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Rail Industry Standard for Lighting at Stations

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Rail Industry Standard

Rail Industry Standard for Lighting at Stations

Issue record

Issue	Date	Comments
One	01 June 2013	Original document Developed as a result of an Office of Rail Regulation (ORR) review 'Comparison of railway enhancement costs in Great Britain and barriers preventing delivery of station projects for train operators', to rationalise documents that relate to station lighting to produce a common standard.

Superseded or replaced documents

The following Railway Group documents are superseded or replaced, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
RIS-7700-INS, issue one, December 2007 Rail Industry Standard for Station Infrastructure	Part 6	01 June 2013
GI/GN7520, issue one, December 2007 Guidance on Lighting of Railway Premises	2.2, 2.3, 2.4, 2.5, 2.6 2.7, 2.8, 2.9 2.10, 2.11	01 June 2013

Other parts of RIS-7700-INS, issue one, are superseded by RIS-7700-INS, issue two, Rail Industry Standard for Lighting at Stations.

RIS-7700-INS, issue one, ceases to be in force and is withdrawn as of 01 June 2013.

Other parts of GI/GN7520, issue one, are not superseded by RIS-7702-INS, issue one, Rail Industry Standard for Lighting at Stations.

GI/GN7520, issue one, ceases to be in force and is withdrawn as of 01 June 2013.

Supply

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Rail Industry Standard for Lighting at Stations

Contents

Section	Description	Page
Part 1	Introduction	4
1.1	Purpose of this document	4
1.2	Related requirements in other documents	4
1.3	Application of this document	5
1.4	Health and safety responsibilities	5
1.5	The structure of this document	5
1.6	Copyright	5
1.7	Approval and authorisation of this document	5
Part 2	Requirements for Planning of Lighting Installations	6
2.1	Planning considerations	6
2.2	Environmental considerations	7
Part 3	Requirements for Lighting Design	9
3.1	General lighting design	9
3.2	Illuminance	12
3.3	Selection of lighting equipment	13
3.4	Control of glare	14
3.5	Lighting columns	16
3.6	Emergency lighting	17
3.7	Installations on AC and DC electrified lines	19
3.8	Specific requirements for particular areas of a station	20
Part 4	Guidance on Commissioning of Lighting Installations	26
4.1	Verification and testing of lighting installations	26
Part 5	Guidance on Operation, Maintenance and Management of Lighting	28
5.1	Maintenance of design illuminance levels	28
Appendices		
Appendix A	Illuminance Levels	30
Appendix B	Station Categories	33
Appendix C	Engineering Assurance Procedure	34
Definitions		37
References		39
Tables		
Table 1	External areas at station buildings	30
Table 2	Station service and information areas	30
Table 3	General areas in station buildings	31
Table 4	Trafficked areas in station buildings	31
Table 5	Waiting areas at stations	32
Table 6	Station categories	33
Table 7	Engineering assurance through project phases	35
Table 8	Design check categories	36

Rail Industry Standard for Lighting at Stations

Part 1 Introduction

1.1 Purpose of this document

- 1.1.1 This document provides a standard on lighting at stations, for the infrastructure managers responsible for managing and operating stations, to use if they so choose.
- 1.1.2 This document has been derived from requirements and information set out in the following documents:
- a) RIS-7700-INS Rail Industry Standard for Station Infrastructure.
 - b) GI/GN7520 Guidance on Lighting of Railway Premises.
 - c) The Network Rail Managed Stations Manual.

1.2 Related requirements in other documents

- 1.2.1 This document has been supplemented with references to relevant requirements and guidance that are set out in the following documents / organisations:
- a) Accessible Train Station Design for Disabled People: Code of Practice (November 2011).
 - b) The Persons with Reduced Mobility Technical Specification for Interoperability (PRM TSI).
 - c) GI/RT7016 Interface between Station Platforms, Track and Trains.
 - d) Building Regulations.
 - e) British Standards (BSs).
 - f) Euronorms (ENs).
 - g) Chartered Institution of Building Services Engineers (CIBSE).
 - h) The Institution of Lighting Professionals (ILP).
- 1.2.2 It is intended to be a document which provides station project teams with a single reference document for identification of the standards and guidance documents required for the planning, design, operation and maintenance of lighting installations, and the selection of lighting levels at stations.
- 1.2.3 This document sets out requirements for lighting at stations including railway-specific aspects such as lighting of platforms, track crossings and ticket barriers and gates, and also non railway-specific elements covering other parts of the station. Lighting requirements for non-railway specific elements such as car parks for example, are provided as guidance.
- 1.2.4 The document has four parts and three appendices that contain requirements and guidance relating to specific aspects of lighting provisions at a station, and is set out as follows:
- a) Part 2 requirements for planning of lighting installations, relates to the considerations for planning and environment that permit the project brief to be developed in advance of detailed design, installation, operation and management, of lighting to be used at stations.
 - b) Part 3 requirements for lighting design, relates to the general and specific design requirements for lighting to be used at stations.
 - c) Part 4 guidance on installation and commissioning of lighting, relates to the installation and commissioning of lighting to be used at stations.

Rail Industry Standard for Lighting at Stations

- d) Part 5 guidance on operation, maintenance and management of lighting, relates to the on-going, day-to-day operation, maintenance and management of lighting to be used at stations.
- e) Appendix A illuminance levels, sets out the source of illuminance levels for internal and external areas of stations.
- f) Appendix B station categories, sets out the station categorisation systems, which are commonly adopted in industry standards.
- g) Appendix C engineering assurance procedure, sets out the engineering assurance procedures for Building and Civil Engineering Works.

1.3 Application of this document

- 1.3.1 A member of Rail Safety and Standards Board (RSSB) may choose to adopt all or part of this document through company procedures or contract conditions. Where this is the case the member of RSSB will specify the nature and extent of application.
- 1.3.2 Specific compliance requirements and dates have therefore not been specified since these will be the subject of the internal procedures or contract conditions of the companies which choose to adopt this standard.

1.4 Health and safety responsibilities

- 1.4.1 Users of documents published by Rail Safety and Standards Board (RSSB) are reminded of the need to consider their own responsibilities to ensure health and safety at work and their own duties under health and safety legislation. RSSB does not warrant that compliance with all or any documents published by RSSB is sufficient in itself to ensure safe systems of work or operation or to satisfy such responsibilities or duties.

1.5 The structure of this document

- 1.5.1 This document is set out as a series of requirements, in some cases followed by relevant guidance. The guidance is indicated by prefixing the paragraph number with the letter 'G'.

1.6 Copyright

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1.7 Approval and authorisation of this document

- 1.7.1 The content of this document was approved by Infrastructure Standards Committee on 06 March 2013.
- 1.7.2 This document was authorised by RSSB on 24 April 2013.

Rail Industry Standard for Lighting at Stations

Part 2 Requirements for Planning of Lighting Installations

2.1 Planning considerations

2.1.1 The specifications for lighting at stations shall take account of the potential for adverse impact on railway operational systems, and also the impact of existing or proposed lighting on premises adjacent to railway stations.

G 2.1.1.1 The process for determination of the lighting specifications should take account of the planning and regulatory framework that applies to stations.

G 2.1.1.2 Good lighting at stations enhances the appeal of public transport and gives passengers a feeling of comfort and security.

G 2.1.1.3 Good lighting does not adversely impact on signal sighting or the readability of signage. It enhances the ability to safely despatch trains, and also enhances the quality of CCTV images for both train despatch and surveillance.

G 2.1.1.4 Lighting installation schemes are subject to engineering assurance procedures as set out in Appendix C.

2.1.2 Consultation with affected parties, including those with responsibility for the safe operation of the station, and owners of adjacent premises, shall be undertaken at an early stage in the project.

G 2.1.2.1 When assessing the appropriate levels of illumination required, consideration should be given to:

- a) Local town planning requirements.
- b) Heritage issues including, English Heritage, the Welsh Government Historic Environment Service (Cadw), and Historic Scotland.
- c) Listed building status.
- d) The needs of disabled, mobility and / or sensory impaired persons.
- e) The impact on people and businesses close to or in the station.
- f) The impact on adjacent transport systems.

G 2.1.2.2 Consideration should be given to the aesthetics of the building when planning the positioning of luminaires and the luminaire styles, especially for railway premises that are more than 100 years old or of special architectural quality or merit.

2.1.3 The lighting provided at railway stations shall not conflict with the warning indications provided for safety or operation of transport systems including the railway.

G 2.1.3.1 Guidance on the provision of a luminous environment and for distribution of illuminance for the performance of visual tasks is set out in sections 4.1 and 4.2 of BS EN 12464-1:2011 and BS EN 12464-2:2007, for interior and exterior environments respectively.

