectors*
- *Part 7: Smoke detectors — Point smoke detectors using scattered light, transmitted light or ionization*
- *Part 10: Flame detectors — Point detectors*
- *Part 11: Manual call points*
- *Part 12: Smoke detectors — Line detectors using an optical light beam*
- *Part 13: Compatibility and connectability assessment of system components*
- *Part 14: Guidelines for planning, design, installation, commissioning, use and maintenance (CEN/TS 54-14)*
- *Part 16: Voice alarm control and indicating equipment*
- *Part 17: Short-circuit isolators*

- *Part 18: Input/output devices*
- *Part 20: Aspirating smoke detectors*
- *Part 21: Alarm transmission and fault warning routing equipment*
- *Part 22: Resettable line type heat detectors*
- *Part 23: Fire alarm devices — Visual alarm devices*
- *Part 24: Components of voice alarm systems — Loudspeakers*
- *Part 25: Components using radio links*
- *Part 26: Carbon monoxide detectors — Point detectors*
- *Part 27: Duct smoke detectors*
- *Part 28: Non-resettable line type heat detectors*
- *Part 29: Multi-sensor fire detectors — Point detectors using a combination of smoke and heat sensors*
- *Part 30: Multi-sensor fire detectors — Point detectors using a combination of carbon monoxide and heat sensors*
- *Part 31: Multi-sensor fire detectors — Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors*
- *Part 32: Guidelines for the planning, design, installation, commissioning, use and maintenance of voice alarm systems (CEN/TS 54-32)*

For the current status of published standards refer to <https://www.cen.e>.

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Introduction

This document gives the necessary information for the intended use of the series of EN 54 standards. The EN 54 series applies to fire detection and fire alarm systems for buildings and civil engineering works composed of several components that communicate for the purpose of detecting fire at the earliest practicable moment, and:

- to give audible and/or visible signals to the occupants of the building who might be at risk from a fire;
- to provide remote fire alarms to organizations having authority to take care of buildings and their environment;
- to give signals to initiate, in the event of a fire, the operation of other fire protection and equipment/systems.

The EN 54 series specifies:

- product characteristics, test methods and performance criteria against which the effectiveness and reliability of the component parts of fire detection and fire alarm systems can be assessed and declared;
- requirements for compatibility and connectability of components when combined into a system;
- guidelines for application of fire detection and fire alarm systems in buildings and civil engineering works.

The EN 54 series may be used for other applications e.g. mines and ships, but one should consider the specific nature of each application before use. Additional performance and environmental tests might be necessary. This does not preclude the manufacture or use of systems having special characteristics suitable for the protection of specific risks against specific hazards.

As this revision of the standard includes terms and definitions collated from specific parts of EN 54, there can now be some duplication of terms and definitions in other parts. This situation will be corrected in future revisions of the different parts of EN 54 so that definitions are defined only once and are applied consistently throughout the series.

The functions of a fire detection and fire alarm system may be grouped to form subsystems such as a fire detection subsystem and a voice alarm subsystem.

As the system is required to function satisfactorily, not only under fire conditions, but also when exposed to conditions likely to be met in practice, the tests specified in the EN 54 series are intended to assess the performance of the components and the system under such conditions.

The performance of components is assessed from the results obtained in the specified tests. This performance does not ensure that this component will necessarily function correctly when connected with another component also conforming to the relevant part of EN 54 (e.g. control and indicating equipment with a fire detector), unless both components have been assessed together in accordance with EN 54-13.

1 Scope

This document defines the terms and definitions that are used throughout the EN 54 series of standards. It gives the principles on which each part of the series has been based and describes the functions carried out by the components of a fire detection and fire alarm system.

This document applies to fire detection and fire alarm systems for buildings and civil engineering works.

This document does not apply to smoke alarm devices which are covered by EN 14604.

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.

EN 54 (all parts), *Fire detection and fire alarm systems*

3 Terms and definitions

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

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

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

3.1 access level

one of several states of equipment in which selected

- controls can be operated;
- manual operations can be carried out;
- indications are visible; and/or
- information can be obtained and changed.

[SOURCE: ISO 7240-1:2014, 2.1.3, modified]

3.2 addressable device

device that can be individually identified at the CIE

3.3 aerosol tunnel smoke tunnel

test arrangement, producing a well-controlled increase of an artificial aerosol for the purpose of a reproducible assessment of the response behaviour of a smoke detector

3.4 ancillary equipment

equipment which supports fire related functions not currently defined in EN 54

3.5

aspirating smoke detector

smoke detector, in which air and aerosols are drawn through a sampling device and carried to one or more smoke sensing elements by an integral aspirator (e.g. fan or pump)

Note 1 to entry: Each smoke-sensing element may contain more than one sensor exposed to the same smoke sample.

3.6

building management system

facilities used to monitor, control and manage equipment installed in a building for comfort, safety and/or security purposes

3.7

combustion gas detector

fire detector sensitive to gaseous products of combustion and/or thermal decomposition

EXAMPLE Carbon monoxide fire detector.

3.8

commissioning

activating and testing of the system according to the design

[SOURCE: EN 16763:2017, 2.12]

3.9

compatibility

ability of a component of the system to operate with another component of the same system

3.10

competent person

individual who, in relation to the work undertaken, has the necessary knowledge, skill, tools and experience to complete the defined task satisfactorily and safely

3.11

component

device contained in one housing (or cabinet), that performs a function, several functions or part of a function of a fire detection and fire alarm system

EXAMPLE Fire detectors, alarm devices and control and indicating equipment are components of a fire detection and fire alarm system.

Note 1 to entry: Where a function is distributed in separate housings each housing is considered as a separate component.

3.12 control and indicating equipment CIE

component of a fire detection and fire alarm system through which other components may be supplied with power and which is used:

- a) to receive the signals from the connected detectors and/or manual call points;
- b) to determine whether these signals correspond to a fire alarm condition;
- c) to indicate any such fire alarm condition audibly and visually;
- d) to indicate the location of the danger.

Note 1 to entry: CIE is used to monitor correct functioning of the system and give audible and visible warning of any faults (e.g. short circuit, line breakage, or fault in the power supply); and, if necessary is able to pass on the fault warning through fault warning routing equipment to a fault warning receiving centre.

