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Graphical symbols — Safety signs — Safety way guidance systems (SWGS)

Symboles graphiques — Signaux de sécurité — Systèmes de guidage pour cheminement d'évacuation de sécurité

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 145, *Graphical symbols*, Subcommittee SC 2, *Safety identifications, signs, shapes, symbols, and colours*.

This second edition cancels and replaces the first edition (ISO 16069:2004) which has been technically revised.

The main changes compared with the previous edition are as follows:

a) the component luminance requirements of the electrical systems have been updated;

b) the component luminance and dimensions of non-electrical phosphorescent systems have been updated;

c) the document and its requirements have been simplified to improve ease of use and eliminate ambiguity;

d) all example figures which by definition could not cover all arrangements have been removed;

e) an informative annex for designers of non-electrical phosphorescent systems regarding observation distances has been added.

Introduction

Safety way guidance systems need to be standardized so that they communicate the information necessary to allow people to be able to evacuate a building efficiently and, if necessary, to assemble in designated safe areas in cases of fire or other emergencies.

Through the consistent and uniform international application of common SWGS design principles, persons in all countries will be better able to recognize and follow the directional information provided by such systems to assist in providing a safe evacuation. As an additional benefit, a standardized SWGS will assist fire fighters and other rescue teams to evacuate occupied areas during emergency situations.

In order to communicate safety way guidance information efficiently across language barriers, the systems defined in this document incorporate the use of graphical symbols and markings such as arrows, conforming to ISO 7010 and ISO 3864-3.

Illumination of escape routes is not part of the SWGS and is therefore not covered by this document; a SWGS is not intended to replace emergency escape lighting. There will be certain situations where emergency escape lighting is not needed, and other situations, for example where smoke is present, where emergency escape lighting can lose its efficiency and a SWGS will be more effective in assisting emergency evacuation, but it is generally recommended that SWGS be used in combination with the illumination of escape routes to provide additional benefits for the whole system.

The principles given in this document are intended to provide consistent design elements irrespective of whether they use electrically powered or phosphorescent components. Consistent use will improve public awareness of the systems and assist rapid recognition and effectiveness in the case of an emergency.

Graphical symbols — Safety signs — Safety way guidance systems (SWGS)

IMPORTANT — The colours represented in the electronic file of this document can be neither viewed on screen nor printed as true representations. For the purposes of colour matching, see ISO 3864-4 which provides colorimetric and photometric properties together with, as a guideline, references from colour order systems.

1 Scope

This document describes the principles governing the design and application of visual components used to create a safety way guidance system (SWGS).

This document contains general principles valid both for electrically powered and for phosphorescent components. Special information which is related to the type of component is given to assist in defining the environment of use, choice of material, layout, installation and maintenance of SWGS.

This document does not cover risk assessment. Applications with different risks to the occupants typically require different layouts and types of SWGS. The specific application and exact final design of SWGS is entrusted to those persons responsible for this task.

This document also does not include the special considerations of possible tactile or audible components of SWGS, nor does it include requirements for high mounted components of the emergency escape route lighting, especially the design and application of emergency escape route lighting.

This document is intended, by collaboration and coordination, to be used by all other Technical Committees within ISO and IEC charged with developing SWGS for their specific requirements. This document is not to be used for ships falling under regulations of the International Maritime Organization (IMO).

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.

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 3864-3, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*

ISO 3864-4:2011, *Graphical symbols — Safety colours and safety signs — Part 4: Colorimetric and photometric properties of safety sign materials*

ISO 7010:2011, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

ISO 23601, *Safety identification — Escape and evacuation plan signs*

IEC 60364-5-56, *Low-Voltage electrical Installations — Part 5-56: Selection and erection of electrical equipment — Safety services*

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

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:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
assembly area
designated safe area outside the occupied area where occupants are expected to assemble

3.2
dead end
corridor, or part of a corridor whose depth is greater than its width from which there is only one escape route