Rail Industry Standard for Lighting at Stations

- 2.1.4 The planned lighting system shall take account of the users of the station including, passengers, train crew, station and maintenance staff. The lighting system design shall consider the tasks which are being undertaken which include passengers boarding and alighting from trains, passengers and staff reading information, station staff dispatching trains and driver only operation.
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2.2 Environmental considerations

- 2.2.1 There are no railway specific requirements for environmental considerations.
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- G 2.2.1.1 The environmental impact of lighting installations on the station environment should be assessed (for example, the effect on neighbouring properties or bats). Further information is available from 'Statutory Nuisance from Insects and Artificial Light', published by the Department for Environment, Food and Rural Affairs (DEFRA) and 'Bats and Lighting in the UK', published by the Bat Conservation Trust and the ILP.
- G 2.2.1.2 Local conditions are also a factor to be considered during the initial stages of planning. For example, a minor country station is likely to have little or no adjacent lighting whilst terminal stations are in city centres adjacent to well-lit streets.
- G 2.2.1.3 The Environmental Protection Act 1990 and the various amendments to its clauses as imposed by the Clean Neighbourhoods and Environment Act 2005, establishes the duty of local authorities to undertake inspections in their area to detect cases of statutory nuisance arising from artificial light and to investigate complaints of statutory nuisance arising from persons living in their area. Where a local authority is satisfied that a statutory nuisance exists, an abatement notice will be served. Currently, artificial light emanating from railway premises is exempt from these provisions. Despite this, it is considered to be good practice to identify potential adverse impacts arising from station lighting. Consultation with affected parties is required in 2.1.2.
- G 2.2.1.4 Measures for the elimination or mitigation of the adverse effects of lighting at stations should be identified. These measures include the installation of full cut off lighting (down lighting) in car parks to reduce the effect on neighbouring properties.
- G 2.2.1.5 Energy consumption should be considered at an early stage of the development of lighting installation proposals. The energy standards for light sources are set out in Part L of the Building Regulations.
- G 2.2.1.6 The European Directive 2005/32/EC, for energy-using products (EuP) and the Ecodesign Directive 2009/125/EC for energy-related products (ErP) established a framework for the setting of ecodesign requirements for lighting products.
- G 2.2.1.7 The lighting product sector has been further affected by EU Commission Document No 347/2010, which sets out requirements for the ecodesign of lamps and associated equipment, such that regulations have been drawn up regarding the minimum requirements of lighting equipment and the planned withdrawal of certain types of lamp and its associated control equipment. The ILP has published a document entitled 'Guidance on Current and Forthcoming Legislation within the Lighting Sector' that can be downloaded from their website (www.theilp.org).

Rail Industry Standard for Lighting at Stations

- G 2.2.1.8 Part L of the Building Regulations requires buildings to use fuel and power efficiently. Some parts of railway stations cannot however be designed according to the guidance given in Approved Document L2A, because they are not within scope of the buildings for which simplified energy efficiency models are available. Alternative means of compliance should therefore be demonstrated by the designer by, for example:
- a) Using energy-efficient equipment.
 - b) Providing controls, manual or automatic, to enable lighting equipment to be turned off or dimmed when full output is not required. Manual controls should be accessible to those who need to use them and should be clearly labelled.
 - c) Making provision for proper testing and commissioning of the installation to ensure that it uses no more fuel and power than is necessary in normal use.
 - d) Providing good information regarding the use, operation and maintenance of the lighting equipment to the owner / operator of the infrastructure to permit efficient use of energy.
- G 2.2.1.9 The 'Guidance Notes for the Reduction of Obtrusive Light' published by the ILP, may be a useful source of information. Obtrusive light is commonly referred to as light pollution.
- G 2.2.1.10 Guidance on the requirements for energy efficiency of lighting installations is set out in BS EN 12464-1:2011 clause 4.11 for interior lighting and in BS EN 12464-2:2007 clause 4.10 for exterior lighting.
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Rail Industry Standard for Lighting at Stations

Part 3 Requirements for Lighting Design

3.1 General lighting design

- 3.1.1 Requirements for the design of platform lighting are set out in GI/RT7016, the PRM TSI and the Department of Transport's (DfT's) Accessible Train Station Design for Disabled People: Code of Practice. The DfT Code of Practice (November 2011) provides requirements, advice and recommendations for people with disability at other parts of the station in addition to platforms. Higher levels of illumination may be desirable for visually impaired passengers.
- 3.1.2 This document (RIS-7702-INS) does not set out requirements for illuminance levels other than at station platforms. The illuminance requirements for other parts of a station are set out in the European or National Standards listed in Appendix A. These standards shall be used as the basis for determination of the required illuminance levels for visual tasks within the station environment. Additional guidance to that contained in referenced documents is provided in this document, and relevant CIBSE and ILP documents where referenced.

G 3.1.2.1 The European or National Standards listed in Appendix A may also be appropriate for platforms where lighting levels in excess of the minimum levels specified in GI/RT7016 are considered to be appropriate (see G 3.2.1.1 and G 3.2.1.3). The required lighting level should be based on an assessment of the requirements of the specific visual task

- 3.1.3 Requirements and guidance for emergency lighting at stations are set out in section 3.6.
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G 3.1.3.1 CIBSE is a recognised authority on lighting and produces a number of documents giving facts, good practice and information on EU directives and reference to national legislation on lighting matters (see <http://www.cibse.org>). The CIBSE Lighting Guide for Outdoor Environments contains a recommended design calculation method which allows for surface deterioration, luminaire cleaning and lamp changing. The CIBSE documents are regularly updated and are considered a useful source of information on lighting matters. Those of particular relevance to the lighting of railway stations include, 'Chartered Institution of Building Services Engineers and The Society of Light and Lighting, 1992' and 'Lighting Guide 12 Emergency lighting design guide, The Chartered Institution of Building Services Engineers and The Society of Light and Lighting'. All CIBSE lighting guidance is now published by the Society of Light and Lighting.

G 3.1.3.2 The Society of Light and Lighting (SLL) 'Code for Lighting:2012' provides recommended calculation methods for indoor and outdoor environments.

G 3.1.3.3 The ILP is an internationally recognised authority on both Exterior and Interior lighting. The ILP publishes Professional Lighting Guides (PLG) on most areas of lighting. These PLGs give recommendations for design and installation of lighting based on best practice, international and national research. In addition to this the ILP website contains a number of freely available downloads dealing with European legislation on tertiary lighting as well as documents relating to environmental and carbon reduction issues. The website is accessed at www.theilp.org.

G 3.1.3.4 The Construction Industry Research and Information Association (CIRIA) document C710 'Addressing crime and disorder in public places through planning and design' provides useful advice about the design and planning issues that arise from the area of "crime and disorder".

Rail Industry Standard for Lighting at Stations

- G 3.1.3.5 Appendix B of this document contains a comparison of typical station categorisation systems used within RGSs and the Network Rail Managed Stations Manual. These categories have been provided for information as they are in common use. However, the lighting levels required for the performance of particular visual tasks at stations depends on the physical characteristics, level of usage, and staffing levels of the station. The lighting level should be based on an assessment of the requirements of the specific visual task. It could be the case that different lighting levels are required for stations of the same category according to Appendix B.
- G 3.1.3.6 The design of lighting installations, and the provision of equipment, for railway stations, should take account of:
- a) The reliability and availability of the illuminance levels to be achieved.
 - b) The type and location of luminaires to be provided, particularly on platforms.
 - c) The potential for interference with the driver's line of sight including the use of driver only operation (DOO) equipment.
 - d) The effect of glare from luminaires.
 - e) The potential for lighting equipment to be mistaken for signals.
 - f) The variability of lighting on the alertness of personnel undertaking safety critical tasks at all times of day when required.
 - g) The potential for overspill (light pollution) onto adjoining property.
 - h) The ground conditions or the structural characteristics of existing structures, for their ability to support any columns or masts.
 - i) The needs of disabled, mobility and / or sensory impaired persons.
 - j) The impact on CCTV systems where provided.
 - k) The need for possessions or isolations during installation and maintenance.
 - l) The energy demands of the lighting installation.
 - m) The whole life cycle costs of the lighting solutions.
 - n) The need for automatic control of lighting installations.
 - o) The need for general lighting, emergency lighting and the requirements of lighting for other purposes.
 - p) The opportunity to make use of natural light.
 - q) The environmental impact of the railway environment on lighting, in particular to consider electromagnetic compatibility, safety bonding, vibration and airborne detritus.
- G 3.1.3.7 The lighting specifications at stations should consider:
- a) Physical, architectural, and functional characteristics (for example, terminal or minor station).
 - b) Location (for example, urban or rural).
 - c) The degree of vehicular and passenger traffic using the station.
 - d) The station staffing levels.

Rail Industry Standard for Lighting at Stations

- G 3.1.3.8 Wherever possible access for maintenance should be incorporated into the lighting design.
- G 3.1.3.9 The use of artificial light should be kept to a minimum. Public buildings should be designed to make use of natural lighting, although care should be taken to minimise glare and strong reflections from surfaces.
-
- 3.1.4 The lighting provided at railway stations shall be designed to minimise the need for maintenance tasks that require persons to:
- a) Go on or near running lines.
 - b) Take an isolation of the traction electrification system.
- 3.1.5 An assessment of the maintainability shall be performed as part of the design.
- 3.1.6 Except for platforms, there are no railway specific mandatory requirements for provision of lighting where CCTV systems are in use (see 3.8.7).
-
- G 3.1.6.1 The ILP and Association of Chief Police Officers joint publication 'Lighting against Crime', gives recommended lighting levels for CCTV.
- G 3.1.6.2 The design should account for any existing or known proposed CCTV installation with luminaires selected and positioned to ensure that they do not have a detrimental effect on the CCTV coverage.
-
- 3.1.7 Where daylight-linked lighting controls are provided, they shall be adjustable and positioned to minimise the risk of incorrect operation due to interference from lighting outside the railway property.
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- G 3.1.7.1 Lighting controls may be single photo-electric control units (PECUs) for individual luminaires, or remote PECUs and contactor switching.
- G 3.1.7.2 The PECUs should be capable of switching on the power to lighting circuits when ambient lighting levels are below the required level. A single PECU may be used to control the whole platform lighting installation but for larger installations multiple PECUs should be used to ensure correct control of different areas and to provide system redundancy. In order to cater for local conditions (for example, where there are long canopies / structures), care should be taken in locating the PECU / PECUs to ensure that all sections of lighting are controlled under all expected conditions of ambient light. Illuminated footbridges should be considered for separate control where issues of lighting pollution arise.
- G 3.1.7.3 A more recent method of light control is to install a central management system (CMS) for the lighting. There are a number of these systems available some of which operate using the Global System for Mobile Communication (GSM) and some of which operate using the power line system (via the electricity mains cable). The CMS is capable of giving total control of the lighting system to the operator and can incorporate variable lighting levels, information regarding the lamp condition and the ability to switch off either totally or by selecting particular lighting units. CMS can be controlled from a computer (desktop or mobile laptop) and developments are in process to allow the use of smart mobile phones in there operation.
- G 3.1.7.4 Time clocks (for example solar dial type) can be used at locations that require lighting to be switched off when the station is closed. The time clocks should be installed in series with the PECU circuit to switch off the power to the lighting circuits after the last train has run (with acceptable delay) and switch on again at a predetermined time before the first train runs.

