Part 4 Competence, Experience and Responsibility (2000 words)

Introduction and Overview

Since graduating with a B(Eng) Hons Civil Engineering degree in 1987, I have worked within the field of Engineering Design consultancy, predominantly
'Highways' related. My 22 years in engineering started as a Graduate Bridges Engineer and proceeded into Highways Design before joining the specialist Lighting/Electrical team in 2000. It has also included 14 months of dedicated site work (M3 Bassett to Compton 1991/92) and 5 months working on the Heathrow Express Tunnel (post-collapse).

Whilst working in a Highways Design office for XXXXX Ltd I have been able to develop a variety of skills working on various projects at different stages of development; from feasibility, design and documentation, through to construction and maintenance.

In 2000, in recognition of my improved technical and professional competence through design work, contract preparation and project management, I took on the role of Lighting Design Team manager in XXXXX's Highways division in Winchester. This brief report on my Competence, Experience and Responsibility will now select various projects I have worked on and highlight the important issues. Note that these are in reverse chronological order.

Lighting Research Work (2006 – 2009)

Highways Agency

In 2005, following a period of study and research [A1] into *'Passively Safe Lighting'*, I presented on the subject to the ILE Surveyor conference [E4] in London, which included attendance from the Highways Agency (HA). Soon afterwards, I bid [C1] for and secured some work with the HA (Safety, Strategy and Research directorate) in assisting them with their Energy Efficiency strategy. Thus far I have project-managed [C2] two major research tasks and one major implementation task for HA SSR through the MM Highways Consultancy Group. The tasks are entitled:

1. The Whole Life Cycle Code of Practice for Road Lighting on the Strategic Road Network (DMRB/TA96) including Environmental considerations and electrical design requirements. (Started in March 2006)
2. Variable and Part-Night Lighting on the Motorway network (Started in August 2007)
3. Implementation of Part-Night Lighting at 6no. motorway sites across the south of England. (Started in March 2008)

ECUK – A1
Learning new theories and increasing knowledge
ECUK – E4
Involvement with ILE and participative attendance at Conference.
ECUK – C1
Preparing a bid and determining tasks, resources and risks.
ECUK – C2
Managing quality cost and time.

Task 1 has involved putting together a Technical Advice (TA) standard for lighting practitioners involved with HA commissions, giving good practice guidance for all stages of a lighting installation including: Feasibility [B2], Design (Lighting and Electrical), Manufacture and Supply, Installation, Commissioning and Testing, Maintenance and Operation and Decommissioning and Disposal [B3]. There is also an entire chapter devoted to Environmental Considerations [E3], which provides guidance on best options from an environmental point of view. My experience gained in highway lighting projects through option assessment [B2], value management [B2] and into maintenance operations has been invaluable in completing this Standard. It is still in draft but is due to be published in 2010. I talked on the subject [D2] at the ILE Dublin conference in September 2007 and the Low Carbon Lighting conference in London in October 2007.

Task 2 required research [A2] into available technologies for variable lighting and part-night lighting for possible introduction onto the motorway network. I managed the production of an Engineering Framework Report [D1] which has been used as the basis for writing several guidance documents on site selection, equipment specification and economic appraisals using TA49. During 2006 and 2007 it has become clear that dimming gear technology is still insufficiently developed for the motorway network. The work in Task 2 has led onto Task 3.

Task 3 was the implementation task, which was set up to install the Part-Night lighting equipment onto the HA's motorway network. The equipment was sourced and specified [B1] to enable midnight switch-off (for 5 hours) at six selected sites across the south of England. Installation and activation was completed between March 2009 and June 2009. Features of the installation include:

- Remote monitoring and over-ride capability (in the event of an incident between midnight and 5am where the local Road Workers, Traffic Officers and/or emergency services want the lighting restored)
- Reverting to conventional photocell operation (in the event of component failure)
- Data logging on a webserver.
- Part circuit control (to enable some lighting on the circuit to remain on such as at the interface with a local junction) [B2, B3]

Another task **(Task 4)** subsequent to task 3 has recently been awarded by the Highways Agency and this involves managing the project [C2] to introduce a Central Management System (CMS) onto the six switch-off sites, in order to more accurately measure electrical energy usage, to the satisfaction of UMSUG (Unmetered Supplies User Group).