Note 2 to entry: If necessary CIE is able to pass on the fire alarm signal; for example:

- to audible or visible fire alarm devices or to a voice alarm system;
- to the fire alarm routing function to a fire alarm receiving centre;
- to the control function for fire protection equipment or systems;
- to ancillary equipment (e.g. fire brigade panel).

3.13 detachable detector

detector which is designed for removal of the head from its base

Note 1 to entry: The use of detachable detectors can assist during maintenance without disconnecting the fixed wiring.

3.14 distributed CIE

single CIE which is contained in cabinets, which are physically separated from each other

Note 1 to entry: The requirements are given in EN 54-2.

Note 2 to entry: See Annex B for examples.

3.15 distributed VACIE

single VACIE which is contained in cabinets, which are physically separated from each other

Note 1 to entry: The requirements are given in EN 54-16.

Note 2 to entry: See Annex B for examples.

3.16 duct smoke detector

detector that monitors the air in an air duct to detect smoke

3.17

earth fault

unwanted connection between earth potential and any part of the CIE or VACIE, transmission paths to the CIE or VACIE, or transmission paths between parts of the CIE or VACIE

3.18

emergency microphone

microphone for use by the fire service or trained operators as part of a voice alarm system

3.19

fault warning receiving centre

centre from which the necessary corrective measures can be initiated on receipt of fault signals

3.20

fault warning routing equipment

equipment which routes a fault warning signal to a fault warning receiving centre

3.21

fire alarm device

component of a fire alarm system, not incorporated in the control and indicating equipment, which is used for warning persons

EXAMPLE Fire alarm sounders, visual alarm devices, voice alarm loudspeakers, tactile alarm devices.

3.22

fire alarm receiving centre

centre from which the necessary fire protection or fire-fighting measures can be initiated on receipt of a fire alarm signal

3.23

fire alarm routing equipment

equipment which routes an alarm signal from a control and indicating equipment to a fire alarm receiving centre

3.24

**fire alarm sounder
sounder**

device able to generate an audible fire alarm signal for warning persons

3.25

fire brigade panel

device connected to the CIE specifically designed for use by the fire brigade

EXAMPLE Fire brigade control panel, fire brigade indicator panel.

3.26

fire detection and fire alarm system

FDAS

group of components including the control and indicating equipment which when arranged in (a) specific configuration(s) is capable of detecting and indicating a fire, and giving signals for appropriate action

3.27

fire detector

component of a fire detection and fire alarm system which contains at least one sensor which constantly or at frequent intervals monitors at least one suitable physical and/or chemical phenomenon associated with fire, and that provides at least one corresponding signal to the control and indicating equipment

Note 1 to entry: The decision to give the alarm of fire or to operate fire protection equipment or system may be made at the detector or other component of the system, for example at the control and indicating equipment.

EXAMPLE This can include:

- flame detectors, smoke detectors, heat detectors, combustion gas detectors;
- point detectors, line type detectors, multipoint detectors, aspirating detectors;
- resettable detectors, non-resettable detectors;
- detachable detectors, non detachable detectors.

3.28

fire protection equipment

equipment to limit the effect of fire

Note 1 to entry: This includes equipment for containing or preventing the spread and effects of fire, heat or smoke or for supporting other fire protection goals, e.g. lift and ventilation controls.

3.29

fire protection system

FPS

group of devices that in combination are capable of automatically actuating measures to limit the effect of fire

EXAMPLE Compartmentation systems, smoke control systems and fire fighting systems.

3.30

flame detector

fire detector that responds to radiation emitted by flames from a fire

EXAMPLE Infrared (IR) flame detectors, ultraviolet (UV) flame detectors, multiband flame detectors.

3.31

functional condition

state of the CIE / VACIE characterized by indication(s)

3.32

handover

process of transferring the responsibility of the system to the organization specified in the contract

[SOURCE: EN 16763:2017, 2.14]

3.33

heat detector

detector that responds to an increase in temperature

Note 1 to entry: This includes detectors which respond to a rise in temperature and/or exceed a fixed temperature.

3.34

hierarchical system

system comprising more than one CIE/VACIE in which one CIE/VACIE is designated as the main CIE/VACIE and in which the main CIE/VACIE is able to:

- a) receive signals from and/or transmit signals to any subsidiary CIE/VACIE;
- b) indicate the status of any subsidiary CIE/VACIE.

3.35

information display

visible indicator that is capable of giving information consisting of text, numeric characters, graphical symbols or any combination thereof

3.36

infrared (IR) flame detector

flame detector responding only to radiation having wavelengths greater than 850 nm

3.37

input/output device

device connected to a transmission path of a fire detection and fire alarm system, used to receive and/or transmit electrical signals necessary for the operation of the fire detection and fire alarm system

3.38

installation

implementation of the design, specifically the assembling, mounting and connecting of the relevant system components

[SOURCE: EN 16763:2017, 2.11]

3.39

installed system

system after installation has been completed

3.40

ionization smoke detector

detector sensitive to combustion products capable of affecting ionization currents within the detector

3.41

line detector

detector that responds to the phenomenon sensed in the vicinity of a continuous line

3.42

line smoke detector using an optical beam

detector consisting at least of a transmitter and a receiver and which may include reflector(s), for the detection of smoke by the attenuation and/or changes in attenuation of an optical beam

3.43

line type heat detector

detector which responds to heat sensed in the vicinity of a continuous line

EXAMPLE Linear heat detectors, multipoint heat detectors.

3.44

linear heat detector

detector which responds to heat applied to any point along the length of the sensing element

3.45

manual call point

component of a fire detection and fire alarm system which is used for the manual initiation of an alarm

3.46

manual call point type A: direct operation

manual call point in which the change to the alarm condition is automatic (i.e. without the need for further manual action) when the frangible element is broken or displaced

3.47

manual call point type B: indirect operation

manual call point in which the change to the alarm condition necessitates a separate manual operation of the operating element by the user after the frangible element is broken or displaced

3.48

multi-band flame detector

flame detector having two or more sensing elements each responding to radiation in a distinct wavelength range and each of whose outputs may contribute to the alarm decision

3.49

multi-sensor detector

detector using more than one sensor to respond to one or more phenomena of fire

3.50

network of CIEs

more than one CIE (function B) or more than one VACIE (function M) or a combination of both function B and M, which are interconnected for transmitting information

Note 1 to entry: The requirements for a network of CIEs are given in EN 54-13.