Rail Industry Standard for Lighting at Stations

- G 3.1.7.5 Where there is a need to switch on the lighting or to carry out maintenance at unstaffed stations with automated switching, arrangements should be put in place through the station management procedures.
- G 3.1.7.6 Consideration of the warm-up time for luminaires, where necessary, should be taken into account when setting the design minimum for the switch-on point of installations that adopt automatic control of lighting.
- G 3.1.7.7 Consideration of lighting requirements should include the need for temporary lighting that is installed for specific tasks or as a replacement to permanent lighting. This is applicable to engineering worksites, when the railway continues to operate at or close to the site of the temporary lighting.
- G 3.1.7.8 Where temporary lighting does not meet the requirements in this document, special working arrangements that address the specific safety hazards of the temporary lighting should be addressed. These arrangements could include, for example, instructions to drivers, clear boundary descriptions, and the provision of specific instructions and notices for distribution and display to all persons affected by the temporary scheme.
- G 3.1.7.9 Additional information for general lighting design is available from the following documents:
- a) Accessible Train Station Design for Disabled People: Code of Practice Part H1 and J1.
 - b) BS 8300:2009 clause 9.4.
 - c) BS EN 5489-1:2013.
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3.1.8 Engineering assurance of designs for lighting installations shall be based on the procedure set out in Appendix C.

3.2 Illuminance

3.2.1 The average maintained illumination levels for specific visual tasks at locations within stations shall be based on the values determined in Appendix A.

- G 3.2.1.1 When considering the lighting needs at a specific station it is necessary to make provision in accordance with the required minimum mandatory lighting levels (as set out in GI/RT7016 for platforms) and also to establish appropriate lighting levels for specific visual tasks based on the recommended lighting levels set out in European and National standards (see Appendix A). Specific visual tasks can demand a higher level of illuminance than the minimum mandatory level.
- G 3.2.1.2 The safety of passengers and staff using the station involves the need to move around the station safely in different circumstances (for example, during normal use or when evacuating the station in an emergency).
- G 3.2.1.3 GI/RT7016 and other documents (such as the Accessible Train Station Design for Disabled People: Code of Practice) specify minimum levels of illuminance. The minimum levels of illuminance may not be the most appropriate for levels of comfort, security and safety in all circumstances. They should only be applied as a minimum for the required maintained illuminance level. The circumstances at a particular station may demand higher levels of illuminance and this should be established early in the planning stage of a lighting installation project.
- G 3.2.1.4 The particular specifications for lighting at stations are dependent upon not only the visual task that is necessary, but also whether the station is wholly or partially enclosed.

Rail Industry Standard for Lighting at Stations

- G 3.2.1.5 Relevant European and National Standards which specify requirements for illuminance are:
- a) PRM TSI.
 - b) BS 8300:2009.
 - c) 5.3 of BS EN 12464-1:2011 for interior areas, tasks and activities.
 - d) 5.3 of BS EN 12464-2:2007 for exterior areas, tasks and activities.
 - e) 10.6, 10.7 and 12.3 of BS EN 5489-1:2013.
 - f) BS 5266-1:2011.
-
- 3.2.2 The lighting levels specified in this document shall be based on the 'maintained illuminance principle'.
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- G 3.2.2.1 The design calculations for the station lighting should be based on a method (see 3.1.3.1 and 3.1.3.2), which allows (where appropriate) for surface deterioration, luminaire cleaning and lamp changing.
- G 3.2.2.2 A gradual change in illumination should be provided where there are adjacent areas with differing illumination levels, in order to avoid rapid adaptation of the eye.
- G 3.2.2.3 The relative brightness of surfaces should be taken into account when calculating the illuminance values. In order to maintain the required relative brightness it will be necessary to consider the maintenance regime for cleaning of surfaces.
- G 3.2.2.4 When undertaking lighting design calculations for horizontal areas at floor level, a border zone should be excluded from the total area taken into account for illuminance prediction. The border zone should extend 0.5 m from walls, partitions, columns, pillars and other permanent obstructions. The reason for this is to discourage excessive lighting which could arise where border areas are in shadow. On platforms, the platform edge itself should be included in the calculated area and should not be considered as a border zone.
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- 3.2.3 The determination of the level of illuminance shall not include lighting spillage from retail units in any design calculations. No reliance is to be made on lighting spillage from retail units as they have a frequent change of use.
- 3.3 Selection of lighting equipment**
- 3.3.1 All lighting equipment shall be suitable for the environmental conditions to which it is likely to be exposed. Luminaires shall comply with the requirements of BS EN 60598-1:2008. Particular requirements for luminaires used for emergency lighting are set out in BS EN 60598-2-22:1998+A2:2008. Luminaires shall be CE marked.
-
- G 3.3.1.1 The design of lighting installations should take into account the particular requirements of the railway environment, which can be harsh in terms of deterioration to luminaires, and difficult in terms of access to maintain the equipment. External luminaires should be Ingress Protection (IP) rated.
- G 3.3.1.2 The provision of luminaires and / or accessories unique to a particular site will necessitate a level of spares that is appropriate to the assessed rates of replacement throughout the life of the installation, and should be avoided if possible.

Rail Industry Standard for Lighting at Stations

G 3.3.1.3 The use of emerging light source technology, such as LEDs, is to minimise energy consumption and maximise maintenance intervals. Due regard should be given to the risks of utilising unproven solutions on railway infrastructure, and account should be taken of the environment in which the alternative light source technology is required to operate. Particular attention should be paid to the electromagnetic compatibility (EMC) performance of new equipment.

G 3.3.1.4 In the absence of guidance on novel lighting technology, for which there is currently no applicable standard, design proposals should be submitted for approval through the engineering assurance procedure in Appendix C.

3.3.2 Where access for maintenance is restricted, consideration shall be given to the need for enclosed luminaires.

G 3.3.2.1 Enclosed luminaires are only necessary where access for maintenance is difficult. If these are specified, the IP rating should be appropriate for the environment and the mechanical construction of the luminaire should be such that routine maintenance is no more difficult than it would be for an open fitting.

G 3.3.2.2 The physical layout and architecture of the station dictates the mounting positions and heights of luminaires and influences the choice of lighting equipment.

3.3.3 The type or colour of light source shall be selected such that there is no potential for conflict with the signalling system.

G 3.3.3.1 GK/RT0045 sets out requirements for emitted light parameters to avoid conflict with the colours used for signalling systems.

G 3.3.3.2 There is the potential for conflict to occur where:

- a) A driver is unable to see a signal because of the location of the lighting structure.
- b) A light source can be mistaken for a signal because its colour appearance is similar to that of a signal aspect.
- c) A light source can reduce the visibility of a signal due to high luminance (brightness) in the field of view.
- d) A light source can cause conflict by reflection or refraction.
- e) A light source can be perceived to be a different colour where it is modified by the ambient lighting.

G 3.3.3.3 Part H1.a of the Accessible Train Station Design for Disabled People: Code of Practice gives guidance on the effectiveness of artificial light colouring and the avoidance of strobe effects.

3.4 Control of glare

3.4.1 With the exception of lighting for platforms and footbridges over the track, there are no railway specific requirements for the control of glare.

Rail Industry Standard for Lighting at Stations

3.4.2 The spread of lighting shall not compromise the view of signalling equipment for drivers or platform staff engaged in train dispatch.

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- G 3.4.2.1 Glare is a visual sensation causing discomfort or disability when a source of high brightness (luminance) is present in the field of vision. The cause may be sunlight or skylight through glazing or other openings, direct glare from luminaires or reflected glare from surfaces within a space. Veiling glare may occur where a display or task (for example, touch screen equipment) has its contrast reduced by adjacent lighting. In order to maximise visual performance, consideration should be given to controlling glare by careful design of fenestration and artificial lighting. It is also important to take into account glare produced by large openings such as the portals of platform train sheds.
- G 3.4.2.2 Glare from natural sources may be reduced by the use of blinds, tinted windows, or solar film and the correct orientation of the affected station area relative to the source of light. Daylight should be used to cross-light the affected station area to avoid shadows and to minimise veiling glare.
- G 3.4.2.3 For interior lighting schemes using regular arrays of luminaires, it is possible to calculate discomfort glare using the Unified Glare Rating (UGR) method, which is defined in Commission Internationale de L'éclairage (International Commission on Illumination(CIE)) publication 117 'Discomfort Glare in Interior Lighting'. The value of the glare rating index should not exceed the lowest index recommended for that particular task.
- G 3.4.2.4 External artificial lighting presents a different problem. The high luminance of the luminaires and the very low ambient luminance produces an excessive contrast. The use of high mounting to raise light sources above the normal sighting angles is advantageous. An alternative to high mounting of light sources (such as at platforms), is for luminaires to have tightly controlled light distribution to minimise glare towards the observer.
- G 3.4.2.5 Where column mounted luminaires are used for platform lighting, these should be of a type which does not cause glare in the field of view of drivers of approaching trains. Generally luminaires with cut-off below high angles (60°) of elevation will achieve this, the aim being that drivers do not see the light source itself in their direct line of sight.
- G 3.4.2.6 The design of luminaire reflectors will require the delivery of large quantities of light downwards, although the sideways distribution should also be considered, particularly for lighting of vertical surfaces, whilst being sympathetic to the structure and its architecture.
- G 3.4.2.7 The lighting design should take account of the requirements for locations where computer screens are in use, such as in ticket offices, which are associated with railway operation. Station lighting levels should be adjustable.
- G 3.4.2.8 Lighting designs are required to comply with the Display Screen Equipment Regulations. These regulations require a risk assessment to be undertaken to determine whether the visibility of the screen can become degraded to the point where eye strain could occur.
- G 3.4.2.9 Additional information for control of glare is available from the following documents:
- a) Accessible Train Station Design for Disabled People: Code of Practice Parts H1, H1.b, K7.i, K7.j and P5.b.
 - b) BS EN 12464-1:2011 clause 4.5 and clause 4.9.
 - c) BS EN 12464-2:2007 clause 4.4.
 - d) BS 8300:2009 clause 5.8.8.

