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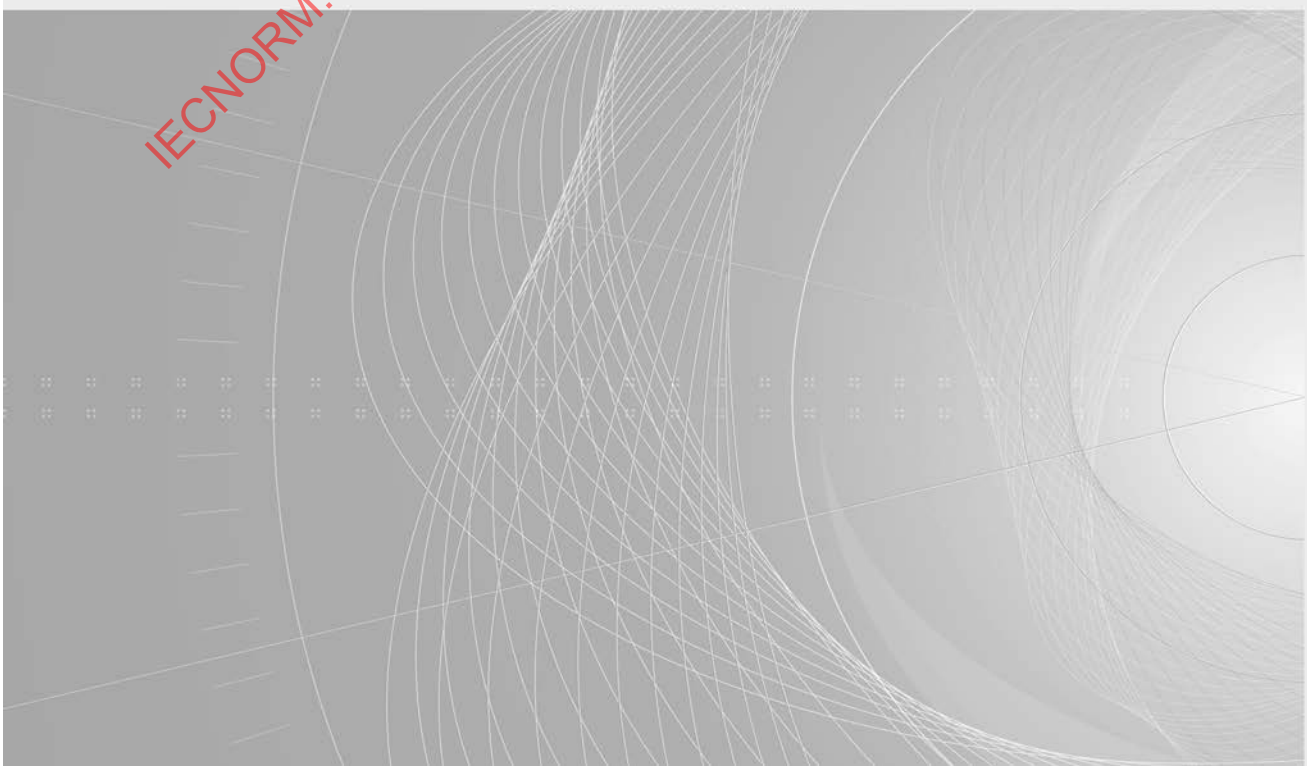
Edition 3.0 2018-11

INTERNATIONAL STANDARD

Low-voltage electrical installations –
Part 5-56: Selection and erection of electrical equipment – Safety services



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

Part 5-56: Selection and erection of electrical equipment – Safety services

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60364-5-56 has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock.

This third edition cancels and replaces the second edition published in 2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

1) Modifications to normative references and terms and definitions.
2) Under electrical circuits for safety services, addition of requirements concerning circuit and overcurrent protection in order to maintain reliability of safety service power supplies under fire conditions.
3) Under electrical circuits for safety services, addition of requirements stating that circuits for safety services are not to be protected by RCDs or AFDDs.

4) Under emergency lighting applications, addition of requirements to prevent emergency lighting systems being adversely affected by any control system.
5) Addition of requirements for all emergency luminaires in the area to provide full design light output in the event of any final circuit failure.
6) Addition of a new Annex D (informative): Fire switch.
7) Addition of a new Annex E (informative): Example of installation methods of safety services with cable management system.
8) Addition of a new Annex F (informative): Wiring systems.
9) Addition of a new Annex G (informative): Guidance on suitable locations for electrical sources for safety services.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
64/2316/FDIS	64/2341/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The reader's attention is drawn to the fact that Annex C lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this standard.

A list of all parts in the IEC 60364 series, published under the general title *Low-voltage electrical installations,* can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

Part 5-56: Selection and erection of electrical equipment – Safety services

560.1 Scope

This part of IEC 60364 covers general requirements for safety services, selection and erection of electrical supply systems for safety services and the electrical source for safety services.

Standby electrical supply systems are outside the scope of this document. This document does not apply to installations in hazardous areas (BE3), for which requirements are given in IEC 60079-14.

560.2 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.