[SOURCE: ISO 15370:2010, 3.5]

3.3
emergency escape lighting
that part of *emergency lighting* (3.4) that provides illumination for the safety of people leaving a location or attempting to terminate a potentially dangerous process before doing so

3.4
emergency lighting
lighting provided for use when the supply to the normal lighting fails

3.5
factor of distance
z
relationship between the height (h) of a sign and observation distance (l), used to determine observation distances of signs

$$z = \frac{l}{h}$$

[SOURCE: ISO 3864-1:2011, 3.2]

3.6
guidance line
line of luminous material on or close to the floor provided to clearly delineate an escape route or define an escape path through an open area

3.7
high location
installation position above doors or at or close to ceiling level for safety signs and other safety way guidance components

3.8
intermediate location
installation position between a *low location* (3.9) and a *high location* (3.7) especially at eye level for safety signs and other safety way guidance components

3.9
low location
installation position at or close to floor level for safety signs and other safety way guidance components

3.10
luminance contrast
<SWGS> luminance of the brightest element of the safety way guidance component divided by the luminance of the surrounding environment

3.11
marking
method of highlighting and identifying specific building components or equipment

3.12
observation distance
l
<sign> distance from which a sign is identifiable and conspicuous

3.13
observation distance
l
<guidance lines, door frames> distance from which *guidance lines* (3.6) and door frames are visible

3.14
period of use
time over which the safety way guidance system is expected to be operational

3.15
phosphorescent material
material incorporating phosphors that, if excited by UV or visible radiation, store energy, which is emitted as light over a period of time

Note 1 to entry: A phosphorescent sign is the same as "photoluminescent" commonly used in the literature of the photoluminescent safety sign industry.

[SOURCE: ISO 3864-4:2011, 3.12, modified — Note 1 to entry has been added.]

3.16
safety sign
sign which gives a general safety message, obtained by a combination of colour and geometric shape and which, by the addition of a graphical symbol, gives a particular safety message

[SOURCE: ISO 3864-1:2011, 3.12]

3.17
safety way guidance system
SWGS
system that provides luminous markings and direction information for the safety of people leaving a location

3.18
sign height
diameter of a circular geometric shape or height of a rectangular or triangular geometric shape

Note 1 to entry: Registered safety sign originals in ISO 7010 are in a uniform 70 mm size with corner marks to enable accurate enlargement and reduction scaling. A border is not shown.

[SOURCE: ISO 3864-1:2011, 3.13, modified — Note 1 to entry has been added.]

3.19
supplementary sign
sign that is supportive of a safety sign and the main purpose of which is to provide additional clarification

[SOURCE: ISO 3864-1:2011, 3.14]

4 Planning a SWGS

This document provides guidelines for the installation of the guidance system in buildings where it has been decided as the result of risk assessment to install a luminous safety way guidance system.

Since SWGS can consist of a variety of possible components, steps shall be taken at the planning stage to determine appropriate designs.

The SWGS shall take into account the following factors:

a) the characteristics of the exit path of the horizontal and stairwell sections of the defined escape route and exit paths to them, including through open areas;

b) the location of emergency exit doors and how the door frame can be marked and the placement of escape route signs;

c) the location of assembly stations and refuge areas;

d) the location of all possible escape routes (emergency stairwell, escape windows, ladders);

e) the location of escape and evacuation plan signs at a prominent place;

f) the location of hazards such as machinery, dangerous goods, steps and obstacles;

g) the location of safety equipment and fire equipment;

h) the characteristics of the installed emergency lighting in terms of designed illuminance performance and duration;

i) the location and type of high mounted emergency exit signs installed as part of the emergency lighting system;

j) for phosphorescent systems, the type of light source of the normal and emergency lighting and designed/*in situ* illuminance at potential placement of guidance lines and safety signs;

k) for phosphorescent systems, the time management of the normal light sources in the location (occupancy floor and stairwells) for phosphorescent components to be sufficiently exposed to an illumination source in order to function in dark surroundings;

l) for electrically powered systems, the potential locations for the independent power supply, the potential locations for routing of the power cables and devices for detection of failure of power supply and/or smoke;

m) the possible combinations of components in SWGS to assist evacuation under specific risk conditions such as presence of diffused or stratified smoke, earthquakes, and presence of obstacles or specific crowding conditions;

n) the fire compartmentalization provisions;

o) the location of opening devices for doors, e.g. sliding doors, door handle, push bars, emergency push buttons;

p) the design of existing escape route signs.