Rail Industry Standard for Lighting at Stations

- e) BS EN 5489-1:2013.
 - f) SLL Code for Lighting:2012 clause 2.1.9.
 - g) Way finding at stations – A good practice guide.
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3.5 Lighting columns

3.5.1 The requirements for the position of lighting columns on platforms is set out in GI/RT7016 and GC/RT5212. GE/RT8000 sets out requirements for maintenance of lighting columns and luminaires (see G 3.5.1.8). There are no railway specific requirements for the design and manufacture of lighting columns.

- G 3.5.1.1 For the design of lighting columns, the following aspects should be considered:
- a) Geometric limits on the location and height of columns.
 - b) The relevant design loading (for example, wind and vehicular impact).
 - c) The ground conditions and their influence on the type and method of fixing and maintaining the column in position.
 - d) The durability requirements for the lighting columns (for example, risk of corrosion).
 - e) The space required for lowering the head frame or the whole column, in the case of raising and lowering columns, without requiring a track possession or isolation of the overhead line equipment.
 - f) The means of safe access for lamp maintenance without disturbing the operational railway.
 - g) The vulnerability of the lighting columns and luminaires to attack from vandals.
- G 3.5.1.2 Lighting columns are generally designed in accordance with the definitions and terms of BS EN 40-1:1992 and the general requirements and dimensions of BS EN 40-2:2004 respectively, for the material selected (for example, steel, aluminium or concrete). The document PD6547 gives guidance on the use of BS EN 40-3-1:2000 and BS EN 40-3-3:2003.
- G 3.5.1.3 The design requirements for lighting columns will be influenced by the following factors:
- a) The need to avoid installation of foundations in restricted areas such as between the tracks.
 - b) Plans for future track re-modelling.
- G 3.5.1.4 Where access for maintenance is necessary from an embankment or from level ground, consider the provision of level walkways (possibly paved), of sufficient width and length for the planned maintenance activity. Should it be impracticable to provide such walkways, an alternative safe maintenance strategy should be agreed.
- G 3.5.1.5 Industry practice is for lighting column heights to be 5 m and 6 m for all stations although the use of 8 m high columns may be considered where vandalism is an issue (for example, at unstaffed stations). However, efficiency and economy of design will be the overriding factors taking account of vandalism, light pollution, power consumption and column spacing.

Rail Industry Standard for Lighting at Stations

- G 3.5.1.6 Lighting columns should be hinged to enable the raising and lowering of the columns to facilitate maintenance of the luminaire at ground level. This also facilitates maintenance of the column itself in line with the manufacturer's specification.
- G 3.5.1.7 Lighting columns should ideally be located at the rear of the platform, within the platform surface, for single face platforms and centrally for double face platforms. Columns should be orientated to permit lamp replacement from within the safe area for carrying out 'engineering or technical work' on platforms as set out in GE/RT8000. It is important that the column does not hinge towards the track or any structure that will prevent lowering to the ground. Where a fence obstructs the full lowering of the column, provision should be made to allow maintenance of the fitting.
- G 3.5.1.8 Lighting columns should be placed such that they may be lowered on a line parallel to the platform edge. Should this not be possible because of the need to avoid platform furniture and fittings, the columns may be lowered on a slight angle provided they remain within the safe working area (see G 3.5.1.8 and G 3.5.1.10).
- G 3.5.1.9 For raising and lowering lighting columns, the required clearances to passing trains, as set out in GC/RT5212, should be maintained during the raise and lower procedure.
- G 3.5.1.10 In order to facilitate safe working in accordance with GE/RT8000, no part of the lighting column in the lowered position, or any attachment, or any individual required to work on such lowered column, should be required to be closer than 1250 mm from the platform edge. An increased dimension may be necessary where access to the light fitting on the track side is required and also where there is a risk of aerodynamic effects from passing trains (see GI/RT7016).
- G 3.5.1.11 Permanent attachments provided in the lighting column for jacking purposes should not intrude within the specified minimum clearance envelope, to allow lifting.
- G 3.5.1.12 Where items such as signage, hanging baskets and CCTV cameras are required to be fixed to raising and lowering lighting columns, they should be installed in accordance with the recommendations of the lighting column manufacturer.
- G 3.5.1.13 Additional information for lighting columns is available from the following documents:
- a) Accessible Train Station Design for Disabled People: Code of Practice Part F1.g.
 - b) BS EN 40-1:1992.
 - c) BS EN 40-2:2004.
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3.6 Emergency lighting

3.6.1 Stations shall be provided with emergency lighting to:

- a) Provide back-up in the event of failure of the station lighting.
- And
- b) Facilitate the purpose of escape during an emergency.

Rail Industry Standard for Lighting at Stations

- G 3.6.1.1 BS 5266-1:2011 provides recommendations and guidance on the factors that need to be considered in the design, installation and wiring of emergency lighting systems and the level of illumination required for safe movement and for areas with fixed seating. It distinguishes between lighting for general use following the failure of the normal lighting, which is usually referred to as emergency lighting, and emergency escape lighting, which is provided to assist the building occupants to escape during a fire.
- G 3.6.1.2 The Regulatory Reform (Fire Safety) Order 2005 and the Fire (Scotland) Act 2005, require the person responsible for fire safety at stations (the 'responsible person') to carry out a fire safety risk assessment and to identify, implement and maintain appropriate measures to ensure the safety of the occupants and anyone else likely to be affected by a fire on the premises. These measures include the need for provision of a safe means of escape, including where necessary, emergency lighting with suitable autonomy, taking into account the needs of people with disabilities, particularly visual impairment. Advice on undertaking a risk assessment is included in the Department for Communities and Local Government (DCLG) document, 'Fire safety risk assessment – transport premises and facilities'.
- G 3.6.1.3 Railway stations can be considered high risk environments given the number of passengers, the types of activities undertaken within them, and the fact that many users will not be familiar with their layout. Footfall, usage patterns and consideration of relevant emergency scenarios should be taken into account when determining the need for emergency lighting (for example, time needed for evacuation).
- G 3.6.1.4 The illuminance values recommended for emergency lighting on station escape routes, open area (anti-panic) lighting and high risk task area lighting, are set out in BS EN 1838:1999 / BS 5266-7:1999. The values selected should be no more than is necessary for safe evacuation subject to the minimum level specified in 3.6.3.
- G 3.6.1.5 The level of illuminance that the emergency lighting provides should at least be the design minimum with autonomy suitable for the anticipated emergency. Further information can be found in BS 5266-1:2011.
- G 3.6.1.6 Where emergency lighting is required on open platforms or under open canopies, 'open area' lighting should be provided as set out in BS EN 1838:1999 / BS 5266-7:1999.
- G 3.6.1.7 Emergency platform lighting should be provided at all sub-surface stations. Minimum values are set out in 3.6.4 and 3.6.5.
- G 3.6.1.8 Additional information for emergency lighting is available from the following documents:
- a) BS 5489-1:2013 clause 10.7.4.
 - b) BS EN 1838:1999 / BS 5266-7:1999.
 - c) EN 60598-2-22:1998+A2:2008.
 - d) BS 5266-1:2011 clause 3.6.1.
 - e) BS 5266-6:1999.
 - f) BS EN 50172:2004 / BS 5266-8:2004.
 - g) CIBSE Lighting Guide 6 clause 5.4. (The guidance given is not railway specific).
 - h) CIBSE Lighting Guide 12. (The guidance given is not railway specific and it makes reference to other documents).

Rail Industry Standard for Lighting at Stations

- i) CIBSE TM12:1986 Addendum.
 - j) www.gov.uk/dclg.
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- 3.6.2 Where ticket halls / barriers, waiting areas, subways, footbridges and areas outside a station form part of an escape route from a platform, they shall be signed and illuminated in such a way as to aid egress in the case of an emergency.
- 3.6.3 The minimum maintained horizontal illuminance of emergency lighting on an escape route shall be 2 lux measured at the walkway surface, with a diversity not exceeding 40:1.
- 3.6.4 Emergency lighting in public and normally occupied non-public areas at sub-surface stations shall provide illuminance of 10 lux average, 5 lux minimum, on designated escape routes.
- 3.6.5 Emergency lighting at surface stations, and not normally occupied areas of sub-surface stations, shall have autonomy suitable for the application.
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- G 3.6.5.1 Relevant requirements are set out in BS 5266-1:2011.
- G 3.6.5.2 Emergency lighting for areas not covered in 3.6.4 or 3.6.5, should be based on a risk assessment taking footfall and usage patterns into account.
- G 3.6.5.3 Relevant requirements are set out in BS 5266-6:1999 or BS EN 1838:1999 / BS 5266-7:1999.
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3.7 Installations on AC and DC electrified lines

- 3.7.1 The design of lighting installations at stations on electrified lines shall be compatible with the electrification system(s) to avoid danger.
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- G 3.7.1.1 This guidance also applies when raising and lowering lighting columns, or maintaining the equipment. In particular specific consideration needs to be given to the following:
- a) The design should take into account the location of all live equipment, including overhead contact lines, contact rails, return conductors, feeder cables and exposed conductive parts connected to the return circuit of the traction supply.
 - b) Low voltage power supplies used for lighting comply with the requirements set out in GL/RT1255.
 - c) Lighting assets should preferably be located outside the contact line zone and current collector zone as set out in clause 4 of BS EN 50122-1:2011+A1:2011. Where lighting assets are located within this zone, the possibility of direct contact with a damaged part of the live overhead line system should be considered.
 - d) Lighting assets should preferably be separated from exposed live parts of the contact line by an air clearance corresponding to reinforced insulation as set out in BS EN 50124-1:2001+A2:2005 according to the rated insulation voltage (UNm) and rated impulse voltage (UNi) corresponding to of the traction supply system's rated voltage (Un). For a traction supply system rated voltage of 25 kV (Un), rated insulation voltage 27.5 kV (UNm) and rated impulse voltage 200 kV (UNi), the necessary air clearance is 600 mm.

