



# INDEX TO BSGA TECHNICAL GUIDELINES

## A: GENERAL

### A1: BSGA Obligations of membership

This guideline specifies the legal and technical obligations of BSGA members. It covers statutory and planning requirements as well as the technical construction and installation standards for signs. All BSGA members are expected to comply with these obligations.

### A2: Acknowledgements

This short guideline lists some of the companies, organisations and individuals who have assisted in the preparation of the technical guidelines.

### A3: Glossary of terms

There are many terms used informally for signs and sign components. This guideline has been prepared by the BSGA to provide members with a universal set of descriptions.

## B: COMMERCIAL FACTORS

### B1: Investment cost ... Purchase or lease

In this guideline, the BSGA explains how the cost of a sign and its subsequent maintenance may be spread over a number of years using a hire maintenance agreement.

### B2: Standard form of contract

Examples of various types of contract and sub-contract documents are listed. As a warning to members, examples of onerous terms and conditions which should be avoided are mentioned.

### B3: Terms and conditions of sale

Items such as payment terms, warranty, planning approval and limitations of liability are suggested for possible inclusion in a contract. Other factors that should be considered include patents, copyright, health and safety and requirements for the mains supply.

### B4: Insurance

This guideline includes a comprehensive list of various insurances that may apply to sign manufacture and installation as well as the personnel of a sign company.

### B5: Model maintenance agreement

All signs need to be maintained (see Electricity at Work Regulation 4.2). Maintenance should always be subject to a formal agreement. This guideline provides an example of such an agreement.

### B6: Maintenance price index

Maintenance agreements usually extend over a number of years and it is important that they contain a clause allowing for any price increase in line with inflation. Each year, the BSGA publishes an index based on the rises in costs of sign components and labour costs over the previous 12 months. The current baseline figure for the index (100) is based on costs in January 1992.

## C: SIGN DESIGN

### C1: The sign function ... concepts and types

What is a sign? This guideline explains the purpose of signs and lists the various types. It also includes descriptions of the methods and construction and types of support.



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## **C2: Design considerations**

### **C2.1: Legibility and visibility**

A sign may be visible at a considerable distance but may not be legible until the observer is much closer. Parameters such as letter height, letter style and colour, which affect legibility, are discussed. Colour and brightness of illumination, which affect night time legibility, are also mentioned.

### **C2.2: Internal illumination**

#### **C2.2 (a): Box signs**

Box signs may be lit using a variety of lamp types and the type of material used for the translucent face will vary. This guideline considers various lamp and face combinations and arrives at a value for the face luminance. The results are compared with the luminance recommendations in ILE Report No5, since this is the document most often used by local authorities in planning applications. Factors affecting evenness of illumination are also discussed.

#### **C2.2 (b): Letters and logos**

A method of calculating the brightness of individual letter signs, based on the type of tubing and the face material, is provided. Factors affecting the evenness of the letter face are also discussed.

#### **C2.2(c): Use of light-emitting diodes**

This Technical Guideline is in the course of preparation.

### **C2.3: External illumination (floodlighting)**

#### **C2.3 (a): General criteria**

This guideline discusses the differences between internal illumination of signs and external illumination by means of floodlighting. It suggests applications where floodlighting may be suitable and mentions its advantages and disadvantages.

#### **C2.3 (b): Compact luminaires**

Floodlighting of a sign may be obtained by using compact luminaires spaced at regular intervals along the top or bottom of a sign. Starting with the published performance figures for a luminaire, this guideline provides a method of calculating the illumination of the various parts of a sign.

#### **C2.3(c): Slim luminaires**

Signs are often floodlit using simple luminaires containing linear fluorescent lamps. These luminaires normally have a very basic construction and provide very little assistance to the light emitted by the lamps. This guideline shows how the illumination obtained from such luminaires may be calculated and how the evenness of illumination varies with luminaire positions.

#### **C2.3 (d): Linear reflectors**

There are a variety of slim luminaires that include reflectors and/or prismatic diffusers to improve the forward distribution of the light from the fluorescent lamps. This guideline shows how the sign illumination may be calculated, starting with published performance figures for the luminaire.