5 Basic principles for the design of SWGS

5.1 Design objectives

5.1.1 General

Safety way guidance systems shall provide the users of the building with consistent, coherent information so that they can be evacuated efficiently from any occupancy unit to a safe area.

Luminous safety way guidance systems can be installed in addition to high located emergency lighting and its associated high located escape route signs. Safety way guidance systems shall be installed and activated in all risk situations that have been defined by risk assessments. Examples of situations include blackout of the exit path and escape route signs due to potential failure of the power supply to the escape route lighting or the risk of smoke obscuring the exit path and emergency exit doors.

The approach of both phosphorescent or electrically powered safety way guidance systems is luminous marking of the exit path and changes of level of the emergency exit path, not the illumination of the floor or steps. Consequently, for the safety way guidance systems specified in this document there is not a requirement to specify the horizontal illuminance on the centre line of the escape path or vertical illuminance at safety equipment.

Activation/charging of phosphorescent components to produce light emission in dark surroundings requires pre-exposure of the components to the installed light sources. The luminance performance during the decay mode of the phosphorescent components depends upon the light spectral characteristics of the light source, the excitation illuminance at the location of the phosphorescent component and the duration of the excitation.

All the components of an activated safety way guidance system shall have a luminance contrast with the surroundings of >3 when in use and for at least the time allocated for escape in clear air conditions.

For the same performance of luminous material, the observation distance for visibility of emergency exit door marking is longer than the distance for identification of the escape route sign at the exit door.

In conditions of smoke on the emergency exit path, the light from luminous way guidance components is attenuated exponentially with smoke density and light is scattered producing a luminous veil. As the smoke density increases, an emergency exit door may no longer be visible but the guidance lines and escape route signs in short distance from the evacuee can be visible to direct evacuees towards an emergency exit door. In smoke conditions evacuees may bend forward or crawl, reducing their speed of movement and increasing the evacuation time to a safe area.

The technical design of the different luminous safety way guidance systems is discussed in Clause 6 for electrically powered systems and in Clause 7 for phosphorescent systems.

SWGS is intended to be installed throughout a building but may be restricted to certain parts of the escape route where supported by a risk analysis.

5.1.2 Continuity

SWGS components shall be arranged as continuously and unbroken as possible from within the occupied area to the assembly area. Way guidance lines shall be used to provide a visually continuous, conspicuous line from within the building to a final point of the escape route and shall preferably be a complete delineation of the boundaries of the escape route.

NOTE 1 Four dots or chevrons per linear metre with diameter of at least 100 mm can be accepted as continuous line.

NOTE 2 The final point of the escape route can be inside or outside the building, depending on the evacuation strategy.

5.1.3 Visual reinforcement

Escape route signs shall be placed at intervals sufficient to provide consistency and continuity of information.

The frequency and visual reinforcement of escape route signs at intermediate and low location shall be determined by the risk assessment.

Escape route signs positioned at low location shall be close to the way guidance lines or be incorporated in the guidance line, Wherever practical, escape route signs located at intermediary level shall be repeated at low location.

5.1.4 Location

Low location shall be the principal position for guidance lines giving perspective over distances of 10 m. The height of the low location guidance lines shall be no higher than 300 mm from the floor, and lower may be preferred.

Intermediate guidance lines may be placed at up to 1,20 m from the floor to provide visual reinforcement and to assist in the identification of guide rails, handrails or other architectural elements along the escape route. This adds further to the perspective of the escape route over medium observation distances of approximately 10 m to 20 m.