Rail Industry Standard for Lighting at Stations

- e) Lighting assets placed within the contact line zone, current collector zone, or less than the clearance required for reinforced insulation away from exposed live parts of the contact line or current collector, need to be protected so that danger does not arise due to a discharge between an asset fed from the traction supply and any lighting asset. Methods for achieving this are in BS EN 50122-1:2011+A1:2011 clause 6. For example, indirect contact risk associated with the exposed conductive parts of the lighting asset being energised from the traction system during a fault condition (such as flashover of an air gap separating the assets, energisation due to contact line or current collector breakage), energisation of a lighting circuit from the traction supply (for example, when protective separation between separate circuits is lost due to a fault event).
- f) Touch voltages occurring during normal operation and during a fault condition on the electrification system should not give rise to danger, particularly those occurring between simultaneously accessible conductive parts of lighting assets and conductive parts connected to the traction supply earthing / return system including rail vehicles. Protective provisions against indirect contact and impermissible rail potential are set out in BS EN 50122-1:2011+A1:2011 clause 6.
- g) Staff operating and maintaining lighting assets (whilst the adjacent electrification system remains live) should be protected against direct contact with the exposed live parts of the electrification system and those on the outside of vehicles as set out in BS EN 50122-1:2011+A1:2011 clause 5. Unless specifically agreed otherwise, locations at stations should be regarded as public areas and the UK Special National Condition is not to be used.
- h) The lighting system design should ensure that operation and maintenance of lighting assets is possible with the adjacent electrification system remaining live and, for AC electrified lines, without infringing the limits for personal safety set out in GE/RT8000.
- i) Metallic parts of the lighting assets should not provide a conductive path which enables the flow of traction load or fault return currents (stray currents), except where safety makes conduction via an intended path a necessity. The requirements for clearance of lighting columns are set out in 3.5 of this document.

3.8 Specific requirements for particular areas of a station

3.8.1 Car park

3.8.1.1 There are no railway specific requirements for lighting of car parks.

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- G 3.8.1.1.1 Where practicable, exterior car park lighting should be provided from the perimeter of the car park with raising and lowering columns orientated to drop into the perimeter area. This should prevent maintenance of lighting columns being obstructed by parked cars.
 - G 3.8.1.1.2 The use of area floodlight type luminaires which emit light at angles above the horizontal should be avoided as these contribute to light pollution.
 - G 3.8.1.1.3 Where car park lighting provided from the perimeter is not possible, an alternative is for lighting to be undertaken from island sites using raising and lowering columns orientated to drop onto the island, such that access for maintenance will not be obstructed nor interfere with car parking.
 - G 3.8.1.1.4 Lighting columns mounted within the car park should be protected against damage from vehicular impact.

Rail Industry Standard for Lighting at Stations

- G 3.8.1.1.5 Covered car parks should use light sources with colour rendering greater than Ra 60 as below this level colour recognition and visual acuity becomes difficult.
- G 3.8.1.1.6 In addition the 'roadways' within the car park space should be well lit and defined to enable users both in cars and on foot to see adequately and to judge speed and distance.
- G 3.8.1.1.7 Additional information for station car parks is available from the following documents:
- a) BS EN 12464-2:2007 clause 4.7 and Table 5.9.
 - b) 4 BS EN 12464-1:2011 clause 4.7 and Table 5.34.
 - c) CIBSE Lighting Guide 6 clause 4.4.
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3.8.2 Approach road, forecourt and entrance canopy

- 3.8.2.1 There are no railway specific requirements for lighting of station approach roads, forecourts and entrance canopies.
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- G 3.8.2.1.1 Station approach road and forecourt lighting should be in accordance with BS 5489-1:2013 (see Appendix A).
- G 3.8.2.1.2 The position of luminaires and subsequent access for maintenance should be carefully considered, particularly around the station entrance area, where there are signs for directing people either to trains or exits for cars, taxis and public transport.
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3.8.3 Concourse and ticket hall

- 3.8.3.1 There are no railway specific requirements for lighting of station concourses and ticket halls.
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- G 3.8.3.1.1 Concourse and ticket hall areas tend to be large open spaces with heights often exceeding 8 m. These areas may also have retail outlets scattered throughout and the designer of the concourse and ticket hall should obtain as much information as possible about their positions and structure as they will have an influence on the final lighting result.
- G 3.8.3.1.2 The purpose of general lighting in station concourse and ticket hall areas is to enable passengers to identify important facilities, such as the ticket purchase point, be it a staffed point or a ticket machine. It also facilitates the safe movement of station users into and out of the station, particularly at larger stations where there is a higher number of passengers.
- G 3.8.3.1.3 Additional information for station concourses and ticket halls is available from the following documents:
- a) BS EN 12464-1:2011 Table 5.53 for concourse and ticket hall.
 - b) BS EN 12464-1:2011 Table 5.53 for entrance hall and station halls.
 - c) CIBSE Lighting Guide 6 clause 4.6 sets out guidance specifically for railways.
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3.8.4 Station service and information areas

- 3.8.4.1 There are no railway specific mandatory requirements for lighting of service and information areas at stations.
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Rail Industry Standard for Lighting at Stations

- G 3.8.4.1.1 Requirements for the minimum illuminance level to be provided at ticket vending machines, is set out in in part N2, 4 of the Accessible Train Station Design for Disabled People: Code of Practice.
 - G 3.8.4.1.2 Guidance on illuminance levels and measures to facilitate visual tasks at information and service desks is set out in part N1, f), g) and h), of the Accessible Train Station Design for Disabled People: Code of Practice.
 - G 3.8.4.1.3 Additional information for station service and information areas is available from the following documents:
 - a) PRM TSI clause 4.1.2.10.
 - b) BS EN 12464-1:2011 Table 5.53 for ticket and luggage offices and counters.
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3.8.5 Ticket barriers and gates

- 3.8.5.1 The lighting requirements at the ticket barrier or gate shall be as specified in Appendix A.
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- G 3.8.5.1.1 Good quality lighting with good control should be provided to avoid any form of glare and enable ticket checking to be carried out as speedily and efficiently as possible.
 - G 3.8.5.1.2 Lighting levels with good colour rendering (Ra80) should be provided at ticket barriers.
 - G 3.8.5.1.3 Advice on the need for clear visibility at ticket / coin insertion slots at ticket barriers is set out in part N3.6 of Accessible Train Station Design for Disabled People: Code of Practice.
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3.8.6 Lifts

- 3.8.6.1 There are no railway specific requirements for lighting of lifts.
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- G 3.8.6.1.1 Lighting of passenger lifts should be in accordance with BS EN 81-70:2003.
 - G 3.8.6.1.2 Lighting levels at the approach to the lift should equate to those of the surrounding areas within 2 m of the doors.
 - G 3.8.6.1.3 Emergency lift lighting should comprise a minimum of one non-maintained fitting in each luminaire providing a minimum of 8 lux at threshold level for a period of 3 hours.
 - G 3.8.6.1.4 Additional information for station lifts is available from the following documents:
 - a) BS EN 12464-1:2011 Table 5.1.
 - b) Accessible Train Station Design for Disabled People: Code of Practice Part H1.c.
 - c) BS 8300:2009 clause 8.3.3.4.
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3.8.7 Platforms

- 3.8.7.1 Platforms shall be provided with lighting to achieve the minimum lighting levels set out in GI/RT7016. Values of average maintained illumination levels for platforms within lighting industry standards are set out in Appendix A.
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Rail Industry Standard for Lighting at Stations

- G 3.8.7.1.1 For the purpose of this standard, the useable area of the platform edge is considered to also include the area enclosed by a line 0.5 m towards the track. This allows for an area to the trackside of the platform edge to ensure that lighting is adequate for boarding and alighting trains.
- G 3.8.7.1.2 GC/RT5033 requires the influence of the lighting conditions on speed and force of impact to be taken into account in selection of the type of buffer stop or arresting device (where fitted).
- G 3.8.7.1.3 GI/RT7016 and GE/RT8060, sets out requirements for lighting where CCTV is provided in connection with driver only operation at stations.
- G 3.8.7.1.4 Although station platform layouts vary widely, they all have similar features and the majority can be dealt with either as mainly open (uncovered platforms with some structures) or mainly canopy (a significant proportion of the platform is covered).
- G 3.8.7.1.5 Having ascertained the type of platform to be lit, the appropriate lighting provisions should be selected according to the choice of luminaire type, the power rating, the mounting height and the spacing.
- G 3.8.7.1.6 Where platforms fall within the main building, such as at major termini, and are an extension of the concourse, then the lighting system controls should be installed within the station building but access during installation and for maintenance should be considered.
- G 3.8.7.1.7 Wiring, circuit switching and protection, should take account of the desirability to maintain continuity of lighting supplies under some fault modes. Designs should avoid the possibility of single point failures affecting more than one lighting circuit, and the lighting should be arranged so that adjacent luminaires are not fed from the same phase or circuit.
- G 3.8.7.1.8 Additional information for station platforms is available from the following documents:
- a) Accessible Train Station Design for Disabled People: Code of Practice Part H1.3. and W2.10. It also makes reference to 4.1.2.10 of PRM TSI.
 - b) Accessible Train Station Design for Disabled People: Code of Practice Part H1.f and W2.b. for the minimum illumination level on platforms.
 - c) BS EN 12464-1:2011 Table 5.53 for fully enclosed platforms for large and small numbers of passengers.
 - d) BS EN 12464-2:2007 Table 5.12 for open platforms for rural and local trains or inter-city services with small number of passengers (with special attention to the edge of the platform) and for open platforms for suburban and regional trains with large number of passengers.