IEC 60331 (all parts), *Tests for electric cables under fire conditions – Circuit integrity*

IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-5-52, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60598-2-22, *Luminaires – Part 2-22: Particular requirements – Luminaires for emergency lighting*

IEC 60702-1, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V – Part 1: Cables*

IEC 60702-2, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V – Part 2: Terminations*

IEC 62040-1, *Uninterruptible power systems (UPS) – Part 1: Safety requirements*

IEC 62040-2, *Uninterruptible power systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements*

IEC 62040-3, *Uninterruptible power systems (UPS) – Part 3: Method of specifying the performance and test requirements*

ISO 8528-12, *Reciprocating internal combustion engine driven alternating current generating sets – Part 12: Emergency power supply to safety services*

ISO 30061:2007, *Emergency lighting*

560.3 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 http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

560.3.1
electrical supply system for safety services
supply system intended to maintain the operation of essential parts of an electrical installation and equipment

– for the health and safety of persons and livestock, and/or
– to avoid damage to the environment and to other equipment

Note 1 to entry: The supply system includes the source and the electrical circuits up to the terminals of electrical equipment.

560.3.2
electrical source for safety services
electrical source intended to be used as part of an electrical supply system for safety services

560.3.3
electrical circuits for safety services
electrical circuits intended to be used as part of an electrical supply system for safety services

560.3.4
standby electrical supply system
supply system intended to maintain, for reasons other than safety, the functioning of an electrical installation or parts thereof, in case of interruption of the normal supply

560.3.5
standby electrical source
electrical source intended to maintain, for reasons other than safety, the supply to an electrical installation or parts thereof, in case of interruption of the normal supply

560.3.6
emergency lighting
lighting provided for use when the supply to the normal lighting fails

[SOURCE: ISO 30061:2007, 4.1]

560.3.7
emergency lighting luminaire
luminaire which may or may not be provided with its own electrical source for safety services and which is used for safety or emergency lighting

560.3.8
escape sign luminaire
luminaire that indicates and assists the identification of escape routes

560.3.9
maintained mode
operating mode of a lighting system in which the emergency lighting lamps are energized at all times when normal or emergency lighting is required

560.3.10
non-maintained mode
operating mode of a lighting system in which the emergency lighting lamps are in operation only when the supply to the normal lighting fails

560.3.11
response time
time that elapses between the failure of the normal power supply and the electrical source for safety services energizing the equipment

560.3.12
central power supply system
system which supplies the required emergency power to essential safety equipment

560.3.13
escape route
route to follow for access to a safe area in the event of an emergency

560.3.14
preferential circuit
circuit derived directly from the incoming supply to the building intended to supply safety services which, in case of emergency, shall remain in operation for as long as possible

560.3.15
minimum illuminance
illuminance for emergency lighting throughout the whole rated operating time

560.3.16
safety service
electrical system for electrical equipment provided to protect or warn persons in the event of a hazard, or essential to their evacuation from a location

EXAMPLE:

– emergency (escape) lighting;
– fire pumps;
– fire rescue services lifts;
– alarm systems, such as fire alarms, CO alarms and intruder alarms;
– evacuation systems;
– smoke extraction systems;
– essential medical systems.

Note 1 to entry: Safety services is equipment installed in buildings to detect fire or danger in its initial stage, also limit fire spread and extinguish fire and control smoke and enable safe and effective evacuation

560.3.17
fire condition
condition defined by the temperature-time curve of ISO 834-1, or by local legislation

560.3.18
suitable location
constructional enclosure or separate fire protected compartment or room ensuring normal operation of equipment under fire conditions

560.3.19
fire switch
electrical apparatus, which shall be used to disconnect all circuits with the exception of circuits supplying the equipment whose operation during a fire is necessary

Note 1 to entry: The installation and characteristics of fire switch are described in Annex D (informative).

Note 2 to entry: The switch could be a circuit breaker or disconnector.

560.4 Classification

560.4.1 An electrical supply system for safety services is either:

– a non-automatic supply system, the starting of which is initiated by an operator, or
– an automatic supply system, the starting of which is independent of an operator.

An automatic supply system is classified as follows, according to the maximum changeover time:

– class A – no-break: an automatic supply system which can ensure a continuous supply within specified conditions during the period of transition, for example as regards variations in voltage and frequency;
– class B – very short break: an automatic supply system available within 0,15 s;
– class C – short break: an automatic supply system available within 0,5 s;
– class D – average break: an automatic supply system available within 5 s;
– class E – medium break: an automatic supply system available within 15 s;
– class F – long break: an automatic supply system available in more than 15 s.

560.4.2 The essential equipment for safety services shall be within the specified class according to 560.4.1 in order to maintain the specified operation.

560.5 General

560.5.1 Safety services may be required to operate at all relevant times including during main and local supply failure and through fire conditions. To meet these requirements, specific sources, equipment, circuits and wiring are necessary. Some applications also have particular requirements, as in 560.5.2 and 560.5.3.

560.5.2 For safety services required to operate in fire conditions, the following additional conditions shall be fulfilled:

– one or more electrical sources for safety services shall be provided to maintain a supply of adequate duration, except for preferential circuits and all equipment of safety services shall be provided, either by construction or by erection, with fire protection ensuring normal operation in fire conditions of adequate duration.

NOTE 1 Equipment includes for example, power sources, feeder conductors, cable management systems, junction boxes.

NOTE 2 The electrical source for safety services is generally additional to the normal supply source, for example the public supply network.

NOTE 3 Local legislation can apply.

560.5.3 An IT system is preferred where non-disconnection on the first fault is required. In IT systems for safety services, insulation monitoring devices shall be provided which give an audible and visible indication in the event of a first fault.