### **C2.4: Animation**

This guideline discusses various types of sign animation and how they have been achieved. Starting with early mechanical devices, the various steps leading to semiconductor switching of the sign components are listed. Deriving the flashing sequence requires various semiconductor circuits, ranging from simple on/off oscillators to full computer control with the sequence determined by software.

### **C2.5: Structural design**

#### **C2.5 (a): Poles and structures**

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## **C2.5 (b): Plastics panels**

Plastic face panels of signs are subject to wind pressure (see Guideline K13.1). Depending on the dimensions of the face area, the thickness of the panel must be chosen to reduce the deflection (due to wind forces) to acceptable limits. This guideline describes a method for calculating the deflection using the characteristics of the chosen plastics material.

## **C2.5(c): Retaining plastic sign panels**

Signs may have face panels made from single sheets of plastics material. The face panels for large signs may be made up using several sheets, fitted end to end. In either case, the method of supporting the panels has to cope with wind pressures, etc. and with the fact that the linear expansion of the plastics material may be quite different from that of the housing. This guideline shows various methods of supporting the panels to ensure safe retention.

## **C2.6: Electrical design**

Signs must be safe electrically and this guideline discusses the various methods of achieving safety. These include passive protection (enclosures, clearances, etc.) and active protection by means of earth-leakage and open-circuit protection. The guideline also discusses the choice of tube diameters and number of lines of tubing from sign letters of various heights.

## **C2.7: Cold-cathode lighting design**

This guideline shows how to calculate room illuminance from room dimensions and lamp light output. It also suggests lamp arrangements to ensure even illumination.

## **C2.8: Fire safety design**

This Technical Guideline is in the course of preparation

## **C3: Variable information signs**

Most modern variable information signs are produced by means of dot-matrix arrangements. Various methods of producing a dot matrix (electro-mechanical, liquid crystal, fibre optics and LEDs) are discussed. Some historical notes on earlier methods of varying displays are also mentioned. Methods of inputting data and transmitting that data to the display are also listed.

## **D: SIGN MANUFACTURE**

### **D1: Materials**

#### **D1.1: Metals, types and sources of information**

The various metals that may be used for signs and sign components are listed. In each case, their properties and applications are discussed and the relevant standards listed.

#### **D1.2: Plastics materials, types and sources of information**

##### **D1.2 (a): Rigid plastics materials**

The various rigid plastics materials used for signs are listed, together with their properties. Their applications and methods of decoration are also discussed.

##### **D1.2 (b): Flexible plastics materials**

This guideline describes materials such as vinyl films, used to decorate the faces of rigid plastics, and also reinforced materials, used directly as sign faces. The properties of some of the more usual types of materials are discussed.

#### **D1.3: Wood and wood laminates**

Wood and wood laminates are still used for the construction of some signs. This guideline considers the different types of wood that may be used and lists methods of wood preservation. Various methods of finishing a wooden sign (paints, varnishes, stains, etc.) are also discussed.



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## **D2: Fabrication**

### **D2.1: Cutting and routing**

Various methods of sawing and other means of cutting sign materials are discussed. As well as simple cutting tools, techniques using laser and high-pressure water jet cutters are mentioned.

### **D2.2: Fixing methods**

#### **D2.2 (a): Adhesives and sealants**

This guideline lists the properties and applications of the various adhesives and sealants used in the sign industry. Precautions to be taken when using the adhesives and sealants are also mentioned.

#### **D2.2 (b): Fastenings**

This Technical Guideline is in the course of preparation

### **D2.3: Soldering and welding**

#### **D2.3 (a) Welding of metals**

This guideline lists a number of articles published by the Welding Institute on welding techniques for various metals, including health and safety information.

#### **D2.3 (b): Welding of plastics materials**

Techniques for welding of plastics materials using hot air equipment are explained. There is also a list of plastics materials that are suitable for this technique

#### **D2.3 (c): Soldering**

This Technical Guideline is in the course of preparation

### **D2.4: Finishing processes**

#### **D2.4 (a): Corrosion**

This guideline examines the types of metal corrosion and their causes. It lists places in metal structures where corrosion is more likely to occur. It also lists the reasons for galvanic corrosion occurring at the junction of dissimilar metals.

