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INTERNATIONAL STANDARD

colour inside

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

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LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

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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.

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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 ~~electrical safety sources~~ 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 60364-4-43:2008, *Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent*~~

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 62040-1-1, *Uninterruptible power systems (UPS) – Part 1-1: General and safety requirements for UPS in operator access areas*~~

~~IEC 62040-1-2, *Uninterruptible power systems (UPS) – Part 1-2: General and safety requirements for UPS used in restricted access locations*~~

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*

~~CIE S 020/~~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.

~~NOTE 2 Examples of safety services include:~~

~~– 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.~~

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: ~~CIE S 0-20/~~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 ~~auxiliary power supply~~ electrical source for safety services energizing the equipment

560.3.12
central power supply system ~~(unlimited power)~~
system which supplies the required emergency power to essential safety equipment ~~without any limitation in power output~~

~~**560.3.13**~~
~~**central low-power supply system (low power output)**~~
~~central power supply system with a limitation of the power output of the system at 500 W for 3 h or 1 500 W for 1 h~~

~~NOTE A low-power supply system normally comprises a maintenance-free battery and a charging and testing unit.~~

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

560.3.14
preferential circuit
~~safety source~~ 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

~~NOTE An example of such a safety service is sprinkler pumps.~~

560.3.15
minimum illuminance
illuminance for emergency lighting ~~at the end of~~ 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 ~~compatible with the changeover time~~ 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 ~~two~~ conditions shall be fulfilled:

~~– an electrical source for safety supply shall be selected in order to maintain a supply of adequate duration, and~~

~~– all equipment of safety services shall be provided, either by construction or by erection, with protection ensuring fire resistance of adequate duration.~~

– 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 ~~safety supply source~~ 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 ~~Where automatic disconnection of supply is used as a protective measure against electric shock, non-disconnection on the first fault is preferred.~~ 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 ~~Regarding control and bus systems, a failure in the control or bus system of a normal installation shall not adversely affect the function of safety services.~~ 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 ~~Safety sources~~ The electrical source for safety services shall be installed as fixed equipment and in such a manner that ~~they~~ it cannot be adversely affected by failure of the normal source.

560.6.3 ~~Safety sources~~ 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 ~~safety source~~ 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 ~~safety source~~ electrical source for safety services shall have sufficient capability to supply its related safety service.

560.6.7 ~~A safety source~~ 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.

~~**560.6.8.1**~~ 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.

~~NOTE This may be achieved by mechanical interlocking.~~

~~**560.6.8.2 Short circuit protection and fault protection shall be ensured for each source.**~~

~~**560.6.9 Special requirements for safety services having sources capable of operation in parallel**~~

~~NOTE 1 The parallel operation of independent sources normally requires the authorization of the supply undertaking. This may require special devices, for example to prevent reverse power.~~

~~Short circuit protection and fault protection shall be ensured when the installation is supplied separately by either of the two sources or by both in parallel.~~

~~NOTE 2 Precautions may be necessary to limit current circulation in the connection between the neutral points of the sources, in particular the effect of third harmonics.~~

~~**560.6.10 Central power supply system**~~

~~Batteries shall be of vented or valve-regulated maintenance-free type and shall be of heavy duty industrial design, for example cells complying with IEC 60623 or the IEC 60896 series.~~

~~NOTE The minimum design life of the batteries at 20 °C should be 10 years.~~

~~**560.6.11 Low-power supply system**~~

~~The power output of a low-power supply system is limited to 500 W for a 3 h duration and 1500 W for a 1 h duration. Batteries can be of gas-tight or valve-regulated maintenance-free type and shall be of heavy duty industrial design, for example cells complying with IEC 60623 or the IEC 60896 series.~~

~~NOTE The minimum design life of the batteries at 20 °C should be 5 years.~~

~~**560.6.12 Uninterruptible power supply sources**~~

~~Where an uninterruptible power supply is used, it shall:~~

~~a) be able to operate distribution circuit protective devices, and~~

~~b) be able to start the safety devices when it is operating in the emergency condition from the inverter supplied by the battery, and~~

~~c) comply with the requirements of 560.6.10, and~~

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

~~**560.6.13 Safety generating sets**~~

~~Where a safety generating set is used as a safety source, it shall comply with ISO 8528-12.~~

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.