Note 2 to entry: See Annex B for examples.

3.51

non-detachable detector

detector which is designed to be mounted directly to a surface without the use of a mounting base

3.52

optical smoke detector

detector sensitive to combustion products capable of affecting the absorption or scattering of radiation in the infra-red, visible and/or ultraviolet regions of the electromagnetic spectrum

3.53

point detector

detector which responds to the phenomenon sensed in the vicinity of a fixed point

3.54

power supply equipment PSE

component of a fire detection and fire alarm system which supplies power for the CIE or VACIE and/or for other components, including those fed with power from the CIE or VACIE

3.55

smoke detector

detector sensitive to particulate products of combustion and/or pyrolysis suspended in the atmosphere (aerosols)

EXAMPLE Point smoke detectors, aspirating smoke detectors, duct smoke detectors, line smoke detectors using an optical beam.

3.56

tactile alarm device

device able to generate a tactile sensation for warning person(s)

3.57

transmission path

connection between components used for the transmission of information and/or power

EXAMPLE Cables, radio links.

3.58

transmission path isolator short-circuit isolator

device, which may be inserted into a transmission path of a fire detection and fire alarm system, to limit the consequences of low parallel resistance faults between the lines of this transmission path

Note 1 to entry: This device can be a physically separate device or it can be incorporated into another device (e.g. integrated into a smoke detector or detector base).

3.59

transmission path monitoring device end of line device

active or passive device, which may be inserted into a transmission path of a fire detection and fire alarm system, to facilitate the monitoring of a transmission path

Note 1 to entry: A transmission path monitoring device can be a physically separate device or it can be incorporated into another device (e.g. end sounder on the line, detector or loudspeaker).

Note 2 to entry: Transmission path monitoring is an inherent requirement in standards for components such as CIE/VACIE.

3.60

ultra-violet flame detector UV flame detector

flame detector responding only to radiation having wavelengths less than 300 nm

3.61

video fire detector

fire detector which analyses video images to detect the presence of smoke and/or flame

3.62

visual alarm device

device able to generate a flashing light for warning persons

3.63

visualization system

additional equipment used to visualize the information provided by a fire detection and fire alarm system

3.64

voice alarm control and indicating equipment

VACIE

component of a voice alarm system that generates and transmits emergency messages or alarm signals to loudspeaker(s) when it receives alarm signal(s) from CIE and/or from manual controls

Note 1 to entry: VACIE can vary in size and complexity from a single cabinet through to many cabinets distributed throughout a building or site.

3.65

voice alarm loudspeaker

device able to generate a voice message and an alert signal from an electrical signal sent by the VACIE

3.66

voice alarm system

group of components, including VACIE and loudspeakers, which broadcasts speech messages and/or warning signals in an emergency

3.67

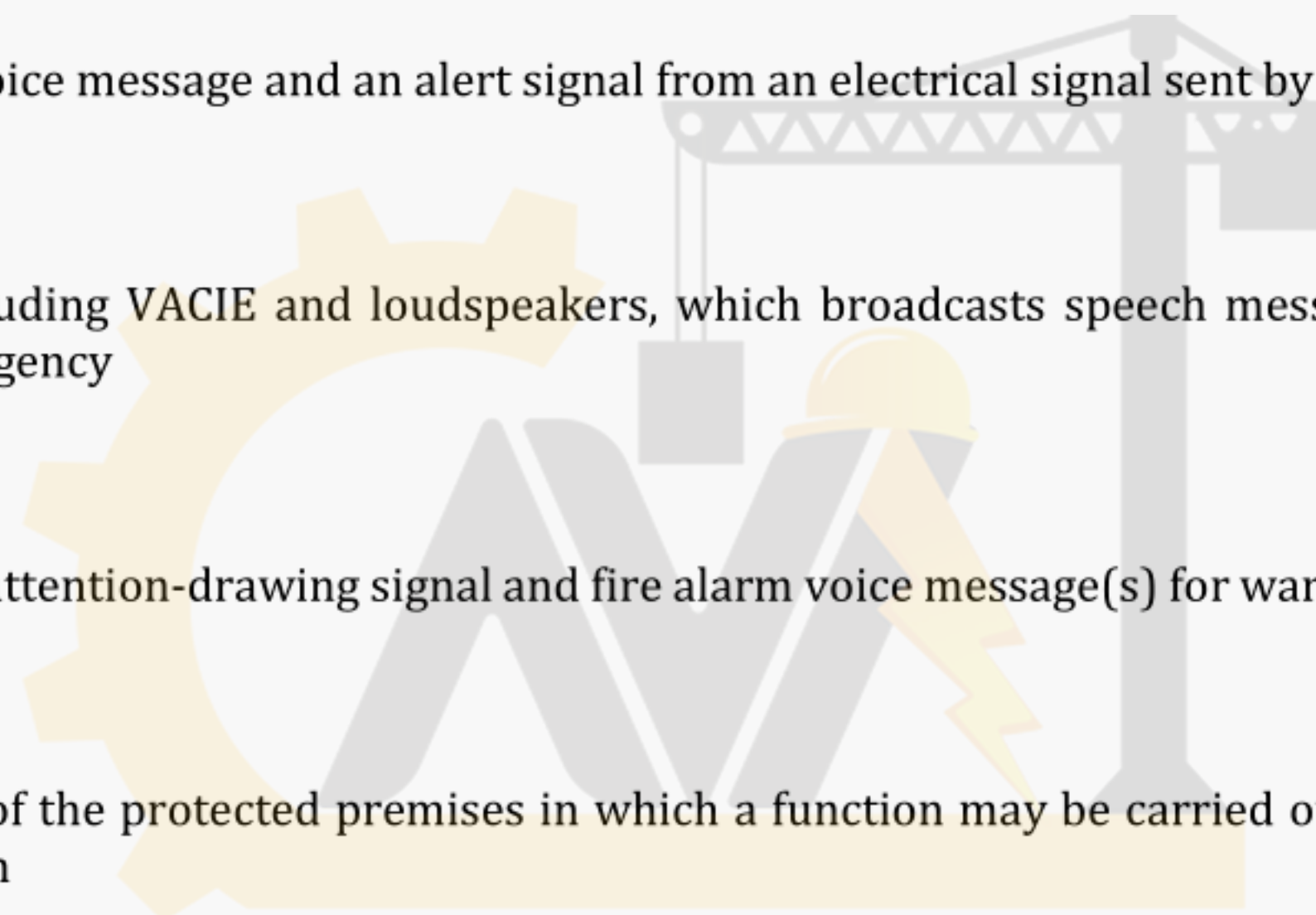
voice sounder

device able to generate an attention-drawing signal and fire alarm voice message(s) for warning persons

