The Relighting of Coventry Cathedral

by Bruce Kirk

Background to the Project

In preparation for Coventry Cathedral's 50th Jubilee in 2012, the Dean and Chapter has commissioned a number of improvement projects to revitalise St. Michael's Cathedral and prepare it for life over the next fifty years. One of the first projects was a comprehensive internal relighting project which was completed in time for Easter 2010. The scheme was designed by Bruce Kirk of Light Perceptions who also acted as project manager and CDM Co-ordinator throughout the planning and installation phases of the work.

The new Cathedral was built at right angles to the ruins of the old Cathedral, devastated during the Luftwaffe's bombardment of Coventry in November 1940. The high altar lies to the north and therefore the glazed screen at the liturgical west end is to the south, allowing daylight to flood into the building in a manner quite unique in English cathedrals [Fig 1].

The lighting of cathedral spaces is a complex study which spans almost a thousand years. Elements of this story form a useful preface to the understanding of artificial lighting at Coventry.

Saxon and Medieval cathedrals began as dark, mysterious and solitary spaces lit only by narrow windows, great fires, flaming torches and candles. As building techniques developed and larger window openings became easier to build, architects learnt more about how to use natural light to illuminate an interior, relying less on flame and extending the hours in which these magnificent buildings could be more purposefully occupied. In the 17th century Sir Christopher Wren significantly changed the way in which daylight was used. In building St. Paul's he used almost every opportunity to harvest natural light to furnish the interior.



The "technology" of artificial lighting began to develop about the same time, although the ancient Chinese had learnt to ignite natural gases some centuries before. The 17th and 18th centuries saw the increasing use of natural fuels for lighting including whale, nut and olive oils. In 1792 William Murdoch used coal gas to light his house in Cornwall. Gas lighting developed throughout the 19th century and became widely used,

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particularly for street lighting and then increasingly in commercial and domestic properties.

Davy invented the first electric light bulb in 1809, but it was not until some eighty years later when both Swan and Edison developed the filament lamps that came into more common use in the early 20th century. The early 1900s saw the invention of the mercury vapour and sodium lamps which, by the 1930s, became the norm for industrial and street lighting applications.

So in 1951 when Basil Spence began to develop his vision for St. Michaels Cathedral, he would have been only one of a handful of architects challenged with building a new cathedral with electric lighting in mind. Nonetheless the development of lighting technology was only in its infancy and the tools available were rudimentary, and whilst some alterations and improvements had been made since the consecration, the lighting remained essentially as it was originally conceived for almost 50 years.



The Effect of Daylight

The effect of daylight at Coventry is probably more dramatic than at most other cathedrals and no study of its artificial lighting could be undertaken without an understanding of the true effect of daylight on the interior of the cathedral. The transition from the wide expanse of clear glazing at the south facing west screen, to the deeper colours of the stained glass in the nave and smaller openings of the clear glazed Lady chapel windows means that, even when the sun is perpendicular to the west Screen, the amount of natural light



reaching the east end is far less than that which enters at the west [Fig 2].

The un-reflective surfaces of the grey-white roughcast stone, (originally chosen to set off the stained glass) further impede the flow of light through the space. By contrast the effect of daylight through the stained glass onto the Tablets of The Word is quite extraordinary [Fig 3].

The overall result presents a near-impossible challenge to balance the artificial light against often dramatic changes in the effects of daylight. The essential problem is therefore one of managing or accepting dramatic, yet sometimes uncomfortable levels of contrast. The English architectural historian, Alec Clifton-Taylor (1907-1985), observed that "The lighting is not entirely successful; there is too much daylight at the entrance end, while too little reaches the high altar and the tapestry above it."

The Original Lighting Scheme

Spence lit his new cathedral simply, relying largely on downlighting, leaving much of the cathedral's modern artistic riches to be lit by daylight or indirectly by simple floodlighting. Whilst some spotlighting was used towards the east end, the fittings were small and ineffective. Most fell into disrepair and were not maintained or replaced.