Escape route signs shall be located to ensure visual reinforcement at medium to long observation distances of between approximately 10 m and 30 m and to indicate change of escape route direction or intermediate and final destinations on the escape route.

The visual field between 1,20 m and 1,80 m on the walls of the escape route may be used for visually reinforcing directional information for medium observation distances of approximately 10 m to 20 m.

5.1.5 Destination

Final and intermediary destinations along the escape route such as exit doors on the route and assembly/refuge areas/escape windows shall be given specific emphasis by using SWGS components. Other doors shall not be marked.

5.1.6 Avoidance of confusion at decision points

SWGS shall avoid the presentation to occupants of alternative routes to follow which might create uncertainty and confusion during evacuation. In the case of equal distances between alternative routes then, occupants shall be encouraged to move either way by the location of escape route signs some distance away from the equidistant point.

5.1.7 Dead ends

The frequency of escape route signs at any location shall be increased in dead end areas to progress occupants away from the dead end towards the escape route.

5.1.8 Minimization of potentially competing or confusing information in the visual field on escape routes

Public information signs and general building facilities signs shall be subordinate and of distinctively different colour to components of the SWGS along designated escape routes.

NOTE This can be achieved by increasing size, frequency or luminance of safety way guidance components or similarly reducing size or luminance of potentially competing information.

5.1.9 Multi-level facilities

SWGS in multi-level facilities shall include a floor/level numbering and stair identification system on all levels at each level adjacent to the access point and exit points within the stairwell.

5.2 Guidance lines

Guidance lines together with the luminous marking of the full frame of emergency exit doors are the prime components of a SWGS.

Guidance lines shall be realized by line sources of different sizes and luminances or luminous intensities.

The guidance lines shall be as continuous as possible. No break shall exceed 0,2 m, unless there are doors along the escape route, in which case the wall or floor guidance line may be interrupted with a maximum break of 1 m or the lines shall be continued on the floor in front of the door. Door leafs shall never be marked with a guidance line.

Wall guidance lines which are interrupted by intersecting corridors should be continued by using floor lines or by continuing the guidance line on the opposite side of the corridor starting the guidance line with directional signs.

The maximum height of low-located wall guidance lines above floor level shall be 300 mm. If a low-located wall guidance line is interrupted, it may be continued at floor level for the duration of that interruption.

An additional horizontal luminous line can be located on the wall at a height between 0,9 m and 1,1 m from the floor to show the configuration of the exit route.

It is preferable to provide both sides of the escape route with guidance lines. On escape routes up to 2 m in width it may be sufficient to have only one guidance line. This line may be positioned either on the floor or on the wall.

In rooms or open areas escape routes shall be marked on both sides with guidance lines or the guidance lines shall be used to define a travel path through that area.

NOTE The technical design parameters of the individual components are dealt with in Clause 6 for electrically powered systems and in Clause 7 for phosphorescent systems.

5.3 Escape route signs

5.3.1 Design

SWGS designed to this document shall use the safety signs ISO 7010:2011, E001 or ISO 7010:2011, E002 for emergency exit together with the appropriate supplementary arrow type D from ISO 3864-3 for directional purposes (see Figure 1).

The escape route sign does not indicate the decisions or direction that should be made on the other side of the door. Meanings of escape route signs are given in Figure 1 and Figure 2.

NOTE 1 The addition of supplementary text to a safety sign increases the size and can make the sign more conspicuous.

The colour of escape route signs shall meet the colorimetric and photometric specifications of ISO 3864-4 under its specified test conditions related to escape route signs being externally illuminated or being internally illuminated by electrical power.

NOTE 2 ISO 3864-4 defines colour under certain test conditions and not all conditions of observation of safety signs. Phosphorescent escape route signs during the luminance decay mode lack colour recognition of the green, however they are designed such the luminance contrast enables the graphical symbols to be /remain identifiable.