3.8.8 Escalators and travelators

3.8.8.1 There are no railway specific mandatory requirements for lighting of escalators and travelators.

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- G 3.8.8.1.1 Additional information for escalators and travelators is available from the following document:
- a) Table 5.1 of BS EN 12464-1:2011.
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Rail Industry Standard for Lighting at Stations

3.8.9 Footbridges

3.8.9.1 Where open footbridges cross railway lines, the position and type of luminaire should be considered to avoid light from these luminaires causing distraction to train drivers either through their location, glare or colour of the lamps.

3.8.9.2 With the exception of where a footbridge is over the track, there are no railway specific mandatory requirements for lighting of footbridges.

G 3.8.9.2.1 Recommendations for illuminance levels on footbridges are set out in BS EN 5489-1:2013 Table 4. (see Appendix A).

G 3.8.9.2.2 Footbridges between platforms can be areas of high passenger traffic specifically after the arrival of trains and in peak traffic times. Lighting is required to facilitate the safe movement of passengers during access to and egress from platforms and to ensure that signs and notice boards directing them can be easily read. Care should be taken to avoid shadow on steps.

G 3.8.9.2.3 The design of footbridge lighting should take account of practicality, cost and disruption to passenger flow during maintenance.

G 3.8.9.2.4 Where practicable, the design should include footbridge lighting from raise and lower type columns, rather than bridge fixed columns, to facilitate maintenance.

G 3.8.9.2.5 The columns, luminaires, cables and cable connections should be of vandal resistant design. Other options may include parapet lighting systems.

G 3.8.9.2.6 Wiring containment for lighting on footbridges should be designed so that it is accessible without the requirement for interference with the operation of trains.

G 3.8.9.2.7 Additional information for railway footbridges is available from the following documents:

- a) BS 5489-1:2013 Table 4 for open and enclosed footbridges.
 - b) BS EN 12464-2:2007 clause 4.7. (The requirements are not specific to railway footbridges).
 - c) CIBSE Lighting Guide 6 clause 4.13 and clause 4.17.3 sets out guidance on lux levels for open footbridges. (This guidance given is not railway specific).
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3.8.10 Subways

3.8.10.1 There are no railway specific mandatory requirements for lighting of subways.

G 3.8.10.1.1 Subways serve a similar function to pedestrian footbridges and lighting standards should conform to covered footbridge standards as a minimum.

G 3.8.10.1.2 Additional information for lighting of subways is available from the following documents:

- a) PRM TSI clause 4.1.2.10.
- b) Accessible Train Station Design for Disabled People: Code of Practice Part F1.d.
- c) Accessible Train Station Design for Disabled People: Code of Practice Part Q2.2 and Q2.3. It also makes reference to 4.1.2.10 of PRM TSI.
- d) BS 5489-1:2013 Table 4.

Rail Industry Standard for Lighting at Stations

- e) BS 5489-1:2013 clause 10.6.2. It also makes reference to BS 5266-1:2011 and BS 5266-7:1999.
 - f) BS EN 12464-1:2011 Table 5.53.
 - g) CIBSE Lighting Guide 6 clause 4.13 for short and long subways. (This guidance is not railway specific).
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3.8.11 Sign illumination

3.8.11.1 There are no railway specific mandatory requirements for illumination of signs.

G 3.8.11.1.1 Consideration should be given to adverse shadowing caused by overhead signage which reduces design illumination levels.

G 3.8.11.1.2 There is a particular need for effective lighting of station name signs. Unlike all other signs on a station, these have to be read from a train moving (often at speed) relative to the sign, and from inside a train which is usually more brightly lit internally and has reflective windows. Such signs are often positioned under lights on poles which are designed to spread light along the platform edge, leaving them in deep shadow.

G 3.8.11.1.3 Additional information for sign illumination is available from the following documents:

- a) PRM TSI clause 4.1.2.10 and clause 4.1.2.11.
 - b) Accessible Train Station Design for Disabled People: Code of Practice Part F1.g.
 - c) Accessible Train Station Design for Disabled People: Code of Practice Part K5.1., K5.2. and K5.3. It also makes reference to BS 8300.
 - d) BS EN 1838:1999 / BS 5266-7:1999.
 - e) CIBSE Lighting Guide 6 clause 4.26. (This guidance document is not railway specific).
 - f) ILP lighting Guide 05 (formerly TR5).
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Rail Industry Standard for Lighting at Stations

Part 4 Guidance on Commissioning of Lighting Installations

4.1 Verification and testing of lighting installations

4.1.1 There are no railway specific mandatory requirements for commissioning of lighting installations at stations.

- G 4.1.1.1 The performance of lighting designs should be verified on site at the commissioning stage. It should be recognised that field photometry is not an exact science and that in some cases it is difficult to obtain accurate and repeatable illuminance data where access constraints limit the time available for testing.
- G 4.1.1.2 A good quality light meter (photometer) complying with BS 667:2005 should be used. Meters should be colour-corrected for the type of light source in use.
- G 4.1.1.3 Hand-held meters should not be used except for indicative 'order of magnitude' measurement. A tripod or fixed surface should be used to ensure that the photocell is perpendicular to the measurement plane. Photocells should incorporate correction for the cosine effect.
- G 4.1.1.4 Care should be taken to avoid the creation of shadows which might affect the performance of the photocell. In most cases, it will be necessary to use a light meter with a remote photocell.
- G 4.1.1.5 Test instruments should be capable of measuring illuminance values across the ranges which are expected in any given installation, and should have a reasonable accuracy (10%) across all ranges.
- G 4.1.1.6 Where possible, account should be taken of light spillage from the adjacent property, and the effect of this discounted from the illuminance values recorded.
- G 4.1.1.7 A practical measurement procedure is set out in the ILP Professional Service Guide TR28 'Measurement of lighting performance on site'. This gives a practical method for illuminance measurement on site which correlates certain design programmes which are equipped for this reduced measurement.
- G 4.1.1.8 For station platforms, it is impractical to follow the guidance set out in ILP Professional Service Guide TR28 'Measurement of lighting performance on site'. This is because platforms are not within the scope of areas for which guidance on light measurements is provided. It is recommended that illuminance measurements on platforms should be taken using a 1.0 m x 1.0 m grid across a platform and along its length.
- G 4.1.1.9 Input to the overall design should be sought from the British Transport Police (BTP), and those responsible for fire safety, at the commissioning stage.
- G 4.1.1.10 The approval of the manufacturer should be obtained before installing additional equipment, for example, extra luminaires, signs, or public address systems, on lighting columns, identified as necessary during testing and following consultation with BTP.
- G 4.1.1.11 Lighting systems for emergency escape routes and exits should be tested in accordance with BS 5266-1:2011.

Rail Industry Standard for Lighting at Stations

G 4.1.1.12 Additional information for commissioning of lighting installations at stations, is available from the following documents:

- a) BS 5266-1:2011 clause 9.2.2 and Annex B.
 - b) Building Regulations Part L.
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Rail Industry Standard for Lighting at Stations

Part 5 Guidance on Operation, Maintenance and Management of Lighting

5.1 Maintenance of design illuminance levels

5.1.1 There are no railway specific mandatory requirements for operation, maintenance and management of lighting.

- G 5.1.1.1 The effective maintenance of lighting installations is essential to the continuing efficiency of lighting equipment and adherence to the illuminance requirements of this standard.
- G 5.1.1.2 The following factors will affect the maintenance function:
- a) Lamp replacement frequency.
 - b) Atmospheric pollution.
 - c) The frequency and efficiency of cleaning the luminaires.
 - d) The decoration of the interior surface.
 - e) Electrical supply quality.
 - f) Electrical supply circuit configuration.
- G 5.1.1.3 For the exterior, lighting maintenance is governed by the Department for Transport manual 'Well Lit Highways'. This lists all of the procedures for maintaining the asset, looks at the legal powers for the provision of lighting and gives recommendations for maintenance regimes.
- G 5.1.1.4 The light output of lamps, including LEDs, decreases from its initial value to that at the end of its rated life. A lamp may continue to operate well after its rated life but efficiency in terms of light output to power will be reduced.
- G 5.1.1.5 If cleaning of luminaires, and where appropriate room surfaces, is not carried out regularly and efficiently, the illumination levels may fall further to an unacceptably low figure. Illuminance can be restored to approximately its original value, subject to lamp age. The cleaning cycle is determined by the need to maintain illuminance at or above the required design illuminance. Cleaning will not restore the installation to its original efficiency but only to that of the aged lamps and luminaire.
- G 5.1.1.6 The efficiency of the installation depends on the efficiency of the lamp and the luminaire as well as the state of the surroundings.
- G 5.1.1.7 The maintenance of clean bright reflective surfaces enhances the illuminance whilst dark surfaces will degrade it. In developing the appropriate maintenance strategy for a station, consideration should be given to the colour of surfaces exposed to light.
- G 5.1.1.8 Dirty or corrosive environments, such as underground or enclosed stations subject to airborne dust from trains increase the need for more frequent cleaning, painting and remedial work.
- G 5.1.1.9 Equipment may be subject to strong magnetic fields emanating from adjacent electrical equipment and to vibration caused by passing trains.
- G 5.1.1.10 The cost of maintenance within the railway environment can be expensive therefore consideration should be given to the quality of materials installed to minimise maintenance costs.

