Getting it right with LED emergency lighting

LED lighting technology delivers significant benefits to emergency lighting systems, though it's essential to address key criteria if optimum performance is to be achieved. Stewart Langdown of Mackwell explains

The benefits of LED lighting are now well established and it's fair to say LEDs are the light source of first choice for the majority of commercial and industrial applications. However, in many cases the focus is very much on the general lighting of the space(s), with less emphasis on the emergency lighting alongside it.

There are a number of reasons for emergency lighting often being treated as a 'second class citizen'. For instance, emergency lighting is typically only around 10-15% of the building's lighting, and many lighting specifiers are content to leave the emergency lighting design to the electrical contractor.

Of course, there is also the question of cost and many building operators may be tempted to go for the cheapest option that will enable them to comply with the regulations. This is a short-sighted approach that fails to take account of the lifetime costs of such a system. A properly designed scheme using the right products will prove considerably more cost-effective over the lifetime of the installation.

This latter issue may require lighting specifiers to modify their approach if the end client is to receive best value.

For example, early LED emergency lighting fixtures often delivered a light output of around 50 lm, delivering a compliant emergency lighting solution with spacings of around 6 m at typical ceiling heights. Indeed, this is still a technically and commercially viable solution.

As LED technology has improved there has certainly been an increase in lumen output. Improvements in semiconductor technology now provide a range of luminous flux from modules offering <100 lms up an in excess of 300 lumens. With the right charging regime such as Markwell's Smart Charge the overall power levels can be reduced to <1W thereby providing unparralleld levels of system efficacy.

However, an increase in luminous flux will not necessarily give a proportionally linear increase in emergency lighting spacings. It is essential to factor the optical performance in the design. Failing to do to can actually result in more luminaires being specified with an increase in costs for the overall project.

It is also important to be aware of the constraints imposed by the thermal characteristics of LED circuits. Even with a carefully designed LED lamphead, it will still have an optimum performance point. Going beyond this may result in unnecessary power consumption and an inefficient product that may require more or larger batteries, or offer no extra benefits in terms of output or performance.

The answer, then, is to make use of luminaires with tailored optics to ensure optimum distribution and maximise spacings, resulting in a lower cost of ownership per square metre.

In achieving this, it may also be useful to model the space in which the emergency lighting is to be installed. For instance, the lighting designer may find that initial estimations based on generic spacing tables exceed the emergency light levels required. With careful positioning and use of appropriate lamphead/optic arrangements it may then be feasible to further optimise the spacings to reduce costs whilst ensuring the scheme is safe, compliant and designed to the application.

By focusing on application requirements, other factors, such as the way the emergency lighting scheme is powered, maintained and operated, play a much more vital role. This will ultimately result

in a system being far more beneficial than if the lumen output was the sole focus.

A key advantage of higher lumen output is the opportunity to reduce the size of emergency luminaires. Smaller emergency luminaires have less visual impact on the space and make it easier for the lighting designer to address sensitive aesthetic requirements. The ideal situation is that the emergency lighting is only noticed when it is required – namely, when in emergency operation. And this applies to both conversions and stand-alone emergency luminaires.

Lower lumen packages tailored for emergency lighting schemes are able to make use of lower power control gear, smaller lampheads, smaller drivers and smaller batteries. Here, the choice of battery is also important and battery technology is an area of significant challenge. Recent high profile failures of certain battery chemistries have shown that the wrong selection of battery can have a very serious impact on the safety of the system. Each battery has its own benefits and drawbacks, whilst the temperature and environment in which the emergency lighting is housed has an impact on battery performance and lifespan.

Currently, nickel cadmium (NiCd) and nickel metal hydride (NiMH) are the only two types of battery approved for emergency lighting but other technologies (e.g. lithium ion) will become accepted when appropriate safety measures have been put in place.

As with any other type of lighting design, it is clearly important to understand the application and any factors that may impinge on the design of the emergency lighting system. These include local standards, mounting heights, escape routes and any areas of risk.

To that end, a risk assessment will help in determining the requirements for compliance and how best the scheme should be designed and maintained throughout the life of the installation. This understanding will make it easier to identify the types of lampheads and optics that are best suited to each space.

MAINTAINING COMPLIANCE

Over and above all other considerations is the safety role of the emergency lighting system and its ongoing effectiveness in protecting the inhabitants of the building. Yet there have been a number of cases where emergency lighting has been neglected or the maintenance requirements have not been fully understood by the individual who is responsible.

Implementing automatic test systems and intuitive emergency control platforms helps engineers and end users to ensure the entire emergency lighting system is operating as intended and is compliant.

Such addressable systems help to ensure compliance with BS EN 62034:2006 'Automatic test systems for battery powered emergency escape lighting'. To that end, DALI is the key to addressable communication but it's important to remember DALI is simply a protocol – it needs a suitable interface if it is to be meaningful to the building operator. Such an interface should be intuitive and simple to use, with live system status information for instant information.

Emergency lighting controls that notify users of potential issues or problems that need further investigation all aid in demystifying the processes required to ensure good practice and maintain a simple approach to monitoring a small or large scale scheme.

As the connectivity of lighting systems improves and makes them part of the 'Internet of Things' (IoT) there are opportunities to integrate the monitoring and testing of emergency lighting with other 'smart' aspects of the building's systems. The low power requirements of LED light sources (compared to traditional sources) means that both general and emergency lighting can be powered via category cable without the need for separate power and communication cabling. Consequently, understanding the range of options available and selecting emergency lighting systems that work in harmony with general lighting, will help to instil confidence in those that are tasked with maintenance and operation. The result is a system that is monitored and checked regularly and properly.

LOOKING TO THE FUTURE

Operation of emergency lighting on an IoT platform opens the door to many further refinements, using a combination of hardware and software integrated into emergency lighting products to enable a range of features and upgrades.
Such IoT platforms will include features such as retinal response, extensive battery protection, diagnostics and wireless communications via Bluetooth or visible light communication (VLC). The ability to synchronise data with cloud storage for access from any location will also become standard. Moreover, such platforms are inherently upgradable to take advantage of newer technologies as they become available. Systems that take advantage of this opportunity are already entering the market, so specifiers need to be sure they are up to speed with the latest developments and take advantage of them when appropriate. ER