#### **D2.4 (b): Pre-treatment, lead coating and galvanising**

This Technical Guideline is in the course of preparation

#### **D2.4 (c): Anodising**

This Technical Guideline is in the course of preparation

#### **D2.4 (d): Powder coating**

The advantages and disadvantages of powder coating of metals are discussed, as are the advantages and disadvantages of the various powder coating materials. A full description of the plant and techniques needed for powder coating is also given.

#### **D2.4 (e): Finish coating**

This Technical Guideline is in the course of preparation

### **D2.5: Vinyl graphics**

#### **D2.5 (a): Types of vinyl sheet**

The various types of vinyl sheet used to decorate sign faces are described. The types of adhesive used with vinyl sheet are also mentioned.



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## **D2.5 (b): Working with vinyl sheet**

This guideline provides practical information for working with vinyl sheet. Topics include the storage and handling of the sheet material and also techniques for the removal of some types. Selection and cleaning of the substrate to which the vinyl sheet is to be applied are described, together with general application techniques.

## **D2.6: Signwriting**

This guideline does not describe methods of signwriting. Instead, it suggests two books which provide such information and also lists a number of affiliated colleges providing instruction in signwriting.

## **D2.7: Engraving**

This Technical Guideline is in the course of preparation.

## **D3: Light sources**

### **D3.1: Cold-cathode tubes**

#### **D3.1 (a): Types and characteristics**

The way in which a cold-cathode tube operates is briefly described. Details are given of the individual components (electrodes, glass, phosphor, gas filling, etc.) that comprise a cold cathode tube. There is a list of most of the popular colours of tubes and their light output at various tube currents.

#### **D3.1 (b): Pumping**

This guideline provides information on all aspects of the pumping and gas filling of cold-cathode tubes. Both bombard and oven-pumping techniques are discussed and complete schedules provided for many of the common electrode types.

#### **D3.1(c): Operation of cold-cathode tubes**

The characteristics of cold cathode tubes are described and this provides details of how a number of tubes may be connected to a typical high-voltage circuit. Formulae are provided to enable prospective tube lives to be calculated from the various tube and circuit parameters.

### **D3.2: Hot-cathode fluorescent lamps (MCF) and their control gear**

The guideline lists most of the linear and compact fluorescent lamps that may be used in signs. There is also information on different types of fluorescent lamp ballast.

### **D3.3: Lamps other than MCF lamps and their control gear**

Many types of lamps are listed and their applications for signs noted. The list includes filament lamps (GLS and tungsten halogen), MBF and mercury halide lamps used for general sign lighting. There are also details of other light sources, such as LEDs, miniature filament lamps and xenon flash tubes that may be used for matrix displays and special effects.

### **D3.4: Fluorescent lamps; (a) Mercury reduction, (b) Amalgam lamps (LIF Technical Statement 24)**

For environmental reasons, there is a requirement to reduce the amount of mercury used in fluorescent lamps. This guideline, which is a copy of a technical note produced by the LIF, discusses how this may be done and introduces the concept of holding a small amount of mercury close to the lamp cathodes in the form of an amalgam.

### **D3.5: Starting of discharge tubes and starting aids**

When operating tubes with starting voltages less than 1000V, it may be difficult to ensure reliable starting of the tubes. This guideline examines circuits designed to boost the available voltage and lists their advantages and drawbacks.



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## **E: CONTROL GEAR FOR LIGHT SOURCES**

### **E1: Ballasts for cold-cathode tubes**

#### **E1 (a): High-voltage transformers**

High-voltage transformers for neon tubes need to provide both the required starting voltage for the tubes and also sufficient series impedance to control the tube current, once the tubes have started. The construction of a typical transformer is explained and also how to assess their voltage and current ratings. Other notes include information on temperature rating, earth-leakage protection and power-factor correction.

#### **E1 (b): High-frequency ballasts**

This guideline explains the basic circuit operation of high-frequency ballasts. It lists the problems that may be experienced with lamp operation and also the EMC requirements.

### **E2 Control gear and wiring of fluorescent lamps in box signs**

This guideline discusses the choice of lamps of various diameters and their effect on sign illumination. It lists the components of a typical gear tray, noting the standards that apply to the various components. Information is given on power-factor correction and the protection of the mains supply.