3.68

zone

geographical sub-division of the protected premises in which a function may be carried out separately from any other sub-division



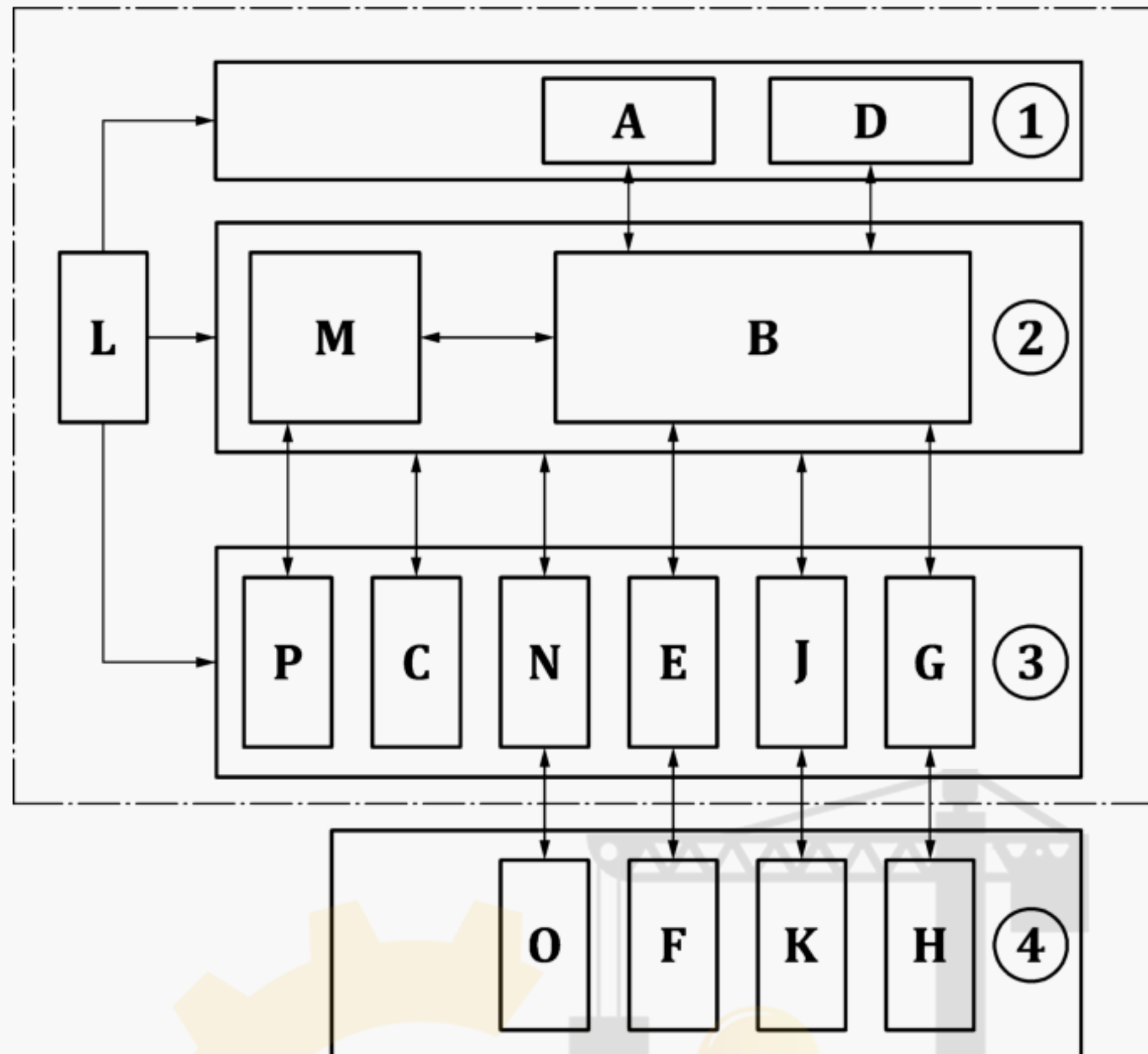
4 Function

To achieve the overall functionality of a fire detection and fire alarm system, several functions need to be implemented. These functions are identified in Figure 1. They may be complemented by ancillary functions to offer more convenience to the user.

All these functions are performed by components which are inter-linked using wire, radio communication or other suitable means to achieve the overall functionality of the fire detection and fire alarm system.

Functionality may be distributed in one or more components.

Annex A gives additional information about the use of functions and applicable standards.



Key

1	detection and initiating	G	fire protection control function
2	control and indicating	H	fire protection function
3	action	J	fault warning routing function
4	function associated with FDAS	K	fault warning receiving function
A	fire detection function	L	power supply function
B	control and indication function for fire detection and fire alarm	M	voice alarm control and indication function for fire alarm
C	fire alarm function (excluding loudspeaker)	N	ancillary interface function
D	manual initiating function	O	ancillary management function
E	fire alarm routing function	P	fire alarm function (loudspeakers)
F	fire alarm receiving function	↔	exchange of information between functions

NOTE The functions that are included within the FDAS are shown inside the dotted line.

