

The Philips logo is displayed in a white rounded rectangle on a dark blue background. The word "PHILIPS" is written in a bold, blue, sans-serif font.

Tunnels

Public lighting



Case Study

# Lighting the way for ground-breaking A55 tunnel refurbishment



The  
**A55  
tunnel**  
Conwy, Wales

## Fast Facts

### Customer

SPIE

### Location

A55, Wales: Conwy, Pen Y Clip and Penmaenbach tunnels

### Philips Products

FlowStar and T-Line luminaires,  
B-ScoutMaster control system



## A ground-breaking road tunnel refurbishment project is using Philips LED tunnel lighting technology and controls to meet demanding performance criteria.

Following its recent M&E upgrade by contractors SPIE, the Conwy Eastbound tunnel on the A55 became the UK's first long (c.1km) high-speed road tunnel to be lit with a LED continuously dimming system. This follows a lighting upgrade project in the Westbound bore in 2013, which was illuminated by a hybrid LED-dimmed/HPS-switched scheme.

The Conwy tunnel is one of three high speed tunnels on the A55 where SPIE has recently installed Philips LED tunnel lighting in their refurbishment, the others being the 1 km Pen Y Clip tunnel and the 0.65 km tunnel at Penmaenbach. The projects were carried out under the Welsh Government's Ancillary

Framework Agreement and on average delivered 60% energy savings, 95% maintenance cost savings and 40% installation cost savings.

"All three of these projects imposed demanding specifications on the lighting, as well as presenting budgetary and scheduling challenges," recalled SPIE's Steve Henry, Operations Manager. "We selected the Philips luminaires and controls as they clearly met the performance criteria at the lowest installation cost, and were backed by the company's extensive experience of delivering major tunnel lighting contracts," he added.



60% energy savings



40% installation  
cost reduction and  
95% savings on  
maintenance



Improved comfort  
and safety by 100%  
LED lighting



Professional Services  
recommendation for  
improvements

## Project criteria

The principles applied to the tunnel upgrades are exemplified by the system selected for the Conwy Eastbound tunnel. The previous lighting scheme in the Conwy tunnel – using fluorescent interior zone lighting with high pressure sodium boost lighting – was no longer compliant with the latest British Standards and the equipment was at the end of its design life.

This presented the perfect opportunity to exploit the cost savings and environmental benefits of LED lighting, while also ensuring best value for the client over a 20 year design lifetime. In

addition, the chosen lighting needed to offer a fast and reliable installation method with full galvanic isolation (anti corrosion) and plug and socket connections, that would also minimize the cost of the required new stainless steel primary fixing grid and cable trays. It also had to provide high lighting levels and uniformity in the threshold and transition zones and provide enhanced safety levels via dual redundant controls and adherence to rigorous fire safety requirements.



The A55 Penmaenbach tunnel in particular, also required the existing lighting to be retained until the new lighting was installed and commissioned. This was because the tunnel needed to be opened for traffic each morning after night-time refurbishment work.

“The projects were delivered to demanding schedules with short delivery and installation/commissioning times, so Philips’ ability to provide one-stop-shop delivery and commissioning was critical,” Steve Henry continued.

## The right lighting

A coordinated design approach was essential to account for tunnel curvatures and to avoid clashes with other essential services such as the large ventilation fans.

The lighting calculations ensure that luminaire photometric performance is fully optimized and in close correlation to BS5489-2:2008 luminance reduction curves. The design for the Conwy Eastbound and Pen Y Clip tunnels adopts a linear approach with luminaires arranged about the centerline of the carriageway. In the Penmaenbach tunnel the new lighting is side-mounted to avoid the existing centerline lighting.



All of the designs achieve exceptionally high longitudinal lighting uniformity and levels of light across the full width of the carriageway, with the client setting tough challenges to provide these even well above the minimum requirements of BS 5489-2.

Each design is primarily based on a uni-directional traffic arrangement with supplementary lighting to allow for a reduced speed contra-flow arrangement at the normal exit portal, also used in-part to derive the normal exit lighting. The interior tunnel lighting is provided by Philips T-Line LED luminaires spaced to provide constant longitudinal lighting. These are controlled via two fixed dimming stages between night and day driving conditions.

A major advantage of the linear lighting design is that of driver comfort; given that there is little or no sensation of flicker, which can often be sensed when driving below widely spaced and very bright luminaires. The linear lighting also acts as desirable subliminal driver guidance through the length of the long tunnel.

Boost lighting is provided using Philips FlowStar luminaires mounted in a single row, marginally offset from the interior luminaire row. The boost lighting is fully dynamic during daylight hours, continually adapting to changes in exterior ambient light conditions, to ensure drivers have good vision into the tunnel from the approach road, across all weather and seasonal conditions.





External photometers continually monitor these daylight levels and feed brightness data to the lighting controls, which instantaneously determine the correct corresponding lighting required within the tunnel.

The FlowStar luminaires are very powerful so just a single end-to-end lighting row can achieve up to the 10,000 lux needed to balance mid-summer sunshine on the approach road.

## Reduced installation time

The project also took advantage of the proven clamping system on Philips road tunnel luminaires. Each luminaire has a mounting flange running the full length of two sides as part of the extrusion/structure. Purpose-designed mounting clamps engage the luminaire flanges with the principal support structure to form a quick and reliable fixing with similar quick de-mounting potential should this ever be needed under future maintenance.

This simple style of mounting is very flexible, given the wide luminaire mounting flanges, and does not rely on accurate primary fixing locations to be arranged; thereby reducing installation time and material costs.

## Lighting control

The project also features a complete tunnel lighting control system using two Philips B-ScoutMaster control panels arranged in a duty/standby configuration for enhanced resilience. These are linked to Philips L20 photometers mounted on columns at

the stopping distance from the entrance portals. The duty lighting control panel instructs local control units (each serving up to 10 LED drivers) to switch to 'on', 'dim' or 'off' to create the required lighting pattern at any given time.

The controls are designed to operate as a fully stand-alone system under normal conditions, with the ability to link to the SCADA (Supervisory Control and Data Acquisition) control system to provide high level monitoring for the tunnel operating staff and essential override control and data reporting.

## Tunnel Professional Services

As well as carrying out preliminary site measurements and surveys, the Philips team provided a functional design specification and worked closely with SPIE in optimizing the design for ease and speed of installation – as well as commissioning on site. Factory acceptance testing demonstrated equipment suitability prior to installation. Philips also carried out the commissioning and relevant Site Acceptance Testing.

“In all of the recent extensive tunnel refurbishment projects good communications and teamwork has been essential in meeting the client’s expectations; on time delivery and to budget, with minimum disruption to motorists. The collaborative approach of Philips Lighting and their specialist expertise, has proved invaluable to the success of all the A55 projects,” Steve Henry concluded.





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