NOTE For IT systems after first fault see IEC 60364-4-41:2005, 411.6.4.

560.5.4 A failure in the control or bus systems (control technology) of the non-safety services installation shall not adversely affect the proper function of safety services. This applies to control or bus systems of different safety services as well.

560.6 Electrical sources for safety services

560.6.1 The following electrical sources for safety services are recognized:

– storage batteries;
– primary cells;
– generator sets independent of the normal supply;
– a separate feeder of the supply network that is effectively independent of the normal feeder.

560.6.2 The electrical source for safety services shall be installed as fixed equipment and in such a manner that it cannot be adversely affected by failure of the normal source.

560.6.3 The electrical source for safety services shall be installed in a suitable location and be accessible only to skilled or instructed persons (BA5 or BA4). Electrical sources for safety services should be segregated from other sources.

Safety services and sources shall be designed and located so as to minimize hazards that could cause fire, flooding, freezing, vandalism and other adverse conditions and impact the availability of the electrical supply.

NOTE See Annex G for guidance.

560.6.4 The location of the electrical source for safety services shall be properly and adequately ventilated so that exhaust gases, smoke or fumes from the safety source cannot penetrate areas occupied by persons.

560.6.5 Separate, independent feeders from a supply network shall not serve as electrical sources for safety services unless assurance can be obtained that the two supplies are unlikely to fail concurrently.

560.6.6 The electrical source for safety services shall have sufficient capability to supply its related safety service.

560.6.7 An electrical source for safety services may, in addition, be used for purposes other than safety services, provided the availability for safety services is not thereby impaired. A fault occurring in a circuit for purposes other than safety services shall not cause the interruption of any circuit for safety services.

560.6.8 There are special requirements for safety sources not capable of operation in parallel.

Adequate precautions shall be taken to avoid the paralleling of sources.

Short circuit protection and fault protection within the electrical supply system for safety services shall be provided for each source.

560.6.9 There are special requirements for safety services having sources capable of operation in parallel.

The parallel operation of independent sources may require special devices, for example to prevent reverse power.

NOTE The parallel operation of independent sources with the public supply can require the authorization of the supply undertaking.

Fault protection and short circuit protection shall be provided when installation is supplied separately by either of the two sources or by both in parallel.

Precautions shall be taken to limit current circulation in the connection between the neutral points of the sources, in particular the effect of triple harmonics.

560.6.10 There are requirements for a central power supply system.

Batteries shall be of vented or valve-regulated type with reduced maintenance and shall be of heavy duty industrial design, for example cells complying with IEC 60623 or IEC 60896 (all parts). This does not preclude proven new technologies. The minimum design life of the batteries at 20 ºC shall be 10 years.

560.6.11 Where an uninterruptible power supply (UPS) is used, it shall:

a) be able to operate all protective devices located on the load side of the UPS,

b) be able to start the safety services when it is operating in the emergency condition,

c) comply with the requirements of 560.6.10, as applicable,

d) comply with IEC 62040-1, IEC 62040-2 or IEC 62040-3, as applicable, and

e) be able to be started independently of the availability of the upstream supply.

560.6.12 Where a safety generating set is used as an electrical source for safety services, a diesel engine driven generating set shall comply with ISO 8528-12.

560.6.13 The condition of the electrical source for safety services (ready for operation, under fault conditions, feeding from the electrical source for safety services) shall be monitored.

560.7 Electrical circuits of safety services

560.7.1 Circuits of safety services shall be independent of other circuits.

An electrical fault or any modification in one system shall not affect the correct functioning of the other. This may necessitate separation by fire-resistant materials or different routes or enclosures.

560.7.2 Circuits of safety services shall not pass through locations exposed to fire risk (BE2 due to nature of processed or stored materials) unless they are fire-resistant. The circuits shall not, in any case, pass through zones exposed to explosion risk (BE3). Where practicable, the passage of any circuit through locations presenting a fire risk should be avoided.

560.7.3 In accordance with IEC 60364-4-43:2008, 433.3.3, protection against overload may be omitted where the loss of supply may cause a greater hazard. Where protection against overload is omitted, the occurrence of an overload shall be monitored.

560.7.4 Overcurrent protective devices shall be selected and erected so as to avoid an overcurrent in one circuit impairing the correct operation of circuits of safety services.

560.7.5 Switchgear and controlgear shall be clearly identified and grouped in locations accessible only to skilled or instructed persons (BA5 or BA4).

560.7.6 In equipment supplied by two different circuits, a fault occurring in one circuit shall not impair the protection against electric shock, nor the correct operation of the other circuit. Such equipment shall be connected to the protective conductors of both circuits, if necessary.

560.7.7 Circuits for safety services, with the exception of wiring for fire and rescue services lift supply cables, and wiring for lifts with special requirements, shall not be installed in lift shafts or other flue-like openings (location).

560.7.8 In addition to a general schematic overview diagram, full details of all electrical sources for safety services shall be given. Information shall be maintained adjacent to the distribution board. A single line diagram is sufficient.

560.7.9 Drawings of the electrical safety installations shall be provided showing the exact location of:

– all electrical equipment and distribution boards, with equipment designations;
– safety equipment with final circuit designation and particulars and purpose of the equipment;
– special switching and monitoring equipment for the safety power supply (e.g. area switches, visual or acoustic warning equipment).