Figure 1 — Fire detection and fire alarm system and associated systems, functions and equipment

Annex A
(informative)

Functions, examples and relevant standards

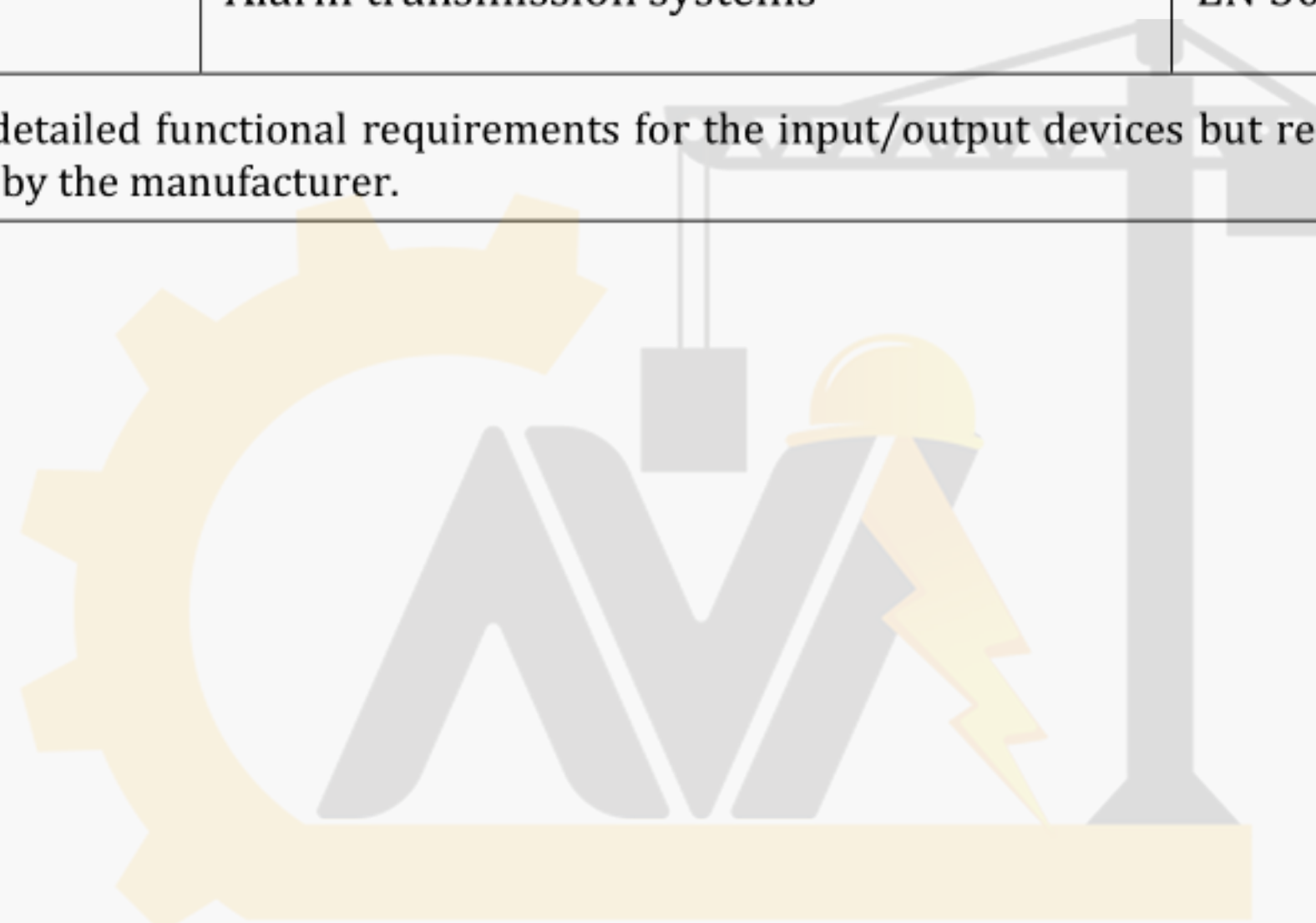
Clause 4 of this document specifies functions and equipment of the fire detection and fire alarm system and associated systems. Table A.1 gives examples of products that carry out the specified functions and gives information on relevant published standards applicable to these products and systems.

Table A.1 — Examples of products and systems carrying out the functions of FDAS and FDAS associated systems and applicable relevant standards

Reference	Functions	Example of product carrying the function	Relevant standards
A	Fire detection function	Fire detectors such as:	
		Smoke detectors (point detectors)	EN 54-7
		Line smoke detectors using optical beam	EN 54-12
		Aspirating smoke detectors	EN 54-20
		Duct smoke detectors	EN 54-27
		Heat detectors (point detectors)	EN 54-5
		Resettable line type heat detectors	EN 54-22
		Non-resettable line type heat detectors	EN 54-28
		Flame detectors (point detectors)	EN 54-10
		Carbon monoxide fire detectors (point detectors)	EN 54-26
		Multi-sensor fire detectors:	
		Point detectors using a combination of smoke and heat sensors	EN 54-29
		Point detectors using a combination of carbon monoxide and heat sensors	EN 54-30
		Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors	EN 54-31
		Input device for auxiliary detection functions such as:	EN 54-18 ^a
Sprinkler activated input			
Input device for connection of secondary detection circuit to a Primary detection circuit			

Reference	Functions	Example of product carrying the function	Relevant standards
B	Control and indication function for fire detection and fire alarm	Control and indicating equipment (CIE)	EN 54-2
C	Fire alarm function (excluding loudspeakers)	Fire alarm devices such as:	
		Fire alarm sounders	EN 54-3
		Visual alarms	EN 54-23
		Tactile alarm devices	
D	Manual initiating function	Manual call points	EN 54-11
E	Fire alarm routing function	Fire alarm routing equipment (alarm transmission routing equipment)	EN 54-21
F	Fire alarm receiving function	Fire alarm receiving centre	EN 50518
G	Fire protection control function	Output device to trigger fire protection equipment	EN 54-18 ^a
		Output to fire protection equipment	EN 54-2
H	Fire protection function	Ventilation for buildings – fire dampers	EN 15650
		Electrically controlled hold-open device for fire/smoke doors	EN 14637
		Smoke and heat control systems	EN 12101 series
		Fixed firefighting systems: gas extinguishing systems	EN 12094 series
		Firefighting systems: sprinkler or water spray systems	EN 12259 series
		Other fire protection measures	
J	Fault warning routing function	Fault warning routing equipment	EN 54-21
K	Fault warning receiving function	Fault warning receiving centre	EN 50518
L	Power supply function	Power supply equipment (PSE)	EN 54-4
M	Voice alarm control and indication function for fire alarm	Voice alarm control and indicating equipment (VACIE)	EN 54-16
		Control for other fire evacuation measures	
N	Ancillary interface function	Data communication interface (e.g. network interface, remote services interface)	

