Site layout planning for daylight and sunlight

A guide to good practice

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Summary

This guide gives advice on site layout planning to achieve good sunlighting and daylighting, both within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylight recommendations for new buildings in the British Standard *Daylight in buildings*, BS EN 17037. It contains guidance on site layout to provide good natural lighting within a new development; safeguarding of daylight and sunlight within existing buildings nearby; and the protection of daylighting of adjoining land for future development. A special section deals with loss of solar radiation for solar panels and for passive solar buildings that use the sun as a source of heating energy. Guidance is also given on the sunlighting of gardens and amenity areas. Issues like privacy, enclosure, microclimate, road layout, and security are briefly reviewed. The appendices contain methods to quantify access to sunlight and daylight within a layout.

This report is a comprehensive revision of the 2011 edition of *Site layout planning for daylight and sunlight: a guide to good practice*. It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location. Appendix F explains how this can be done in a logical way, while retaining consistency with the British Standard recommendations on interior daylighting.

How to use the guide

Before using this guide, read the introduction (section 1) which sets out the scope and nature of the guidance.

Summary of content

Terms and definitions
A glossary of terms and definitions used within the guide is on page 6.

Designing for good daylighting and sunlighting within a new development
Refer to Section 2.1 in Section 2 *Light from the sky*, section 3.1 in Section 3 *Sunlighting*, and Appendix C. Section 4 explains how to plan for winter solar heat gain. If there is a conflict with other requirements, Section 5 gives advice.

Protecting the daylighting and sunlighting of existing buildings
See Sections 2.2 and 3.2. Appendix E explains rights to light.

Daylighting of land adjoining a development
This is covered in Section 2.3. Section 3.3 deals with sunlight in gardens and other open spaces between buildings.

Loss of radiation to solar panels
This is covered in section 4.

Trees and hedges
Appendix G gives guidance on trees.

Environmental impact assessment
Appendix H explains how to apply the guidance on environmental impact assessment.

The other appendices contain calculation methods and data to help assess the daylighting and sunlighting within a site layout.

Glossary

Illuminance	A measure of the amount of light falling on a surface, usually measured in lux.
Target illuminance (E_T)	Illuminance from daylight that should be achieved for at least half of annual daylight hours across a specified fraction of the reference plane in a daylit space.
Minimum target illuminance (E_{TM})	Illuminance from daylight that should be achieved for at least half of annual daylight hours across 95% of the reference plane in spaces with vertical and/or inclined daylight apertures.
Daylight factor (D)	Ratio of total daylight illuminance at a reference point on the working plane within a space to outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky. Thus a 1% D would mean that the indoor illuminance at that point in the space would be one hundredth the outdoor unobstructed horizontal illuminance.
Target daylight factor	Daylight factor value equivalent to the target illuminance to be exceeded for more than half of annual daylight hours over a specified fraction of the reference plane within a daylit space.
Minimum target daylight factor	Daylight factor value equivalent to the minimum target illuminance to be exceeded for more than half of annual daylight hours over 95% of the reference plane within spaces with vertical and/or inclined daylight apertures.
CIE standard overcast sky	A completely overcast sky for which the ratio of its luminance $L\gamma$ at an angle of elevation γ above the horizontal to the luminance Lz at the zenith is given by: $L\gamma = Lz \ \frac{(1 + 2 \ sin \ \gamma)}{3}$ A CIE standard overcast sky is darkest at the horizon and brightest at the zenith (vertically overhead).
Daylight, natural light	Combined skylight and sunlight.
No sky line	The outline on the working plane of the area from which no sky can be seen.
Obstruction angle	The angular altitude of the top of an obstruction above the horizontal, measured from a reference point in a vertical plane in a section perpendicular to the vertical plane.
Annual probable sunlight hours	The long-term average of the total number of hours during a year in which direct sunlight reaches the unobstructed ground (when clouds are taken into account).
Sky factor	This is used in rights to light calculations. It is the ratio of the parts of illuminance at a point on a given plane that would be received directly through unglazed openings from a sky of uniform luminance, to the illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. The sky factor does not include reflected light, either from outdoor or indoor surfaces.
Vertical sky component (VSC)	This is a measure of the amount of light reaching a window. It is the ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a CIE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings.
Reference plane or working plane	Horizontal, vertical, or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 0.85 m above the floor in houses and factories, 0.7 m above the floor in offices.
Assessment grid	Grid of calculation points on the reference plane that is used to calculate daylight factor or illuminance from daylight. Also known as calculation grid.
(Solar) irradiance	A measure of the amount of solar radiation (including infrared and ultraviolet radiation as well as daylight) falling on a surface. Usually measured in Watts per square metre.

1. Introduction

1.1 People expect good natural lighting in their homes and in a wide range of non-domestic buildings. Daylight makes an interior look more attractive and interesting as well as providing light to work or read by. Access to skylight and sunlight helps make a building energy efficient; effective daylighting will reduce the need for electric light, while winter solar gain can meet some of the heating requirements.

1.2 The quality and quantity of natural light in an interior depend on two main factors. The design of the interior environment is important: the size and position of windows, the depth and shape of rooms, and the colours of internal surfaces. But the design of the external environment also plays a major role: e.g. if obstructing buildings are so tall that they make adequate daylighting impossible, or if they block sunlight for much of the year.

1.3 This guide gives advice on site layout planning to achieve good daylighting and sunlighting, within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylighting recommendations in BS EN 17037 *Daylight in buildings*[1], and in the CIBSE publication *LG 10 Daylighting – a guide for designers*[2]. This guide complements them by providing advice on the planning of the external environment. If these guidelines on site layout are followed, along with the window design recommendations in BS EN 17037 and *LG 10 Daylighting – a guide for designers*, there is potential to achieve good daylighting in new buildings, and retain it in existing buildings nearby.

1.4 Other sections in the guide give guidance on site layout for solar energy and on the sunlighting of gardens and amenity areas, and briefly review issues like privacy, enclosure, microclimate, road layout, and security. The appendices contain methods to quantify access to sunlight and daylight within a layout.

1.5 This guide supersedes the 2011 edition, which is now withdrawn. However, the main aim is the same: to help ensure good conditions in the local environment considered broadly, with enough sunlight and daylight on or between the buildings for good interior and exterior conditions.

1.6 The guide is intended for building designers and their clients, consultants, and planning officials. The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design (see Section 5). In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or in an area with modern high-rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings. Alternatively, where natural light is of special importance, less obstruction and hence more sunlight and daylight may be deemed necessary. The calculation methods in Appendices A and B are entirely flexible in this respect. Appendix F gives advice on how to develop a consistent set of target values for skylight under such circumstances.

1.7 The guidance here is intended for use in the United Kingdom and in the Republic of Ireland, though recommendations in the Irish Standard IS EN 17037 may vary from those in BS EN 17037. Many of the principles outlined will apply to other temperate climates. More specific guidance for other locations and climate types is given in BRE Report *Environmental site layout planning*[3].