Rail Industry Standard for Lighting at Stations

- G 5.1.1.11 It has been demonstrated that a high proportion of lamps have failed by the time the 100 % rated lamp life has elapsed but that only a small percentage will have failed at 80 % of rated life. It should therefore be considered whether lamps should be changed on a bulk replacement basis or as individual lamps fail. As the lumen output of lamps will be falling throughout their life it is recommended that lamps be changed on a block basis when 80 % of their rated life has elapsed. There are evident economic benefits in programming lamp changes to coincide with the cleaning cycle.
- G 5.1.1.12 The colour appearance of surfaces particularly in interiors is an important consideration from both measurable (illuminance), and qualitative aspects in the design of lighting installations. Printed colours can become difficult to distinguish under some artificial lighting conditions. It is important that notices such as timetables are correctly illuminated, as colour is often used on these to distinguish, for example, the days of the week on which particular services run.
- G 5.1.1.13 The colour appearance of surfaces also depends on the spectral composition of the incident light and changes in accordance with the wavelength of the light source. Where light sources are mainly monochromatic the changes of colour are less marked.
- G 5.1.1.14 If the colour of surfaces is significantly changed during redecoration then the luminaire / light source may no longer light the area to the desired level. The illuminance of the surface depends not only on the direct component of the light received from the luminaire but also from the light, if any, received indirectly from other surfaces such as the ceiling and wall or floor. Therefore consideration of this effect is essential whenever redecoration is required.
- G 5.1.1.15 Tables of the approximate values for typical building finishes are given in other publications (for example, CIBSE Code for Interior Lighting).
- G 5.1.1.16 Guidance on design of lighting installations to take account of maintenance factors is set out in 4.10 of BS EN 12464-1:2011 for interior lighting and 4.9 of BS EN 12464-2:2007 for exterior lighting.
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Rail Industry Standard for Lighting at Stations

Appendix A Illuminance Levels

Station Area	Average maintained illumination level (lux)	DfT Code of Practice
Car park	BS 5489-1:2003+A2:2008 10.7.1 - general 10.7.2 - enclosed 10.7.3 - outdoor BS EN 12464-1:2007 Table 5.9 - exterior BS EN 12464-1:2011 Table 5.34 - interior	C1.g. (guidance)
Approach road	BS5489-1:2003+A2:2008	
Forecourt		H1.1. refers to BS 8300:2009 + A1:2010
Entrance canopy	BS EN 12464-1:2011 Table 5.53	H1.2. refers to 4.1.2.10 of PRM TSI

Table 1 External areas at station buildings

Station Area	Average maintained illumination level (lux)	DfT Code of Practice
Concourse / ticket hall ¹	BS EN 12464-1:2011 Table 5.53	
Ticket / luggage office ²	BS EN 12464-1:2011 Table 5.53	N1.g. (guidance) N1.h. (guidance) N2.4. refers to 4.1.2.10 of PRM TSI
Ticket machines ³	300 lux, $u_0 = 0.5$	
Ticket barrier ⁴	200 lux	
Timetables (where illuminated) ⁵	100 lux (vertical plane) $U_0 = 0.5$	H1.4. K7.i. (guidance) refers to 4.1.2.10 of PRM TSI

Table 2 Station service and information areas

¹ Includes circulation areas.

² Includes counters, travel centres and enquiries, telephone enquiry bureaux, lost property offices and parcel offices.

³ At non self-illuminated display screens. Ticket machines are now frequently display-screen based with self-luminance which means that external lighting is less important but should be sufficient to allow the display to be read.

⁴ Illuminance levels to be achieved at floor level, where manual ticket checking is carried out routinely, over an area of no less than 2.0 m², measured symmetrically either side of the gateline and for the width of the gateline. A uniform lighting level at, and immediately before and after the barrier, will permit ticket checking to be carried out effectively assuming passenger flows from both directions. The lighting should be such that there is good vertical illuminance throughout the ticket checking area. For automatic ticket gates, the required illuminance level is to be achieved at the point where tickets are to be inserted or where card readers are located.

⁵ Illuminance level required over timetable area. Timetables are generally placed in the vertical plane or close to it.

Rail Industry Standard for Lighting at Stations

Station Area	Average maintained illumination level (lux)	DfT Code of Practice
First aid room	BS EN 12464-1:2011 Table 5.2	
Toilets / washrooms	BS EN 12464-1:2011 Table 5.2	P5.a. (guidance) P5.b. (guidance)
General clerical office	BS EN 12464-1:2011 Table 5.26	
Mess room	BS EN 12464-1:2011 Table 5.2	
Apparatus / plant / stores	BS EN 12464-1:2011 Table 5.3 Table 5.4 (stores)	

Table 3 General areas in station buildings

Station Area	Average maintained illumination level (lux)	DfT Code of Practice
Escalators	BS EN 12464-1:2011 Table 5.1	H1.d. (guidance)
Travelators	BS EN 12464-1:2011 Table 5.1	
Lifts	BS EN 12464-1:2011 Table 5.1	H1.c. (guidance) R1.aa. (guidance)
Footbridges	BS 5489-1:2003+A2:2008 8.1, 8.2.5, 10.6.1 and Table 4	
Subways	BS 5489-1:2003+A2:2008 10.6.2 BS EN 12464-1:2011 Table 5.53 for large and small numbers of passengers	Q2.2. for subways inside Q2.3. for subways outside refers to 4.1.2.10 of PRM TSI F1.d. (guidance)
Barrow crossing	BS EN 12464-2:2007	
DfT Q1.a. and b. guidance states: 'It should be noted that barrow crossings are unlikely to be approved by HMRI if proposed as new facilities. Where barrow crossings exist, it is recommended that consideration is given, where appropriate, to their elimination as part of any station refurbishment or upgrade.'		

Table 4 Trafficked areas in station buildings

Rail Industry Standard for Lighting at Stations

Station Area	Average maintained illumination level (lux)	DfT Code of Practice
Ramps	BS 5489-1:2003+A2:2008 10.6.1	
Platforms	BS EN 12464-2:2007 for open platforms Table 5.12 $u_0 = 0.5$ for stations with large numbers of passengers $u_0 = 0.4$ for stations with small numbers of passengers BS EN 12464-1:2011 Table 5.53 for fully enclosed $u_0 = 0.4$ for stations with small numbers of passengers Table 5.53 for fully enclosed $u_0 = 0.5$ for stations with a large number of passengers	H1.3. (PRM TSI 4.1.2.10) H1.f. [guidance] W2.10. (PRM TSI 4.1.2.10) W2.b. [guidance]
Waiting room / shelter	BS EN 12464-1:2011 Table 5.53	H1.e. (guidance)
Waiting room / buffet	BS EN 12464-1:2011 Table 5.29	

Table 5 Waiting areas at stations

NOTES

1. The colour rendering properties of light sources used should enable the safe and effective performance of all visual tasks likely to be undertaken in a given space. For conventional light sources where the R_a metric is applicable, a colour rendering index (CRI) of 85 (ie. R_a85) or better is recommended for railway applications.
2. The illuminance values determined from the referenced documents, are considered to be based on existing good practice.

Rail Industry Standard for Lighting at Stations

Appendix B Station Categories

Station Category	Examples
A – National hub	Birmingham New Street, Glasgow Central, London Waterloo
B – Regional hub	Brighton, Darlington, Watford Junction
C - Important feeder	Manchester Oxford Road, Motherwell, Southend Victoria
D – Medium, staffed	Caerphilly, Lichfield Trent Valley, Sydenham
E – Small, staffed	Gospel Oak, Llandudno Junction, Lockerbie
F – small, unstaffed	Bishop Auckland, Cromer, Tywyn

Table 6 Station categories

The Network Rail categorisation system for stations adopted in their Managed Stations Manual is different to that in Table above. A comparison key is set out below:

Category A = Terminal (major station).

Category B = Provincial, Suburban and Feeder Stations.

Category C = Provincial, Suburban and Feeder Stations.

Category D = Provincial, Suburban and Feeder Stations.

Category E = Minor Stations.

Category F = Minor Stations.

Rail Industry Standard for Lighting at Stations

Appendix C Engineering Assurance Procedure

C.1 Purpose

C.1.1 Engineering assurance of Building and Civil Engineering Works (including Building Services) is set out in Network Rail Standard NR/L2/CIV/003, and is mandatory for all projects undertaken by Network Rail and its Contractors.

C.2 Scope

C.2.1 The engineering assurance procedure applies to building services works, which includes lighting installations. The following types of lighting installation works are also included:

- a) Enhancements.
- b) Replacements.
- c) Repair works.
- d) Emergency works.
- e) Temporary works.

C.3 Roles and responsibilities

C.3.1 The roles and responsibilities of those responsible for design and approval of building services works (including lighting installation) is defined in NR/L2/CIV/003.

C.4 Definitions and abbreviations

C.4.1 Definitions of key terms and abbreviations associated with the engineering assurance process, are set out in section 4 of NR/L2/CIV/003.

C.5 Procedure

C.5.1 Section 5 of NR/L2/CIV/003, describes the project stages and specific engineering assurance procedures that comprise the Network Rail engineering assurance process. This is summarised in Table C.1 below.

Rail Industry Standard for Lighting at Stations

Project stage	Relevant NR Document/Form	Engineering assurance procedure
1. Sponsor's instruction for development	NR/L2/INI/CP0069: Route requirement management and engineering remit production.	Sponsor's instruction for development includes the project requirements specification (PRS).
2. Approval in principle of the single option	NR/L2/CIV/003/F001: Approval in Principle (AIP).	<p>The AIP describes the design proposals for a single option based on the PRS at selection of single option phase.</p> <p>AIP not required for:</p> <ul style="list-style-type: none"> • Repair works. • Emergency works. • Temporary works. • Works in design check category 0 or 1a.
3. Updating of the sponsor's instruction for Implementation		Updating of sponsor's instruction where necessary following development of PRS and approval of NR/L2/CIV/003/F001 AIP.
4. Contract requirements - technical for design and implementation		Development of contract requirements to align with PRS.
5. Design	<p>NR/L2/CIV/003/F002: Statement of design intent.</p> <p>NR/L2/INI/02009.</p>	<p>Prior to start of detailed design, defines the basis for achievement of PRS requirements.</p> <p>Design of building services to be integrated with other parts of design through an interdisciplinary check.</p>
6. Design check	NR/L2/CIV/003/F003: Certificate of design and check.	<p>At completion of detailed design, check category is determined in accordance with Table C.2 below.</p> <p>Confirmation that the design carried out in accordance with the agreed design check category.</p>
7. Verification and entry into service	NR/L2/CIV/003/F005: Certificate of fitness for entry into service.	Prior to entry into service, confirmation that the completed works comply with the design and check requirements, including any materials or commissioning tests required.