Reference	Functions	Example of product carrying the function	Relevant standards
O	Ancillary management function	Visualization system	
		Building management system	
		Fire brigade panel	
		Fireman's voice alarm panel	
		Remote access server/client	
P	Fire alarm function (loudspeakers)	Voice alarm loudspeakers	EN 54-24
↔	Exchange of information between functions	Short-circuit isolators	EN 54-17
		Components using radio links	EN 54-25
		Alarm transmission systems	EN 50136 series
^a EN 54-18 does not include detailed functional requirements for the input/output devices but requires that their function is sufficiently specified by the manufacturer.			

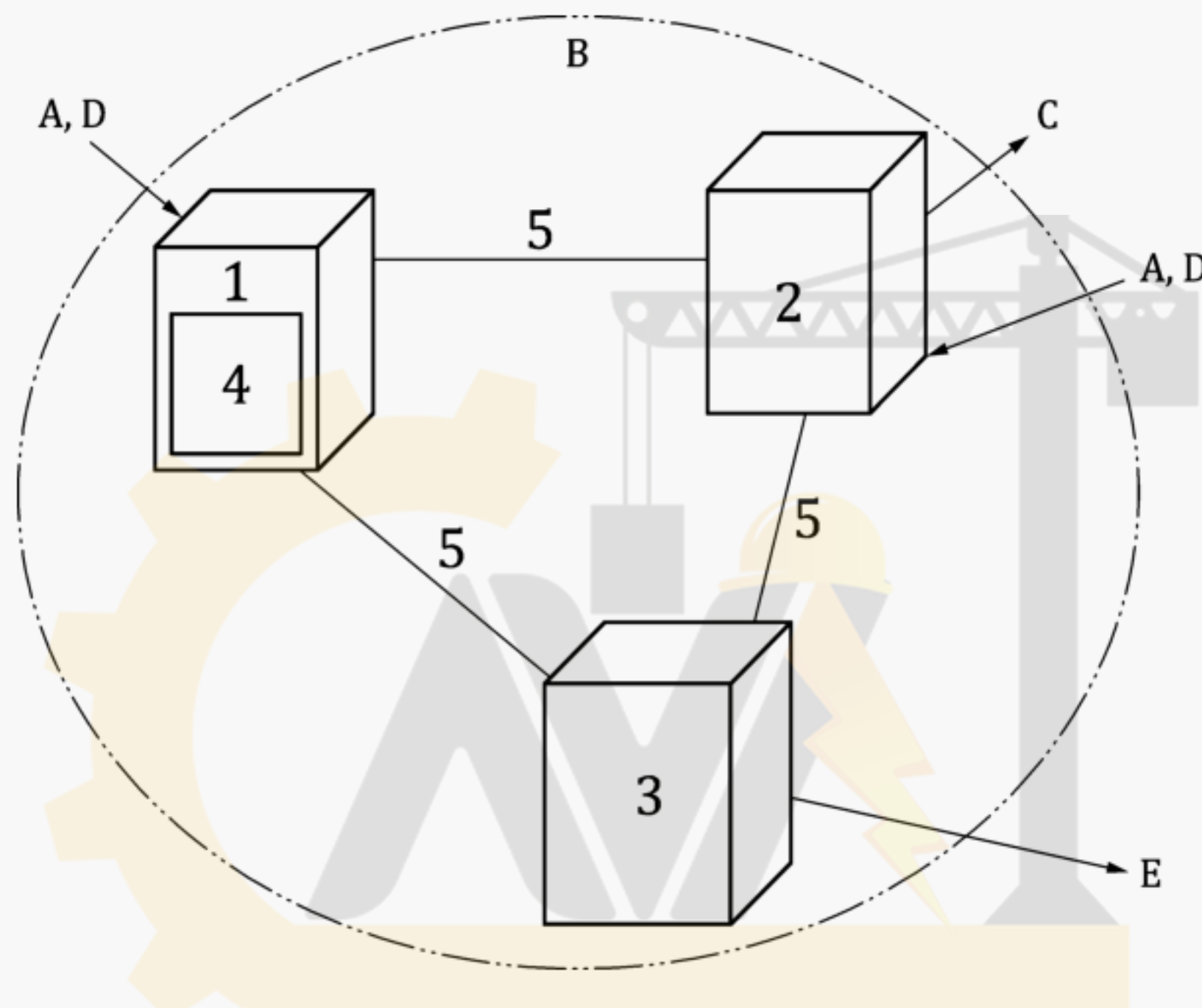


Annex B (informative)

Examples of distributed CIE, distributed VACIE and network of CIEs

B.1 Distributed CIE

The Figure B.1 shows an example of three cabinets forming a single CIE (B). One of the cabinets has the manual controls and indications in accordance to EN 54-2. Other cabinets may also provide manual controls and/or indications.