### **E3: Suppression of interference**

The legal requirements for conformance to the EU Electromagnetic Compatibility Directive (EMCD) are listed. The guideline discusses sources of interference within typical lamp circuits and how they may be minimised.

### **E4: Lamps and control gear operating at medium voltage**

Many customers require signs and lighting installations to operate at voltages less than 1000V. This guideline surveys the types of control gear available to do this and the range of lamp sizes they may be able to operate. The circuit components (cable, lampholders, etc.) suitable for operation in the range 240v – 1000V are also discussed

### **E5: High-frequency luminaires (LIF Technical Statement 15)**

Use of high-frequency ballasts in luminaires or signs requires special techniques if problems are to be avoided. This guideline (reproduced from an LIF technical note) lists the problems and remedies.

### **E6: Use of high-frequency ballasts in outdoor signs**

High-frequency ballasts are used in many signs, particularly those illuminated by fluorescent lamps. Their reliability is normally very good provided they are not subjected to excessive amounts of moisture. Many ballasts are constructed on printed circuit boards with a varnish protection against the effects of humidity. However, this protection is not suitable if the ballasts are subjected to rainwater, as might occur in outdoor signs. The guideline discusses these problems and suggests ways in which such ballasts may be used outdoors.

## **F: INSTALLATION AND MAINTENANCE**

### **F1: Access equipment**

Various types of access equipment, such as scaffolds, portable towers and ladders, are discussed. Safe methods of working and other legal requirements are considered.

### **F2: Sign installation and fixing**

This guideline lists several methods for fixing a sign to a building or structure. Advantages and drawbacks to each type of fixing are mentioned.

### **F3: High-voltage installations**

It is a legal requirement for all electrical installation to be safe. In the case of high-voltage (neon) installations, this means conformance to the EU Standard, EN 50107-1. The requirements of this Standard are listed in this guideline.



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## **F4: Active protection**

Active protection is divided into two types, earth-leakage and open-circuit protection systems. This guideline discusses the requirements for both types and lists where and how they should be used.

## **F5: Mains-supply wiring**

The wiring of a mains supply to a sign, its cabling, switchgear and protection, has to conform to the Wiring Regulations of the Institution of Electrical Engineers (BS7671). This guideline explains those requirements which apply mainly to sign wiring.

## **F6: Sign fixing to cladding panels**

This Technical Guideline is in the course of preparation

## **F7: Sign fixings**

This Technical Guideline is in the course of preparation

## **G: HEALTH AND SAFETY**

### **G1: Safety in high-voltage enclosures**

Some sign manufacturing operations, including bombard pumping and tube ageing, require the use of high-voltage supplies. For safety, it is necessary for these operations to be carried out within a protective enclosure. This guideline specifies the approved design of a typical enclosure, including safety interlocks and cut-outs.

### **G2: General COSHH procedures**

Materials with various degrees of hazard are used in the manufacture of signs. All such materials are covered by the control of substances hazardous to health (COSHH) regulations. This guideline identifies how such substances may be identified and the procedures necessary for their safe handling.

### **G3: Safety in manufacturing processes**

Much legislation (listed) covers safety in the workplace. This guideline examines many of the requirements for providing a safe working environment, safe machinery and safe processes.

### **G4: Safety on installation sites**

#### **G4.1: General safety precautions**

This guideline covers safety procedures during the installation of signs. Aspects of mechanical and electrical safety are considered. Particular emphasis is given to working on petrol station sites.

#### **G4.2: Testing and fault-finding on sign installations**

Finding faults on signs may require testing of live circuits. Means to do this safely are listed. The guideline also contains a complete logical step-by-step procedure for fault finding.

#### **G4.3: Precautions to be taken during site excavations**

Site excavations may be necessary for installing sign foundations or for installing cables up to a sign. Statutory requirements for excavations and safety precautions to be taken during the digging are discussed in this guideline.

#### **G4.4: Health and safety policy for site working**

Working on site is subject to several regulations, which are listed in this guideline. It covers procedures, method statements, risk assessment, documentation and several other procedures necessary to ensure safe working.

### **G5: Sample form for safety policy**

A company must have a written policy covering the safety of its working practices. This guideline lists the items that should be present in such a policy statement.