The lighting for the congregation and choir was provided by a series of some sixty downlights, let into the ribs of the nave ceiling. Originally these used 1000W tungsten lamps which, when first turned on, began to scorch the ceiling timbers. The luminaires were quickly modified with a length of ducting to separate the heat from the timber [Fig 4]. As an early energy saving effort a third of the lights were disconnected and the remainder upgraded to 400W mercury vapour lamps. The price of the energy initiative would have been to replace the warm light of the tungsten lamps with a cold, harsh wash of light more suited to a warehouse.

Graham Sutherland's tapestry was illuminated by floodlights mounted on a gantry at the front of the ceiling panels. Traditionally the face of Christ was lit continuously which presented a significant maintenance problem with the short-life lamps of the period. Again a cold white metal halide lamp was added although the effect was typically harsh. The Lady chapel which lies at the foot of the tapestry was also lit by floodlights at high level, although these may have been some of the 33% of downlights removed from the nave [Fig 5].

Reading light over the canons stalls in the choir was provided by mains voltage spotlights fitted into the overhead tubes which turned out to be brass shell cases. Heat from the lamps caused the wiring to deteriorate and presented another significant maintenance problem. ≥66

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Spotlighting for the font was concealed behind narrow windows in the spiral staircase leading from the nave floor to the roof. This would have struggled to create a contrast in front of the brilliant baptistery window.

Elsewhere much of the remaining lighting consisted of recessed fluorescent striplights let into the ceiling behind metal grills. This provided low level illumination of the Chapel of Gethsemane and the access routes at the east end of the cathedral.

The BBC was consulted by Spence during the design stages and saw the building as an ideal location for the filming of concerts and community events – central to the post war regeneration of the city. Realising that lighting positions for what were then large and heavy film units were very limited, BBC Engineers devised a series of lighting bars. These run along the two sides of the nave on motorised winches diverted to motors positioned centrally above the nave [Fig 6]. Each of the ten lighting bars was wired with two 50A circuits, providing sufficient power for the 5kW & 10kW lighting units in use at the time. A lighting control gallery was built part way up the south west staircase from where the circuits and winches were remotely operated.

The BBC donated a small stock of large theatrical spotlights to the cathedral which were progressively put into use for an increasing variety of purposes. Eventually they became used



for almost all services and, after a number of failures in the ceiling downlights, were used to provide general lighting for visitors during the day. The spotlights could be moved from bar to bar to meet the needs of different services or events. However, the lighting bars do not extend to the rear half of the nave and therefore could not be used to increase the light level near to the west screen.

The Relighting Project

When the project was first commissioned initial discussions with staff and clergy gave rise to the following comments.

"it never seems bright enough - wherever you are"

"the tablets of The Word are important and should be clearly illuminated"

"there is insufficient light in front of the west screen for our early morning services"

"the lighting in the chapel spaces is very poor"

"these old light fittings are at the end of their life"

"I have never seen these lights working"

In the fifty years since the start of the rebuilding of the cathedral, lighting technology has developed enormously. Modern light sources are more efficient, longer lasting and easier to control with methods such as electronic dimming. There are infinitely more light fittings (or luminaires) designed for many differing applications. Perhaps because of the complexity of the technology and ever increasing choice of fittings; the discipline of lighting design is becoming recognised as a craft in its own right.

Before the detailed design work began a mock-up of a number of possible lighting elements was carried out. This was to demonstrate the suggested improvements, test the ability of new light sources to be effective against the prevailing daylight and to answer some of the initial comments from the staff.

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Given the architectural and liturgical significance of this 20th century cathedral, it was clear that the relighting of the worship space should make the most of the available daylight to enhance the natural elegance of the space and the beauty of its interior. The artificial lighting should complement this with elements designed to improve the visibility of the east end and provide additional flexibility to support more diverse worship in other areas of the cathedral. There was an obvious requirement to improve the general lighting for the congregation, the task lighting for the choir and the visibility at key access points. Underpinning all of this was the need to be able to use light to support and enhance the worship and interpretation of the cathedral in an appropriate, efficient and effective manner.