Key

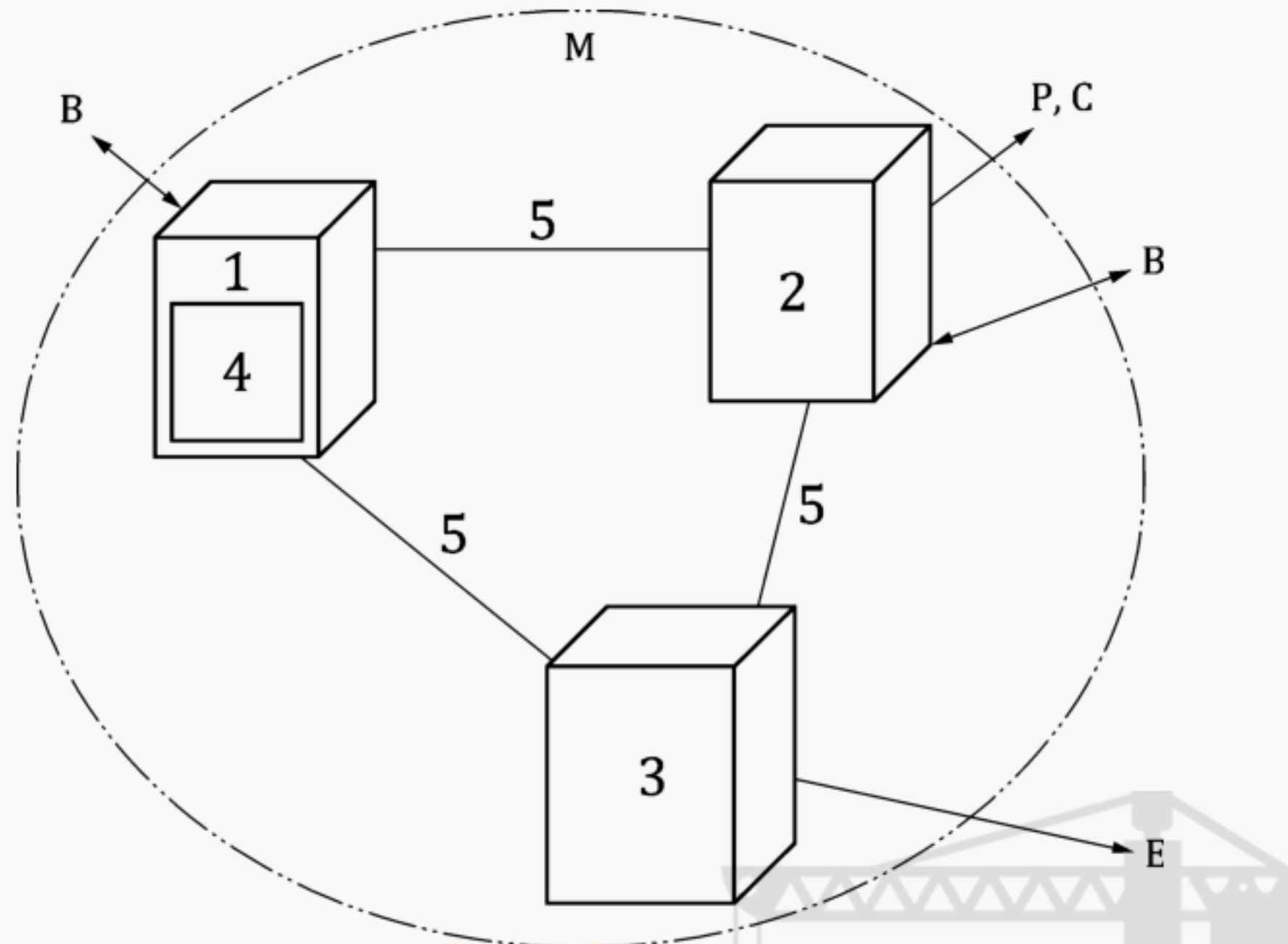
1	cabinet number 1	4	manual controls and indications
2	cabinet number 2	5	transmission path
3	cabinet number 3	..	— boundary of the CIE

NOTE For information about A, B, C, D and E, see Figure 1.

Figure B.1 — Example of a distributed CIE

B.2 Distributed VACIE

The Figure B.2 shows an example of three cabinets forming a single VACIE (M). One of the cabinet has the manual controls and indications in accordance to EN 54-16. Other cabinets may also provide manual controls and/or indications.



Key

- 1 cabinet number 1
- 2 cabinet number 2
- 3 cabinet number 3
- 4 manual controls and indications
- 5 transmission path
- ... boundary of VACIE

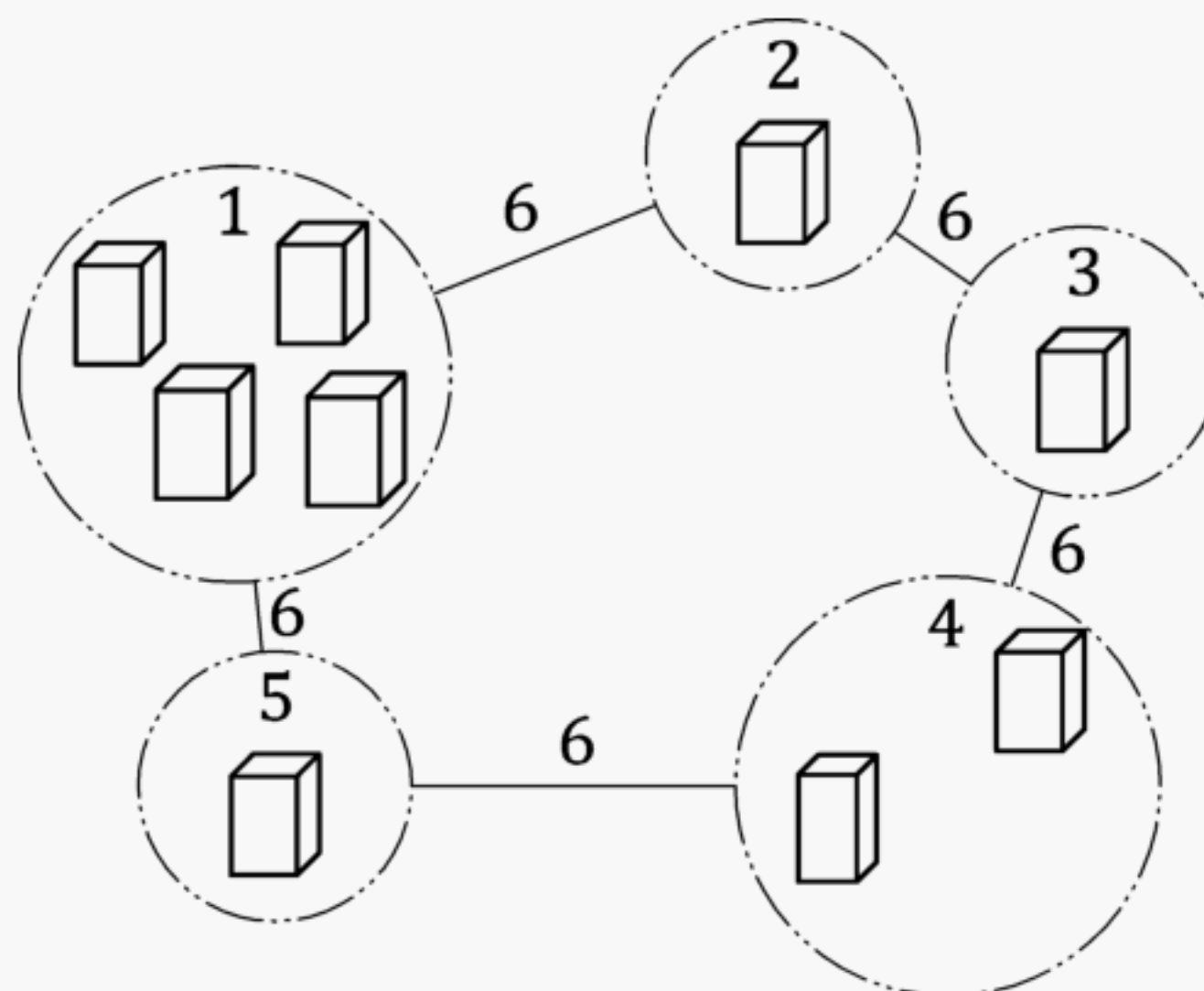
NOTE For information about B, C, E, M and P, see Figure 1.

