

Lighting of religious buildings

David Holmes, an experienced lighter, spent two years visiting dozens of different types of places where religious assembly takes place, from the more familiar churches, synagogues and mosques to the more unusual, such as chapels in airports and hospices. In these buildings he looked not only at the typical features of the buildings but also discussed with those in charge how their spaces were used, the particular ways they performed their rituals and any particular sensitivities they had about people entering the spaces during the design process.

In this article, the [Society of Light and Lighting](#) (the SLL) gives us an overview of the different requirements for lighting religious buildings.

A place of worship is taken to be a building, or a particular room within a building, where people congregate to carry out prayer and activities relevant to their faith. As many gatherings take place at night as well as during the day, a system of artificial lighting is necessary.

Lighting in places of worship has four objectives:

- to enable participants in the religious activity or ceremony to see what they are doing;
- to enable the congregation or assembly to see what's happening around them;
- to contribute to the safety of everyone within the room or building; and
- to create a good visual environment.

It's important to apply the correct source of lighting so that a specified illuminance can be accurately achieved. The success of an installation should not be judged by light meters but through the eyes of those who have to perform the ceremonies as well as those who watch them. Similarly, efficiency should not be rated simply by the effectiveness of gathering all the lamp lumens and exclusively directing them onto the task plane, but rather by the ease with which the task can be seen and by the contribution of the lighting installation to making the environment more agreeable.

Types of bulbs

With the reducing price and increasing availability of good LED spot and floodlights, these should normally be considered as a first option. They provide a good low-energy option with a very long life, thus reducing the need for maintenance access to often high places. The wide availability of LEDs with different beam angles means that one family of fittings can provide light for many different purposes. Wide beams can be used for washes over vaulted ceilings, medium beams for lighting down over seating areas and narrow beams for picking out altars or features in the space. Most LED spotlights can come with integral dimming of many forms, from simple trailing edge mains dimming to DALI (digital addressable lighting interface) or DSI (digital serial interface). A dimming system allows simple changes in the feel of the space, from simple lighting for general access to higher levels for services, with special scenes reserved for weddings, festivals or concerts.

Lighting considerations

When considering the design, an installer should analyse the visual task that will be performed in the religious building and any possible lighting problems. For example, if members of a congregation or assembly tend to sit in one particular area this should be a focus of the design brief. Similarly, if certain parts of the service or ceremony appear better with the aid of daylight, try to understand why – and how this can be supported.

The theatrical performance of the ceremony and the appearance of the room or building should also be considered. For example, it's recommended that uniformity within a prayer or worship area can be lowered if a particular lighting effect is justified, perhaps by using a narrow beam spotlight over a font in a Christian church, to light the Koran in a mosque or the Scriptures in a synagogue.

It is common in places of worship for tasks to occur on different planes: horizontal, vertical and anywhere in between. It is recommended that illuminance is produced on the plane in which the task will be performed. A common failing of lighting in Christian churches is the provision of low illuminances on the vertical plane. The usual causes are the use of narrow distribution luminaires, the choice of luminaire by lay people or insufficient numbers of luminaires. Illuminance on the vertical plane in buildings with high ceilings is much more sensitive to changes in spacing between luminaires than is illuminance on the horizontal plane. It is therefore possible to have conditions in which the illuminance on the horizontal plane meets the illuminance recommendations but the illuminance on the vertical plane is much reduced and markedly non-uniform. Typically, the best approach to avoid this problem is to use luminaires with a wide distribution, at a reduced spacing. Higher room surface reflectances can also be beneficial, although it is appreciated that this particular aspect cannot always be controlled by the lighting designer.

In addition to lighting the task area, the volume of space occupied by any people should be lit. This particular light is required to light objects, reveal texture and improve the appearance of people within the space. The terms 'mean cylindrical illuminance', 'modelling' and 'directional lighting' describe the lighting conditions. Good visual communication and recognition of objects within a space are essential within any religious building. This is achieved by providing adequate mean cylindrical illuminance (E_z) in the space.

Obstructions

Where architectural features can add much to the atmosphere of a religious building, unfortunately, from a lighting perspective, they are commonly the cause of extensive obstruction to the distribution of light from the lighting installation. Large vertical stone pillars, wooden cross beams, heaters and banners are all examples. If obstruction and consequent shadowing are thought likely to be a problem special care should be made when designing the installation. A number of approaches can be used to reduce such problems:

- if the obstruction is by overhead cross beams, etc., the possibility of positioning the lighting below the obstruction should be considered.
- if there are a few large obstructions in the space, such as stone pillars, a suitable approach is to check that all parts of the space are lit by at least two luminaires, either roof mounted or via floodlights mounted on the walls or the pillars themselves. This approach, together with high surface reflectances in the interior, should eliminate any patches of low illuminance.
- often, the spacing between luminaires can be reduced, the amount of reduction being greater the larger the size and number of obstructions and the lower the reflectances of the obstructions. Typically, a one-third reduction in the maximum spacing to mounting height ratio may be required.