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## **G6: Health and Safety check list**

When checking whether sign manufacture and installation is carried out in a safe manner, it is easy to overlook some requirements. This guideline is written in the form of a simple check list to ensure that no requirement is forgotten.

## **H: QUALITY ASSURANCE**

### **H1: BSGA quality guidelines**

The procedures and record keeping necessary if a company wishes its quality management system to be accredited to BS5750 are specified in this guideline. The details include procedures for sign design, manufacture and installation.

### **H2: BSGA quality manual**

An important part of the procedures leading to accreditation to BS5750 is the drafting of a quality manual. This document lists the procedures designed to ensure that all parts of the company's design, production and installation are in accordance with requirements. This guideline lists the various parts of such a manual.

## **J: WASTE MANAGEMENT AND ENVIRONMENTAL MATTERS**

### **J1: Waste management**

This Technical Guideline is in the course of preparation

### **J2.1: Disposal of lamps (LIF Technical Statement 10)**

Legislation requires that fluorescent lamps (including neon tubes) are disposed of in a proper manner. This guideline, which is reproduced from an LIF technical note, lists the requirements.

### **J2.2: Disposal of mercury**

This guideline lists the name of one company able to deal with old fluorescent lamps, extracting mercury and other pollutants.

### **J3: Ultra-violet radiation and health (LIF Technical Statement 8)**

Sunlight contains UV radiation including short-wave UV that may cause health problems – eye problems, skin cancers, etc. The light from fluorescent lamps (and some filament lamps) contains UV radiation, although this is confined to the long wave portion, close to the visible spectrum. This guideline, reproduced from an LIF technical note, discusses possible problems with this radiation and concludes that there is no firm evidence of health problems.

### **J4: Removal of waste from installation sites**

The removal of waste, including dismantled signs, from installation sites is covered by legislation and can only be carried out by registered contractors. This guideline lists the requirements for waste disposal.

## **K: LEGISLATION AND STANDARDS**

### **K1: The Control of Advertisements Regulations**

Many signs, particularly those that are illuminated, are subject to planning regulations. This guideline lists the regulations and discusses the types of sign allowed under 'deemed consent'.

### **K2: The brightness of illuminated advertisements (ILE Report N05)**



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The Institution of Lighting Engineers (ILE) publish a report (No5) listing recommendations for the brightness (luminance) of signs. The permitted levels are dependent on the size of the sign and the type of neighbourhood where the sign is installed. Many local authorities use this report in assessing the suitability of signs for planning purposes.

### **K3: British Standard BS EN 50107:**

'Signs and luminous-discharge-tube installations operating from a no-load output voltage exceeding 1,000 V but not exceeding 10,000 V'

In order to conform to the EU Low Voltage Directive, signs must be installed in a safe manner using safe components. This Standard specifies the safe materials and installation practices. For an explanation of the requirements of BS EN 50107, see guideline K3.1.

#### **K3.1: A Guide to British Standard BS EN 50107**

This guideline examines the clauses of BS EN 50107 and explains the thinking behind the clauses and procedures for compliance.

### **K4: British Standard BS 559: 'Specification for the design, construction and installation of signs'**

The requirements for the design, manufacture and installation of signs are specified in BS 559. The standard specifies materials and procedures necessary for making safe signs. For an explanation of the requirements of BS 559, see guideline K4.1.

#### **K4.1: A guide to British Standard BS 559**

This guideline examines the clauses of BS 559 and explains the thinking behind the clauses and procedures for compliance.

### **K5: British Standard BS EN 50143:**

'Cables for signs and luminous-discharge-tube installations operating from a no-load output voltage exceeding 1 kV but not exceeding 10 kV' BS EN 50143 specifies which types of cable insulation and protection shall be used for various types of sign installations. This standard specifies the characteristics and construction of the permitted cables.

### **K6: British Standard BS 7671: 'The IEE Wiring Regulations'**

The requirements for the mains supply, including cabling, switchgear and protection are specified in the Wiring Regulations of the Institution of Electrical Engineers (BS7671). For an explanation of the requirements of BS7671, see guideline K6.1.

#### **K6.1: A Guide to British Standard BS 7671**

This guideline examines the clauses of the IEE Wiring Regulations (BS7671) and explains the thinking behind the clauses and procedures for compliance.