560.7.10 A list of all the current-using equipment permanently connected to the safety power supply, indicating the nominal electrical power, nominal currents and starting currents and time for current-using equipment, shall be provided.

NOTE This information is often included in circuit diagrams.

560.7.11 Operating instructions for safety equipment and electrical safety services shall be available. They shall take into account all the particulars of the installation.

560.7.12 The circuit and overcurrent protection shall be considered in order to maintain reliability of power supply of the safety services under fire conditions. See also 560.6.8.2.

560.7.13 Circuits of safety services shall not be protected by RCDs or AFDDs.

NOTE At elevated temperatures under fire conditions, leakage currents between conductors can occur leading to unwanted tripping and loss of safety service.

560.8 Wiring systems

560.8.1 One or more of the following wiring systems shall be utilized for safety services required to operate in fire conditions:

– mineral insulated cable complying with IEC 60702-1 and IEC 60702-2 and IEC 60332-1-2;
– fire-resistant cables complying with the appropriate part of the IEC 60331 series and with IEC 60332–1-2;
– a wiring system maintaining the necessary fire and mechanical protection.

Wiring systems and their fixings shall be mounted and installed in such a way that the circuit integrity will not be impaired during the fire.

In long vertical installations wiring systems shall have fire protection for their fixings to ensure that under fire condition, cable fixings do not allow the cables to collapse prematurely.

NOTE 1 Examples of a system maintaining the necessary fire and mechanical protection could be constructional enclosures to maintain fire and mechanical protection, or wiring systems in separate fire protected compartments.

NOTE 2 National legislation can exist.

560.8.2 Wiring for control and bus systems of safety services shall be in accordance with the same requirements as the wiring which is to be used for the safety services. This does not apply to circuits that do not adversely affect the operation of the safety equipment.

This requirement also includes control and bus systems for self-contained luminaires. Wireless control and bus systems shall be considered in an equivalent way.

560.8.3 Circuits for safety services which can be supplied by direct current shall be provided with two-pole overcurrent protective devices.

560.8.4 The higher resistance of conductors due to high temperature when exposed to fire shall be taken into account when sizing the conductor cross-sectional area.

NOTE Information is given in Annex F for cables with copper conductors.

560.8.5 The wiring systems of safety services should be segregated from other services other than metallic screened fire-resistant cables and installed in such a manner that the safety services are not affected by any fault occurring on non-safety services and mitigate the effects of a fire. An example of cables installed for safety services is shown in a diagram in Annex E.

NOTE For battery cables, special requirements can apply.

560.8.6 Precautions shall be taken to prevent excavation damage to buried electrical circuits for safety services.

560.8.7 Switchgear and controlgear used for both AC and DC supply sources shall be suitable for both AC and DC operation.

560.9 Emergency lighting applications

560.9.1 Emergency lighting systems may be powered by a central power supply system or the emergency lighting luminaires may be self-contained. Emergency lighting luminaires shall comply with IEC 60598-2-22. The supply to self-contained emergency lighting luminaires is excluded from the requirements of 560.9.2

560.9.2 Wiring systems for a centrally powered emergency lighting system shall retain the continuity of supply from the source to each fire protected compartment where the emergency lighting luminaires are installed for an adequate period in the event of a fire. This shall be achieved by using wiring systems with a high resistance to fire, as detailed in 560.8.1 and 560.8.2, to transfer power through other fire protected compartments.

Within fire protected compartments where the emergency lighting luminaires are installed, the wiring system between emergency lighting luminaires has no requirements against fire.

For fire protected compartments having more than one emergency lighting luminaire, such emergency lighting luminaires shall be wired alternately from at least two separate circuits so that a suitable level of illuminance is maintained along the escape route in the event of the loss of one circuit.

560.9.3 Where alternate emergency lighting luminaires are supplied by separate circuits, overcurrent protective devices shall be used so that a short-circuit in one circuit does not interrupt the supply to the adjacent emergency lighting luminaires within the fire protected compartment or the emergency lighting luminaires in other fire protected compartments.

No more than 20 emergency lighting luminaires with a total load not exceeding 60 % of the nominal current of the overcurrent protective device shall be supplied from any final circuit.

560.9.4 A safe value of minimum illuminance, response time and rated operation time is required to enable evacuation of a building. Where there are no national or local rules, illumination systems shall comply with ISO 30061:2007

NOTE Guidance on appropriate systems is given in Annex A (see Table A.1).

560.9.5 Emergency lighting shall be wired in maintained or non-maintained mode. These modes may also be combined.

560.9.6 In the non-maintained mode, the power supply for the normal lighting shall be monitored at that area. If a loss of supply to the normal lighting in an area causes the normal lighting to fail, the emergency lighting shall be activated automatically. In all cases, arrangements shall be made to ensure that local emergency lighting will operate in the event of failure of normal supply to the corresponding local area.

560.9.7 Where maintained and non-maintained modes are used in combination, the changeover devices shall each have their own monitoring device and shall be able to be switched separately.

560.9.8 The maintained mode of emergency lighting may be simultaneously switched with normal lighting in locations which either

– cannot be darkened when in use, or

– are not constantly occupied.

560.9.9 Emergency lighting systems shall not be adversely affected by any control systems. Any future modifications of the control systems shall continue to comply with this functional safety requirement. If a failure causes normal lighting in an area to fail, all emergency lighting luminaires in the area shall operate. The emergency lighting luminaires in the area shall provide full emergency design light output.

