# Requirements for extra-low voltage (ELV) lighting installations

Extra-low voltage (ELV) lighting is commonly used in domestic and commercial installations, particularly in the form of recessed downlighter luminaires (see Figure 1)

Specific requirements relating to ELV lighting installations were newly introduced in BS 7671: 2008 in Regulation Group 559.11, as summarised in this article. The article also includes information on the requirements for the enclosure of terminations and joints in ELV lighting installations and on methods to be employed for minimising the spread of fire when installing downlighters.

### Shock protection measures and supplies

ELV supplies used for lighting should be taken from a system meeting the requirements for the protective measures of SELV or PELV. It is not permitted to use an FELV system for an ELV lighting installation (Regulation 559.11.1 refers). Where an ELV luminaire does not have a provision for connection of a protective conductor, only a SELV system may be used to supply the luminaire (Regulation 559.11.2 refers).

Safety isolation transformers used for ELV lighting installations must comply with BS EN 61558-2-6 and meet with at least one of the following two requirements of Regulation 559.11.3.1.

• The transformer is protected on the primary side by a fail-safe protective device that monitors the power demand of the luminaires and automatically disconnects the supply in the event of one of a number of specified fault or failure conditions, as detailed in Regulation 559.11.4.2. • The transformer is short-circuit proof (both inherently and non-inherently) and marked with the following symbol:



Electronic convertors used for ELV lighting installations must comply with BS EN 61347-2-2 and be marked with the following symbol:



## Enclosure of connections

No less than for LV connections, all connections (terminations and joints) in (or to) an ELV lighting circuit must be enclosed in accordance with Regulation 526.5 to help prevent spread of possible fire should a loose connection occur.

Many ELV luminaires are provided complete with an enclosure for the connections between the ELV circuit conductors and the luminaire terminals. Figure 2 shows an example of this where the enclosure is separate from the luminaire. Figure 3 shows an example where the enclosure is attached to the luminaire.

If a luminaire is provided without a suitable enclosure for the ELV connections, the installer must provide an appropriate enclosure complying with Regulation 526.5.



A typical use of ELV lighting in commercial premises



Detail of luminaire ceiling entry

Example of an ELV luminaire with ELV connections in an enclosure a	attached to the luminaire
Table 1: Minimum permitted cross-sectional area for ELV lighting c conductors	ircuit Wiring syst
General 1.5	mm <sup>2</sup> requirements
Flexible cables of a length not exceeding 3 m 1.0	mm <sup>2</sup> gives the mi
Suspended flexible cables or insulated conductors 4.0	mm <sup>2</sup> cross-section
Composite cables consisting of braided tinned copper outer4.0sheath, having a material of high tensile strength inner core4.0	mm <sup>2</sup> Larger cond required in s
Note: Larger conductor sizes may be required in some cases to meet the requirements Section 525 of BS 7671 for voltage drop (depending on the number of luminaires supplie the length of run from the transformer) and Regulation Group 433.1 for co-ordination be	ed and etween
conductor and overload protective device.	structural pa

### Wiring systems

Table 1, which is based on the requirements of Regulation 559.11.5.2, gives the minimum permitted cross-sectional area for the conductors of an ELV lighting circuit. Larger conductor sizes may be required in some cases, as explained in the note to the table.

It is not permitted to use metallic structural parts of the building or its





Part of a typical suspended ELV lighting system

**5** Example of a downligher with integral fire protection



• Example of a fire hood, for use with a downlighter without integral fire protection

services installations (such as pipes) or furniture as live conductors of an ELV lighting installation. Regulation 559.11.5.1 refers.

#### **Bare conductors**

- If the nominal voltage does not exceed 25 V a.c. or 60 V d.c., bare conductors may be used for ELV lighting, provided that
- the installation is designed and installed or enclosed to reduce to a minimum the risk of a short-circuit,
- the conductors have a cross-sectional area not less than 4 mm<sup>2</sup>, and
- the conductors are not placed directly on combustible material. (Regulation 559.11.5.3 refers) Where both live conductors are uninsulated, one of the following two requirements of Regulation 559.11.4.1 must be met to reduce the risk of fire.
- The conductors are provided with a fail-safe protective device that monitors the power demand of the luminaires and automatically disconnects the supply in the

event of one of a number of specified fault or failure conditions, as detailed in Regulation 559.11.4.2.

• The system complies with BS EN 60598-2-23 – Luminaires. Particular requirements. Extra-low voltage lighting systems for filament lamps. Such a system is constructed so that the temperature of the conductors in the output circuit does not rise by more than 10 °C under shortcircuit conditions.

Where suspended bare conductors are used, at least one conductor and its terminals must be insulated for that part of the circuit between the transformer and any short-circuit protective device on the secondary side of the transformer. Regulation 559.11.5.3 refers.

#### Suspended systems

Where the ELV system is suspended (see Figure 4), the suspension device(s) must be capable of supporting five times the weight of the luminaire and its lamp, and not less than 5 kg. The suspended system must be fixed to the walls by insulated cleats and be accessible throughout its length. Termination and connection methods must use either screw terminals or screwless clamping devices, complying with the appropriate standard. It is not permitted to use insulating piercing connections and termination wires relying on counterweights to maintain the electrical connection. Regulation 559.11.6 refers.

Containing the spread of fire where recessed downlighters are used Unless suitable precautions have been taken, when recessed downlighters are exposed to a fire from below, they may provide far less fire protection to a ceiling and the structural elements within it than the plasterboard that they are replacing. It is recommended that, wherever possible, downlighters having integral fire protection (see Figure 5) are selected for use in **all** ceilings where the lining to be penetrated is the sole means of keeping fire and heat out of the cavity.

Where integral fire protection is not available owing to the design or style of the luminaire, additional fire protection may be fitted at the time of installation in the form of a 'fire hood' (see Figure 6) or an insulated fire-protective box or similar.

Insulated fire-protective boxes, fire hoods and the like must be fit for the purpose and not be easily dislodged after installation by subsequent work. Guidance on selecting them is given in Annex E of the Best Practice Guide mentioned at the end of this article.



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information relating to the impact of electrical installations on the fire performance of buildings can be found in the Electrical

Further

Safety Council's Best Practice Guide No5 Electrical installations and their impact on fire performance of buildings, which is available as a free download at www.esc.org.uk