### **K7: British Standard BS 4533 (EN 60598): 'Luminaires' (i.e. low-voltage signs)**

Signs, other than those operating at high voltage are classified as luminaires and are specified in much the same way as any other lighting fitting. The general requirements are specified in BS EN 60598-1 with specific requirements specified in the various sections of Part 2. In particular, Part 2.1 specifies fixed signs and Part 2.4 specifies portable signs.

#### **K7.1: A Guide to British Standard BS 4533 (EN 60598)**

This guideline examines the clauses of BS EN 60598 and explains the thinking behind the clauses and procedures for compliance. Most of the notes concern conformance to Part 1 but there are also notes on Parts 2.1 and 2.4.

### **K8: Fire Regulations**

As part of the Building Regulations, signs attached to buildings should be made from materials having low flammability. The way in which this might be achieved and the appropriate standards are discussed in this guideline.

### **K9: A guide to the Electricity at Work Regulations**

For safe working with electricity, manufacturers and contractors must conform to the Electricity at Work Regulations. The Health and Safety Executive (HSE) publish guidance notes explaining the requirements. This guideline lists the address of HSE Books where the guidance notes may be obtained.



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## **K10: CE marking**

All signs and sign installations have to conform to the appropriate EU directives. This guideline explains what these are and how signs that are electrical products have to be CE marked indicating conformance. This guideline should be read in conjunction with K10.1, K10.2 and K10.3.

### **K10.1: Technical documentation supporting a CE mark**

Two types of documentation are needed to support a CE mark; a declaration of conformity and a technical construction file. This guideline explains the significance of this documentation and how a sign manufacturer should produce the documents.

### **K10.2: A guide to the Electromagnetic Compatibility Directive (EMCD)**

A sign or sign installation has to conform to the electromagnetic compatibility directive (EMCD). This guideline explains what is meant by the EMCD and the requirements and means to ensure conformance.

### **K10.3: A guide to the Low Voltage Directive (LVD)**

A sign or sign installation has to conform to the Low Voltage Directive (LVD). This guideline explains what is meant by the LVD and the requirements and means to ensure conformance.

## **K11: The Construction (Design and Management) Regulations**

The CDM regulations apply to construction sites where either a large sign is being installed or a sign of any size is being installed on a general construction site. This guideline provides the scope of the CDM regulations and lists where suitable information may be obtained.

### **K11.1: A guide to the Construction, Design and Management Regulations**

This Technical Guideline is in the course of preparation

## **K12: British Standard BS EN 60529: 'Degrees of protection provided by enclosures (IP code)'**

The degree of protection provided by an enclosure is specified as an IP code of two numbers. The first number specifies the degree of protection against solid objects and hence gives an indication of electrical safety. The second number specifies the degree of protection against the ingress of water. The guideline should be read in conjunction with K12.1.

### **K12.1: A guide to British Standard BS EN 60529**

This guideline lists the meanings of the various IP codes, including extensions into a third character. The requirements for normally safe signs are mentioned.

## **K13: British Standard BS 6399: 'Loading for buildings' Part 2: 'Code of practice for wind loads'**

Wind loadings on signs can be destructive and it is important to know the wind forces that may be encountered in a particular location. BS 6399 provides a method of calculating the wind force. This guideline, which should be read in conjunction with K13.1, provides the scope of the standard and lists where copies may be purchased.

### **K13.1: A guide to British Standard BS 6399, Part 2**

This guideline takes a step-by-step look at the calculations specified in BS 6399 and explains the significance of each calculation.

## **K14: European voltage harmonisation (LIF Technical Statement 15)**

In an attempt to harmonise the mains supply voltage throughout Europe, the old standard voltages of 240 V (UK) and 220 V (continent of Europe) have been merged to 230 V with a wide tolerance covering the extremes of the previous voltages. The possible dangers of this are highlighted in this technical note from the LIF.

## **K15: Use of energy efficient ballasts**

There is an EU requirement for the use of energy efficient fluorescent lamp ballasts. Over time, the less efficient ballasts are being phased out. This guideline lists the long term requirements and correlates these against the known performance of various types of ballast, including high-frequency ballasts.