NOTE 1 For the definition of functional safety see IEC 61508-4:2010, 3.1.12.

NOTE 2 Here failure means a loss of supply or a failure of the control system.

560.9.10 Changeover from normal to emergency mode shall start automatically if the supply voltage drops below 0,6 times the rated supply voltage for at least 0,5 s. Normal mode shall be restored if the supply voltage is greater than 0,85 times the rated supply voltage.

NOTE 1 The actual time for changeover can depend on national rules.

NOTE 2 The level of changeover depends on the equipment used for safety services.

560.9.11 When the normal supply is restored to the distribution board or monitored circuit, the emergency lighting in non-maintained mode shall automatically switch off. Account shall be taken of the time necessary for the lamps in the normal lighting to return to normal luminance. Account shall also be taken of rooms which had been intentionally ‘blacked-out’ before the supply was lost; in these cases, emergency lighting shall not switch off automatically.

560.9.12 In emergency lighting systems the type of lamps shall be compatible with the changeover time in order to maintain the specified lighting level.

560.9.13 Control switches for emergency lighting shall be placed at a designated location and be arranged and installed in such a way that they cannot be operated by unauthorized persons.

560.9.14 The switched-on position of the emergency lighting shall be indicated at a convenient location for each source of supply.

560.9.15 Emergency lighting luminaires and associated circuit equipment shall be identified by for example a red label of at least 30 mm in diameter.

560.9.16 A switching facility may be provided to prevent discharging of the electrical storage source for safety services when the building is not occupied

560.9.17 Each single phase circuit shall have its own neutral conductor. A common neutral for more than one circuit is not permitted.

560.10 Fire protection applications/equipment

560.10.1 Wiring systems for fire detection and firefighting power supplies shall be supplied by a separate circuit from the main incoming supply.

If a fire switch is required, conductors supplying fire protection equipment whose operation is necessary during a fire, shall be connected at the power supply side of the fire switch. It shall be clearly identified.

NOTE If a fire switch is required to disconnect all non-safety services an example of such a system is shown in a schematic diagram in informative Annex D.

560.10.2 Preferential circuits, if any, shall be directly connected on the supply side of the isolating switch of the main distribution board.

560.10.3 Alarm devices shall be clearly identified.

560.10.4 Except where there are applicable national rules, the minimum requirements for fire protection systems should be in accordance with Annex B. See Table B.1.

Annex A
(informative)

Guidance for emergency lighting

The values in ISO 30061:2007 should be considered but additional details of suitable systems are given in Table A.1. Annex A serves as an informative guide for countries that do not have specific rules or their own guidelines.

Table A.1 – Guidance for emergency lighting

Examples of applications	Requirements							
	1	2	3	4	5	6	7	8
	Extended duration or remote controlled circuit	Escape sign luminaires in maintained mode	Central power supply system	Self-contained battery unit	Motor-generator unit with no break (0 s)	Motor-generator unit with short break (< 0,5 s)	Motor-generator unit with medium break (< 15 s)	Dual supply system
Assembly halls, assembly rooms	**	✓	✓	✓	✓	✓		
Exhibition halls	**	✓	✓	✓	✓	✓		
Theatres, cinemas	**	✓	✓	✓	✓	✓		
Sports arenas	**	✓	✓	✓	✓	✓		
Sales areas	**	✓	✓	✓	✓	✓		
Restaurants	**	✓	✓	✓	✓	✓		
Hospitals, treatment centres	**	✓	✓	✓	✓	✓	✓	
Hotels, guest houses *	**	✓	✓	✓	✓	✓	✓	
Residential care homes *	**	✓	✓	✓	✓	✓	✓	
High-rise buildings *	**	✓	✓	✓	✓	✓	✓	
Schools	**	✓	✓	✓	✓	✓	✓	
Enclosed car parks		✓	✓	✓	✓	✓	✓	
Escape routes in workplaces		–	✓	✓	✓	✓	✓	✓
High risk task areas		–	✓	✓	✓	✓		✓
Stages	**	✓	✓	✓	✓	✓		

Key

✓ Denotes suitable systems.

* In premises (guest houses, hotels, residential care homes and high-rise buildings) used the whole day, the rated operating time for the emergency lighting should be 8 h or shall be switchable with illuminated push buttons for a fixed time by the occupants. In this case, the push buttons and their timing equipment should also run in the emergency mode.

** Denotes applications which require either extended duration or a circuit such as a remote controlled circuit to ensure protection for longer than 60 min.

Annex B
(informative)

Guidance for fire protection equipment

Annex B serves as an informative guide for countries that do not have specific rules or their own guidelines.

Table B.1 – Guidance for safety equipment

Examples for safety equipment	Requirements								
	1	2	3	4	5	6	7	8	9
	Rated operating time of the source, (h)	Response time of the source, (s. max.)	Central power supply system	Self-contained battery unit	Motor-generator unit with no break (0 s)	Motor-generator unit with short break (< 0,5 s)	Motor-generator unit with medium break (< 15 s)	Dual supply system	Monitoring and changeover in the case of failure of the source
Installations for fire pumps	12	15			✓	✓	✓	✓	✓
Fire rescue service lifts	8	15			✓	✓	✓	✓	✓
Lifts with special requirements	3	15			✓	✓	✓	✓	✓
Devices of alarm and issue of instructions	3	15	✓		✓	✓	✓	✓	✓[a]
Smoke and heat extraction equipment	3	15	✓	✓	✓	✓	✓	✓	✓[a]
CO warning equipment	1	15	✓	✓	✓	✓	✓	✓	✓[a]

Key

✓ Denotes suitable systems.