Graham Sutherland's tapestry of Christ in Glory presides over the worship of the cathedral community and remains the visual focus for any visitor - or passer by. The Face of Christ is now illuminated for 20 hours every day and the other elements of the new lighting scheme all flow from this centrepiece [Fig 7]. The clear need for long life and colour stable light sources projecting over 40m in places meant that even the most modern LED light sources would not be suitable. Fluorescent, halogen and xenon sources were also discounted for various

LIGHTING SYSTEMS COMMERCIAL

Commercial Lighting Systems Ltd is very pleased to have been specified on the prestigious project to re-light Coventry Cathedral. Supplying in conjunction with the design and specification by Bruce Kirk of Light Perceptions. Commercial Lighting Systems Ltd supplied the MEYER luminaires to the interior of the Cathedral.

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reasons; eventually CDM or metal halide light sources became the obvious first choice.

As well as the constant illumination of the Face of Christ the tapestry is floodlit from high level allowing greater visibility in the hours of darkness. The Lady chapel which lies at the foot of the tapestry is also lit by narrow beam CDM spotlights at high level [Fig 8].

Spotlighting for the high altar [Fig 9], font [Fig 10], pulpit, lectern and other key liturgical features is also provided by spotlights using 150W CDM light sources. Many are positioned at high level above the stained glass windows of the nave and project over distances of up to 40 metres.

Spotlights at lower levels light the organ pipes [Fig 11] and The Tablets of the Word using 70W and 35W CDM-R lamps. The reading lights over the canons stalls, made from WWII shell cases, have been fitted with mains voltage 7W LED lamps.

The main downlights, set above the nave ceiling, were upgraded to 315W Philips CDM Elite lamps. This change proved even more effective than predicted, with a dramatic improvement in the general lighting achieved by using half of the original fittings. Re-zoning of the fittings allows graduated increases in ambient light selectable for services and events in any part of the cathedral. ≥ 68



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PROJECT TEAM

Client: Dean & Chapter of Coventry Cathedral

Lighting Consultants & Project Managers: Light Perceptions

Contractors: Steane Electrical

Luminaires: Commercial Lighting Limited & Mike Stoane Lighting Limited

Luminaire Restoration: Great British Lighting Limited

Theatrical Lighting & Lighting Controls: ETC Europe The CDM spotlighting provides for most uses of the cathedral including the regular services and events. Preset lighting scenes are accessible from a series of wall stations at convenient locations around the building.

The motorised lighting bars on each side of the nave presented a different type of challenge. The two 50A supplies on each bar would be too restrictive for modern uses but it proved unfeasible to rewire them with multiple dimmable circuits. Maximising the flexibility was important so each bar was fitted with its own 6-way dimmer and relay facility controlled via a radio DMX control system. This allows a total of sixty independently dimmable lighting circuits to be controlled from a theatre lighting desk. With a new stock of theatre profile spotlights and wash lights this provides extensive facilities for larger services, concerts and other events. The sixty theatrical circuits can also be programmed onto presets by the lighting control system.

Other elements of the scheme included the relighting of the intimate Chapel of Gethsemane [Fig 12], the entrance to the chapel of Christ the Servant and the Swedish Steps which house The Charred Cross which was salvaged from the ruins on the night of the bombing [Fig 13] and the steel wall of the Action Reconciliation Service for Peace [Fig 14].

Managing the Installation

Like all cathedrals Coventry has a busy programme of daily services, educational tours, concerts, lectures and other events. The installation of the new lighting system had to be managed carefully to ensure that the day to day work of the cathedral could continue unhindered as the transformation took place. Once a contractor was appointed a phased programme of works was agreed beginning in October 2009 with initial works completed in time for Advent Sunday. This included the installation of the new theatre lighting which provided all of the lighting for the busy Christmas period before the second phase of works between Christmas 2009 and Easter 2010.

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The works were undertaken by Steane Electrical whose flexible approach, and close liaison with the scheme designers and Cathedral team was a significant factor in the smooth implementation and overall success of the installation.

All of the new lighting is controlled by a preset dimming and switching system with twelve basic presets. Manual control of all of the new lighting – including the theatrical fittings is also possible with a theatre lighting console – an integral part of the control system which can also record new presets for services and events.