Maintenance

Several factors need to be considered when it comes to maintenance:

- lighting installations start to deteriorate from the moment they are first switched on.
- the light output from lamps reduces with increasing hours of use.
- the light emitted from luminaires will diminish as the luminaires become increasingly dirty.
- the inter-reflected light in an interior will reduce as the interior becomes dirty.

To maintain the light output of a lighting installation, it's necessary to carry out maintenance of the installation. The first requirement of such maintenance is ease of access. This is something that should always be considered when designing an installation. In a church or mosque with a high ceiling it may be best to mount the luminaires on vertical surfaces such as pillars, instead of suspended from the high ceiling. In so doing, luminaires can usually be positioned to allow for easier maintenance, while still taking the lighting requirements into consideration. Selecting suitable intervals for cleaning the luminaire and for the lamp replacement, together with the best method of carrying out this work, should all be considered when designing the installation.

Energy consumption

A designer must consider energy consumption and running costs. Two aspects of the installation determine the energy cost: the installed power of the installation and the number of hours the installation is used.

Installed power is determined by the choice of light source and luminaire, the proportions of the interior and the reflectance of the interior surfaces. Legislation pertaining to energy conservation in England and Wales is governed by the Building Regulations, with particular reference to Part L: *Conservation of fuel and power*. Similar legislation applies in Scotland and Northern Ireland.

When lighting places of worship, the basic requirement is that all general areas should be illuminated by light sources that have a minimum efficacy of 60 lumens per circuit watt. Many places of worship are only used for a few hours each week and therefore full-life economics must be considered when choosing a lighting system. An elaborate and expensive array of luminaires may be impressive to the public at large, but if a payback period is being considered and calculations show this to be in excess of 20 years, the validity of the decision must be studied carefully.

Over recent decades, due to low weekly usage in churches, there was a trend towards the use of tungsten halogen lamps for general lighting in cheap exterior floodlights. With current legislation and the need to carefully consider a building's energy consumption, the use of high-wattage tungsten halogen lamps is no longer a viable option. However, it is increasingly easy to provide luminaires that match the environment aesthetically (even in listed buildings) while using efficient light sources such as modern LED types.

Emergency lighting

Emergency lighting may be required in places of worship wherever there is deemed to be a risk to the safety, health or welfare of staff and the public, should the normal lighting fail. For

all buildings, a hazard exists if people have to evacuate the building in darkness, so emergency lighting must be provided to allow people to safely and quickly leave the building.

Listed buildings

Many religious buildings will be of architectural or historical interest and may be listed. If they are, planning consent or listed building consent may be needed before works can be carried out. In any case the integrity of the building must be maintained and the fabric of the building respected when choosing locations of lights, how they are fixed to the structure and the routing and fixing of cables to them. There will often be restrictions on drilling through or fixing into listed buildings and clear guidance should be sought before commencing work.

Example: St John's Church, Cirencester. (Lighting design by Lighting Design & Technology)

The Catharine chapel has slim LED lighting strips concealed on ledges high up on each side to provide soft uplighting of the magnificent fan vaulting. The spotlights are mounted on brackets that are fixed over the ledge so that no fixing damages the historic main wall. The spotlights provide emphasis on to the altar and provides lighting for both the seating area and for the areas of revealed wall paintings. The wiring is run along the high-level ledges to conceal them from view and each spotlight or LED strip can be separately dimmed via a DALI control system, so that the balance of uplight to downlight or from altar to seating area can be changed to suit the use of the space.



The spotlights in the Lady Chapel are concealed behind the wooden down-stands from the ceiling so that they cannot be seen from most positions in the pews. As well as lighting the

pews and altar area, additional spotlights with specific beam angles give emphasis to the monuments at the side of the space and to certain carved features on the wooden ceiling. These can be individually dimmed down via the control system.



For more information:

If you'll be lighting a religious building, the SLL's Lighting [Guide 13: Lighting of Places of Worship](#) is worth reading. David Holmes used his detailed knowledge to draft a description of each religion and their practices as well as guidance on how best to light each type of space. He then agreed the wording of these with the authorities of each religion before drafting them into a single guide to the lighting of places of worship. The guide is intended as an introduction to the subject for lighting engineers, installers and users alike – and the descriptions of the religious building itself is really helpful for understanding the space you'll be working in.

The guide also includes up-to-date legislation where relevant and incorporates best practice principles throughout. Individual characteristics have been aligned to BSEN 12464 Part 1:2011 where possible, including the introduction of a distinction between task area and surrounding areas, and the subsequent recommendation of uniformity for those areas. Indeed, uniformity has been given far more importance throughout the Guide, with recommended minimum values in the tables appertaining to each particular application.

See also: our interview with David Haddon-Reece, chartered electrical engineer specialising in religious buildings.