[a] Only in case of no separate safety supply equipment.

Annex C
(informative)

List of notes concerning certain countries

Country	Clause No.	Nature (permanent or less permanent according to IEC directives)	Rationale (detailed justification for the requested country note)	Wording
France	560.1			In France, national regulations define installation rules for safety services: "arrêté du 25 juin 1980 modifié" and "arrêté du 31 janvier 1986 modifié".
Austria	560.4.1			In Austria, a non-automatic supply, the starting of which is initiated by an operator, is not permitted as electrical supply system for safety services.
Germany	560.4.1 1st bullet point			In Germany, a non-automatic supply, the starting of which is initiated by an operator, is not permitted as electrical supply system for safety services for the health and safety of persons.
Germany	560.5.2			In Germany, the necessity of providing wiring systems required to operate in fire conditions and their construction is governed by statutory building provisions of the Lands of the Federal Republic of Germany. In case of doubt the building supervisory board should be consulted.
Norway	560.6.1			In Norway, a separate feeder from the supply network cannot be used as a safety source.
Austria	560.6.1			In Austria, primary cells are not allowed for emergency lighting.
Germany	560.6.1 2nd bullet point			In Germany, primary cells are not permitted as an electrical source for safety services for the health and safety of persons.
Germany	560.6.3			In Germany, in the Lands of the Federal Republic of Germany, partially special statutory building provisions exist regarding rooms in which electric sources for safety services are allowed to be installed. In case of doubt the building supervisory board should be consulted.
	560.6.4			In Germany, in the Lands of the Federal Republic of Germany, partially special statutory building provisions exist regarding rooms in which electric sources for safety services are allowed to be installed. In case of doubt the building supervisory board should be consulted.
UK	560.6.10			In the United Kingdom, the national requirement is for maintenance free batteries.
Austria	560.6.10			In Austria, valve-regulated maintenance-free types are also permitted.

Country	Clause No.	Nature (permanent or less permanent according to IEC directives)	Rationale (detailed justification for the requested country note)	Wording
Germany	560.7.1			In Germany, the necessity of providing wiring systems required to operate in fire conditions and their construction is governed by statutory building provisions of the Lands of the Federal Republic of Germany. In case of doubt the building supervisory board should be consulted.
	560.7.2			In Germany, the necessity of providing wiring systems required to operate in fire conditions and their construction is governed by statutory building provisions of the Lands of the Federal Republic of Germany. In case of doubt the building supervisory board should be consulted.
Germany	560.7.12			In Germany, the necessity of providing wiring systems required to operate in fire conditions and their construction is governed by statutory building provisions of the Lands of the Federal Republic of Germany. In case of doubt the building supervisory board should be consulted.
United Kingdom	560.7.13			In the UK, the national requirements for RCDs in these applications are covered by BS 5839, BS 5266 and BS 8519.
France	560.8			In France, Clause 560.8 does not apply because of national regulations.
Austria	560.8.1			In Austria, constructional enclosures to maintain fire and mechanical protection or wiring systems in separate fire compartments also comply with these requirements. In Austria, all types of fire-resistant cables complying with DIN 4102-12 are also permitted.
Germany	560.8.1			In Germany, the necessity of providing wiring systems required to operate in fire conditions and their construction is governed by statutory building provisions of the Lands of the Federal Republic of Germany. In case of doubt the building supervisory board should be consulted.
Italy	560.8.1			In Italy, wiring systems with cables having low emission of toxic and corrosive smoke and gas during fire are used in installations where, from a relevant risk evaluation, a high risk to persons is envisaged.
United Kingdom	560.8.1			In the United Kingdom, to take into account national requirements, the following new bullet point is required: – fire-resistant cables complying with the test requirements of BS EN 50200, BS 8434 or BS 8491, appropriate for the cable size and with BS EN 60332-1-2.

Country	Clause No.	Nature (permanent or less permanent according to IEC directives)	Rationale (detailed justification for the requested country note)	Wording
United Kingdom	560.8.5			In the United Kingdom, segregation of safety services for emergency lighting and fire detection and fire alarm systems are described in BS 5266, BS 5839 and BS 8519.
Germany	560.8.5			In Germany, the necessity of providing wiring systems required to operate in fire conditions and their construction is governed by statutory building provisions of the Lands of the Federal Republic of Germany. In case of doubt the building supervisory board should be consulted.
United Kingdom	560.8.5			In the United Kingdom, segregation of safety services are described in BS 5266, BS 5839 and BS 8519.
France	560.9			In France, Clause 560.9 does not apply because of national regulations.
United Kingdom	560.9			In the United Kingdom, the national requirements for emergency escape lighting applications contained in the BS 5266 series shall apply.
Ireland	560.9			In Ireland, this item is the subject of a separate Irish standard IS 3217, and does not appear in the national rules for electrical installations.
Finland	560.9.2			In Finland, the third paragraph is not valid.
Germany	560.9.2			In Germany, the necessity of providing wiring systems required to operate in fire conditions and their construction is governed by statutory building provisions of the Lands of the Federal Republic of Germany. In case of doubt the building supervisory board should be consulted.
Switzerland	560.9.2			In Switzerland, with respect to 560.9.2, high fire resistance requirements for the wiring system and the cabling are only mandatory up to the first luminaire or connecting block of an individual fire compartment. High fire resistance requirements for the wiring system and the cabling connecting the luminaires within the fire compartment are not mandatory.
Austria	560.9.3			In Austria, the national wiring conditions for emergency lighting shall apply.
Spain	560.9.3			In Spain, no more than 12 luminaires shall be supplied from any final circuit.
Austria	560.9.8			In Austria, the use of maintained or non-maintained mode shall be determined by national regulations.
Finland	560.9.8			In Finland this subclause is not valid.
United Kingdom	560.9.9			In the United Kingdom, the national requirements for emergency escape lighting applications contained in the BS 5266 series shall apply.