Figure B.2 — Example of a distributed VACIE

B.3 Network of CIEs

The Figure B.3 shows an example of a network of five items. Each item could be either a standalone CIE, a distributed CIE, a standalone VACIE or a distributed VACIE.

The transmission path is the link between several CIEs which are in the network.



Key

- | | | | |
|----|----------------------------------|---|----------------------------------|
| 1 | distributed CIE / VACIE number 1 | 4 | distributed CIE / VACIE number 4 |
| 2 | CIE / VACIE number 2 | 5 | CIE / VACIE number 5 |
| 3 | CIE / VACIE number 3 | 6 | transmission path |
| .. | — boundary of CIE /VACIE | | |

Figure B.3 — Example of a Network of CIEs

Bibliography

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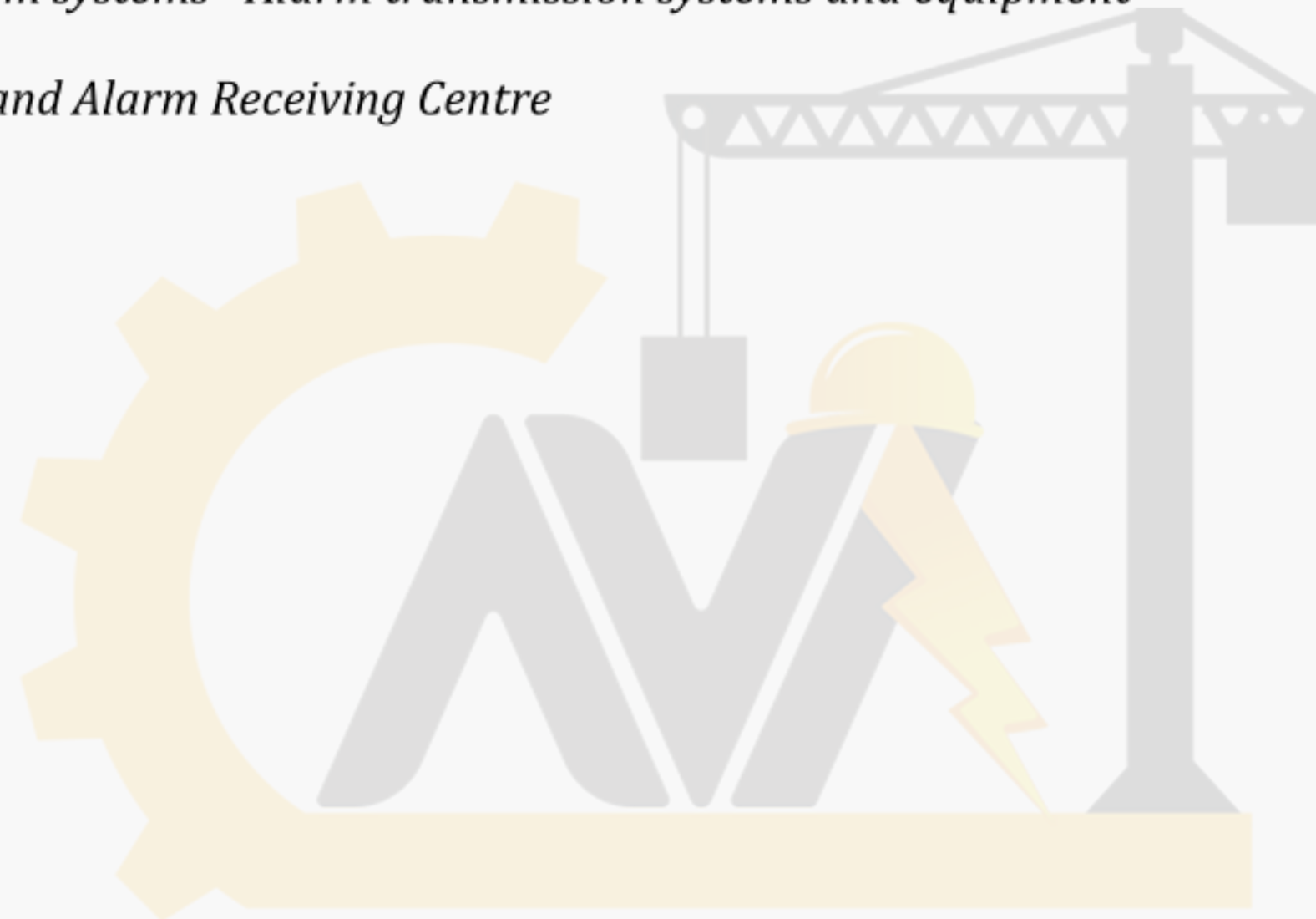
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