Table 7 Engineering assurance through project phases

Rail Industry Standard for Lighting at Stations

C.5.2 Table C.2 indicates the types of works that are generally applicable for the design check categories.

Category	Type of design	Method of checking
0	<p>Designs for which calculations are not required, and the design can be adequately checked by inspection.</p> <p>Designs for which, although simple calculations can be required, the consequences of failure would not be significant.</p>	No additional requirements.
1a and 1b	<p>Standard or simple designs using simple methods of analysis and where all aspects of design are in accordance with relevant standards.</p> <p>Assemblies of elements or components which have themselves been designed and checked and/or accepted.</p>	<p>The design may be checked in the same design team but by staff other than the original designers.</p> <p>The checker may refer to the design calculations and the assumptions on which the calculations are based. The checker shall consider whether the designer's assumptions are valid.</p>
2	All designs which are not in Categories 0, 1 or 3.	<p>The design may be checked in the same organisation as that which prepared the design.</p> <p>Checking shall be undertaken in a separate group or team that has not been concerned with the development of the design.</p>
3	Complex or unusual designs, or where significant departures from current standards, novel methods of analysis, or considerable exercise of engineering judgement, are involved.	The design shall be checked by an organisation independent of the design organisation (that is, by an organisation which is a separate legal entity).

Table 8 Design check categories

C.6 Alterations to the Design

C.6.1 Concerns the need for alteration of a design where revision of forms NR/L2/CIV/003/F002 and NR/L2/CIV/003/F003 is necessary.

C.7 External stakeholders

C.7.1 Where the works affect external parties, the agreement of the affected party should be obtained and recorded in form NR/L2/CIV/003/F001 (see 2.1.2).

Rail Industry Standard for Lighting at Stations

Definitions

Colour appearance

The colour appearance of a lamp refers to the apparent colour (chromaticity) of the light emitted. It is quantified by its correlated colour temperature (T_{CP}). Colour appearance of daylight varies throughout the day. Colour appearance of artificial light can also be described as warm, intermediate or cool.

Colour rendering

Effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant. For design purposes, colour rendering requirements should be specified using the general colour rendering index and should take one of the following values of Ra: 20, 40, 60, 80, 90.

Escape route.

Route designated for escape to a place of safety in the event of an emergency.

Glare

The discomfort or impairment of vision experienced when parts of the visual field are excessively bright in relation to the general surroundings.

Horizontal illuminance

The illuminance falling on a horizontal plane.

Illuminance

The luminous flux density at a surface in a defined plane. The SI unit of illuminance is the lux, which is equal to 1 lumen per square metre (lm / m^2).

IP rating

Ingress protection (IP) rating, classifies and rates the degree of protection provided against the intrusion of solid objects, dust, accidental contact, and water in mechanical casings and with electrical enclosures.

Luminance

The measure of brightness of a surface in a given direction. The SI unit of luminance is candela per square metre (cd / m^2).

Luminaire

An apparatus which controls the distribution of light given by a lamp or lamps and which includes all the components necessary for fixing and protecting the lamps and connecting them to the supply circuit. 'Luminaire' has superseded the term 'lighting fitting'.

Luminous flux

The term used to describe the quantity of light emitted by a source, or received by a surface. The SI unit of luminous flux is the lumen (lm).

Maintained illuminance

The average illuminance over the reference surface at the worst condition of maintenance.

Diversity

The ratio of minimum illuminance to maximum illuminance over a specified area.

Platform

The structure forming the part of a station that provides access to or from a train.

Sub-surface station

A station with platforms enclosed or underground as set out in section 3 of the Fire Precautions (Sub-surface Railway Stations) Regulations 1989.

Rail Industry Standard for Lighting at Stations

Temporary lighting

Any lighting installed to perform a specific task and that is not intended to remain installed or to replace the permanent lighting scheme to which the temporary lighting is to be applied.

Uniformity

The ratio of the minimum illuminance to the average illuminance over a specified surface.

Useable platform edge area

The area enclosed between the platform edge and a line 1.0 m back from the platform edge, over the usable platform length.

Vandalism

For the purpose of this document, vandalism means any malicious action with the potential to result in derailment or collision, for example, placing objects on the line or damaging safety-critical equipment.

Vertical illuminance

The illuminance falling on a vertical plane.

Rail Industry Standard for Lighting at Stations

References

The Catalogue of Railway Group Standards gives the current issue number and status of documents published by RSSB. This information is also available from www.rgsonline.co.uk.

RGSC 01 Railway Group Standards Code
RGSC 02 The Standards Manual

Documents referenced in the text

Railway Group Standards

GC/RT5033	Terminal Tracks – Requirements for Buffer Stops, Arresting Devices and End Impact Walls
GC/RT5212	Requirements for Defining and Maintaining Clearances
GE/RT8000	The rule book
GE/RT8060	Engineering Requirements for Dispatch of Trains from Platforms
GI/RT7016	Interface between Station Platforms, Track and Trains
GK/RT0045	Lineside Signals, Indicators and Layout of Signals
GL/RT1255	Low Voltage Power Supplies in Electrified Areas

RSSB documents

GI/GN7520	Guidance on Lighting of Railway Premises
RIS-7700-INS	Rail Industry Standard for Station Infrastructure

Euronorms and British Standards

BS 667:2005	Illuminance meters. Requirements and test methods
BS 5266-1:2011	Emergency lighting. Code of practice for the emergency escape lighting of premises
BS 5489-1:2013	Code of practice for the design of road lighting. Lighting of roads and public amenity areas
BS 8300:2009+A1:2010	Design of buildings and their approaches to meet the needs of disabled people. Code of Practice
BS EN 40-1:1992	Lighting columns. Definitions and terms
BS EN 40-2:2004	Lighting columns. General requirements and dimensions
BS EN 40-3-1:2000	Lighting columns. Design and verification. Specification for characteristic loads
BS EN 40-3-3:2003	Lighting columns. Design and verification. Verification by calculation
BS EN 81-70:2003	Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Accessibility to lifts for persons including persons with disability
BS EN 1838:1999, BS 5266-7:1999	Lighting applications. Emergency lighting
BS EN 12464-1:2011	Light and lighting. Lighting of work places. Indoor work places
BS EN 12464-2:2007	Lighting of work places. Outdoor work places
BS EN 50124-1:2001+A2:2005	Railway applications. Insulation coordination. Basic requirements. Clearances and creepage distances for all electrical and electronic equipment
BS EN 50122-1:2011+A1:2011	Railway applications. Fixed installations. Electrical safety, earthing and the return circuit. Protective provisions against electric shock

Rail Industry Standard for Lighting at Stations

BS EN 50172:2004, BS EN 5266-8:2004

Emergency escape lighting systems

BS 5266-6:1999

Emergency lighting. Code of practice for non-electrical low mounted way guidance systems for emergency use. Photoluminescent systems

BS EN 60598-1:2008

Luminaires . General requirements and tests

BS EN 60598-2-22:1998+A2:2008

Luminaires. Particular requirements. Luminaires for emergency lighting

Technical Specifications for Interoperability and associated documents:

Details of the current TSIs and Application Guides are available at

http://www.rssb.co.uk/SiteCollectionDocuments/rgs/TSI_status_summary.pdf

2005/32/EC

Establishing a framework for the setting of ecodesign requirements for energy-using products and amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC (OJ L191/29, 22.07.2005)

2009/125/EC

Establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L285/10, 31.10.2009)

EU No 347/2010

Ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps (OJ L104/20, 24.4.2010)

PRM TSI

Persons with Reduced Mobility Technical Specification for Interoperability, Decision 2008/164/EC (OJ L64, 7.3.2008, p72)

Other documents

CIRA C710

Addressing Crime and Disorder in Public Places through planning and design, The Construction Industry Research and Information Association (CIRIA 2011), ISBN 978 0 86017 712-8

CIE 117 – 1995

Discomfort Glare in Interior Lighting

Code of Practice

Accessible Train Station Design for Disabled People: Code of Practice, Department for Transport, November 2011

DCLG document

Fire safety risk assessment – transport premises and facilities, 12 February 2007

DCLG document

Building Regulations Part L: proposals for consequential improvements in existing homes - report of focus groups, 13 December 2012

DEFRA guidance

Statutory Nuisance from Insects and Artificial Light, DEFRA, 2005

ILL and Association of Chief Police Officers joint

Lighting against Crime – A Guide for Crime reduction Professionals, January 2011

ILP and Bat Conservation Trust

Bats and Lighting in the UK, bats and the Built Environment Series, January 2008

ILP Guidance document

Guidance on Current and Forthcoming Legislation within the Lighting Sector, 14 August 2012

ILP Guidance document

Guidance Notes for the Reduction of Obtrusive Light, GN01:2011

Network Rail Manual

The Network Rail Managed Stations Manual

PD6547:2004+A1:2009

Guidance on the use of BS EN 40-3-1 and BS EN 40-3-3.

SLLCL

SLL Code for Lighting (Society of Light and Lighting), 2012

Rail Industry Standard for Lighting at Stations

SLL LG5	Lighting Guide 05: Lighting for Education (Society of Light and Lighting SLL LG5) 2011
SLL LG6	Lighting Guide 6: The Outdoor Environment (Society of Light and Lighting), 1992
SLL LG12	Lighting Guide 12: Emergency lighting design guide (Society of Light and Lighting), 2004
TM 12:1986 Addendum	CIBSE Technical Memorandum - Addendum - Emergency Lighting, January 1999
TR28	Guide to Measurement of lighting performance on site, Institution of Lighting Professionals
Wayfinding at stations	A good practice guide, RSSB, June 2006
UK legislation	Clean Neighbourhoods and Environment Act, 2005
UK legislation	Fire (Scotland) Act 2005
UK legislation	The Environmental Protection Act 1990
UK legislation	The Health and Safety (Display Screen Equipment) Regulations, 1992
UK legislation	The Regulatory Reform (Fire Safety) Order 2005