Country	Clause No.	Nature (permanent or less permanent according to IEC directives)	Rationale (detailed justification for the requested country note)	Wording
Spain	560.9.10			In Spain, changeover from normal to emergency mode of safety lighting circuits shall start automatically if the supply voltage drops below 70 % of the rated supply voltage.
Switzerland	560.9.15			In Switzerland, with respect to 560.9.15, a red or green label shall be used. Within a building the colour coding scheme has to be the same.
Finland	560.9.15			In Finland this subclause is not valid.
Austria	560.9.17			In Austria, a red or green label, which shall be of good visibility and easily legible, shall be used.
Italy	560.10			In Italy, fire prevention regulations are issued by the Ministry of the Interior that apply to particular applications, such as locations open to the public, hotels, hospitals, high-rise buildings and similar premises.
United Kingdom	560.10			In the United Kingdom, the national requirements for fire protection applications contained in the BS 5839 series shall apply.
Spain	Annex A			In Spain, the rated operating time shall be: – 2 h in hospitals, clinics and similar, the time required to evacuate a high-risk area or to abandon the activity which is taking place in that area; – 1 h in other kinds of installation.
Austria	Annex A			In Austria, national rules exist, therefore Annex A does not apply.
United Kingdom	Annex A			In the United Kingdom, national rules exist for the operating time.
Austria	Annex B			In Austria, national rules exist for the rated operating time.
United Kingdom	Annex B			In the United Kingdom, national rules exist for the operating time.
Germany	Annex F			In Germany, statutory building provisions exist regarding more detailed requirements for wiring systems to operate in fire conditions.

Annex D
(informative)

Fire switch

A schematic diagram showing the installation of a fire switch used to disconnect all circuits with the exception of circuits supplying the equipment whose operation during a fire is necessary is shown in Figure D.1.

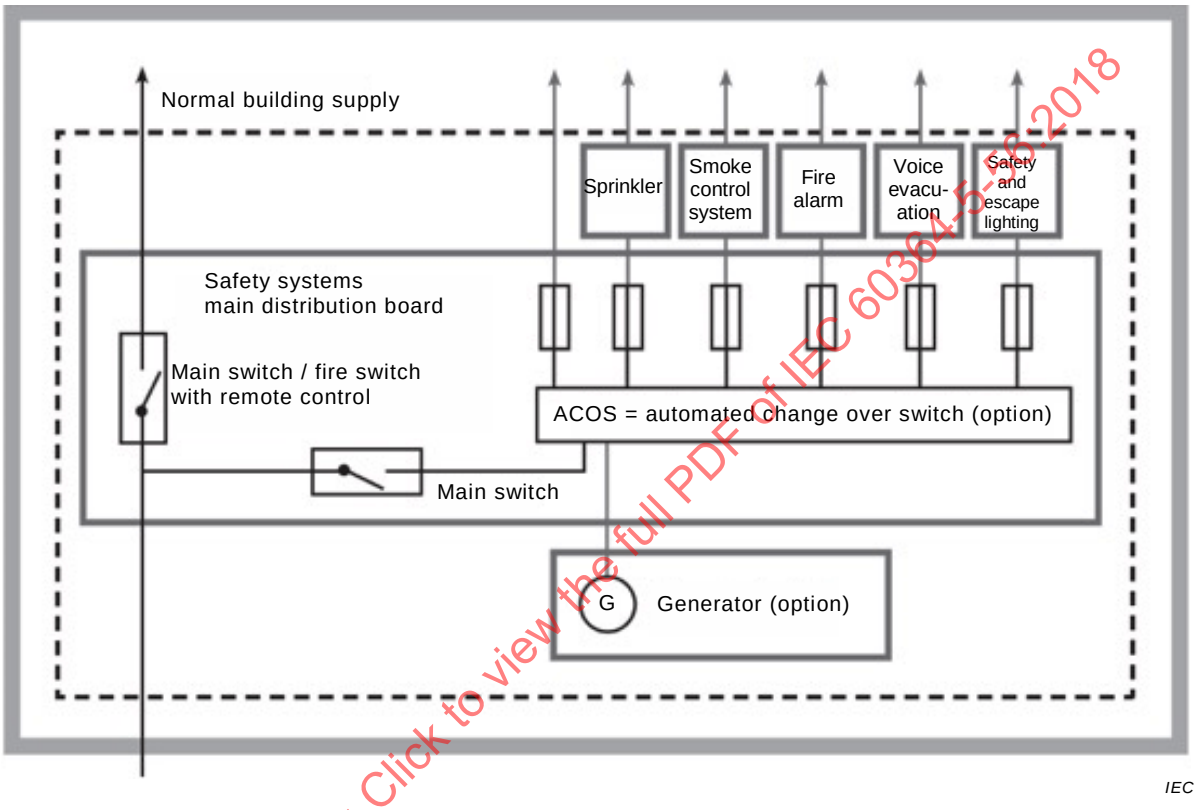
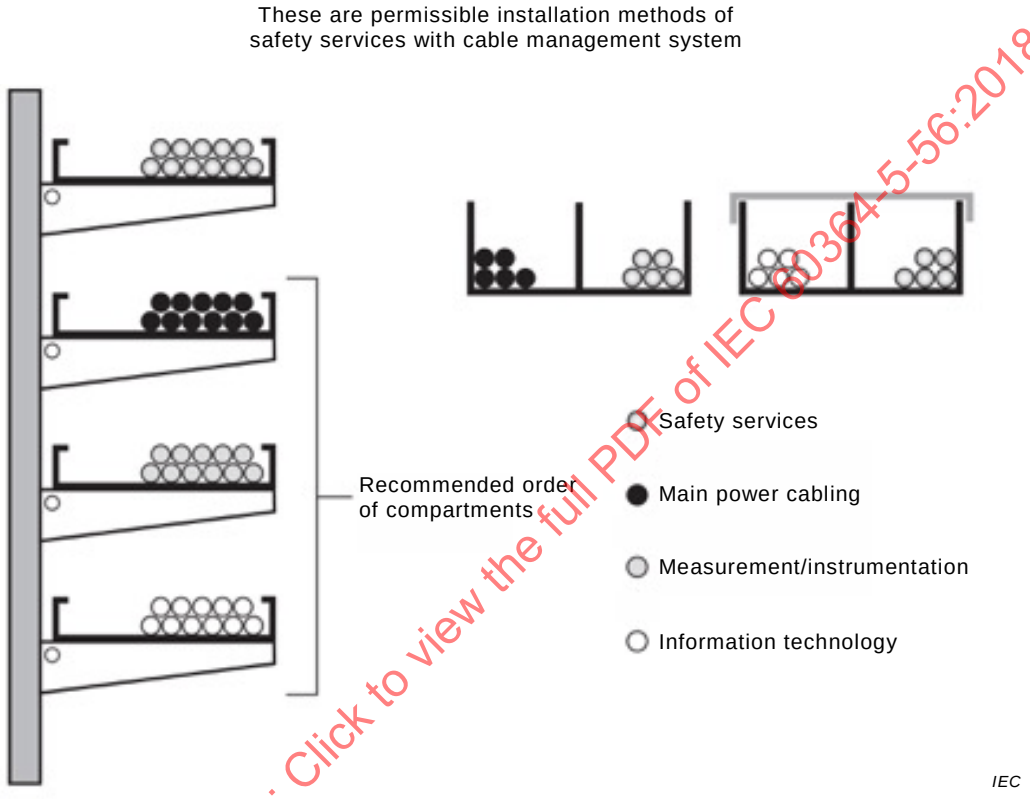


Figure D.1 – Fire switch installation

Annex E
(informative)

Example of installation methods of safety services with cable management system

Safety services should be segregated from other services and installed in such a manner that the safety services are not affected by any fault occurring on non-safety services and mitigate the effects of a fire. An example of cables installed for safety services is shown in Figure E.1.



NOTE Cable trays are numbered from the top down, starting at tray 1:

Tray 1 = Safety services

Tray 2 = Main power cabling

Tray 3 = Measurement/instrumentation

Tray 4 = Information technology

Figure E.1 – Example of cable installation for safety services

Annex F
(informative)

Wiring systems

F.1 Ambient test temperature rise

The standard temperature time curve defines the ambient test temperature rise in time under fire conditions and it is defined in ISO 834-1 as:

$$T = 345 \text{ x } \log10(8 \text{ x } t + 1) + 20 \quad \text{(F.1)}$$

where

T is the temperature in degrees Celsius;

t is the time in minutes.

F.2 Duration of the safety service

The adequate duration of the safety service under fire conditions should be defined.

NOTE Local legislation can apply or can be defined by risk analysis by the designer.

F.3 Expected resistance of feeder conductors

The expected resistance of feeder conductors supplying fire protection equipment that should remain functional during a fire should be determined from Formula (F.2), for copper conductors only:

$$R_0 = R_{20} \cdot k_X \cdot \left(\frac{T_0}{293}\right)^{1,16} \quad \text{(F.2)}$$

where:

R_{20} is the conductor resistance at the temperature of 20 ^{0}C, (Ω);

R_0 is the conductor resistance at the expected fire temperature, (Ω);

k_X is the coefficient determining the relative contribution of the section X, of the entire feeder circuit length l, exposed to a high temperature, according to Formula (F.3), (-);

T_0 is the expected ambient temperature of feeder conductors that may occur during a fire, (K).

$$k_x = \frac{l_x}{l} \quad \text{(F.3)}$$

where:

l is the length of the feeder circuit conductor, (m);

l_x is the section of the feeder circuit conductor exposed to a high temperature, (m).

If a conductor route with the length l is located within a single fire protected compartment it is assumed that the entire length of feeder conductor can be exposed to a high temperature. In such a case k_x = 1.