UK Lighting Board (DfT) / CSS / TfL / HA

In December 2007 I prepared a bid [C1] for two projects of the five which were being offered through the DfT research budget and I was fortunate enough to win the project entitled, 'Review of Luminaire Maintenance Factors (LMF's)'. The objective of the project was to determine the appropriateness of LMF values as applied in lighting designs [B3]. The project initially involved literature research and questionnaires sent to various local authorities to determine

ECUK – B2
Including assessing options and whole life costs.
ECUK – B3
Advising on the design process into implementation.
ECUK – E3
Advising on roadlighting and the environment.
ECUK – D2
Presentations, preparation and delivering.
ECUK – A2
Researching the market and understanding the product.
ECUK – D1
Effective communication through the report.
ECUK – B1
Provision of a performance specification.
ECUK – B2
Conceptual designs for the hardware and software.
ECUK – B3
Critical success factors included automatic switching, over-rides and data transfer.
ECUK – C2
Monitoring project budget and payments.
ECUK – C1
Resources included sub-consultants. Aware of client budget in the fee.
ECUK – B3
Aware of the effect of LMF on lighting design.

current practice. This was followed by laboratory testing of the lighting performance (lumen output) of various luminaires removed from local authority sites, with variables including; protector type, mounting height, environmental zone, age of installation, time since last lamp change and clean [A2]. The project conclusions, which I presented [D2] at Local Authority Lighting (London) on 19 June 2008 indicate that BS5489 seems to underestimate luminaire performance, and hence LMF's are too low. The result of this can be that local authority lighting designs could be made more energy efficient by about 9%.

ECUK – A2
Appraisal of research data from LAs and testing.
ECUK – D2
Presentations, preparation and delivering. Leading to further presentations at ILE Technical Seminars.
ECUK – A1
Developed a thorough understanding of lighting design and management principles trough formal and on-job training.
ECUK – B2
Value engineering, options assessment using Whole Life Cost Analysis.
ECUK – C2
Leading and managing the tasks.
ECUK – D1
Communicating to the team through meetings and by email.
ECUK – D3
To ensure productive working relationships.
ECUK – B2
Options, preliminary designs and assessment using WLC analysis.
ECUK – A2
Multi-disciplinary work in a complex project. Use of best practice techniques to compare options on one spreadsheet.

Area 3 Commission (2000 – 2008)

In 1997, XXXXX was awarded the Highways Agency's Area 3 (Strategic Road Network in South Central England) Maintenance Agent commission and in 2000, I commenced my involvement in Area 3 by becoming the Design Team leader for the Highway Lighting team. As team leader I had responsibility for managing the team and for managing various Area 3 projects, ranging in value from £50,000 up to £5,000,000.

In order to ensure I had the right credentials for the role of team leader, I identified and attended several management type courses including 'Building and Leading Teams', 'Reviewer Training' and 'Interviewer Training'. Additionally, to ensure that I had sufficient technical knowledge I attended Lighting Design courses given by Urbis and an Electrical Principles course run by the ILE in Rugby [A1]. During the course of managing projects I developed experience and knowledge of Exterior Lighting design and specification [A1].

Through my work in the Area 3 Commission I was able to gain further understanding of many aspects of the design function such as Feasibility, Option Analysis and Value Management [B2]. In addition, being employed by the Maintaining Agent I became far more knowledgeable about inspection, maintenance and disposal issues particularly in respect of Highway Lighting [A1].

I have project managed [C2] various lighting schemes (some are outlined below) and this has included monitoring and controlling deliverables, invoicing and budgets. For team management, it has also been necessary for me to lead team meetings [D1] and to allocate work to the team depending on ability and workload [D3].

A27 Hilsea/Warblington Lighting Maintenance Scheme (2005/2006)
The lighting equipment along 8km of the A27 trunk road near Fareham, Hampshire was identified as needing major maintenance. This scheme provided me with the opportunity to manage the scheme feasibility and to present options at a Highways Agency Value Management workshop [B2]. Seven options were considered for the scheme ranging from 'Do-Minimum' (continue with ad-hoc maintenance) to 'Full Replacement' with lighting columns in new positions and to an improved spacing.

Due to the length of the scheme and the need to incorporate other costly disciplines [A2] as well, such as drainage replacement, barrier replacement and environmental works, the client requested that the proposed works be split

into four phases. The phase lengths were chosen for their different road layouts, in particular the numbers of lanes, which varies from 4L, 3L and 2L along the 8km and the existence of a hardstrip.

The preferred option was for 'Full Replacement' of the lighting equipment with the columns mounted in the central reserve on concrete barrier. Although the scheme was not the cheapest capital cost option (due largely to the concrete barrier) it still produced the lowest Whole Life Cost due to the longer life of concrete barrier and the lack of safety fence protection for columns in the verge [B2]. It also allowed for improved safety clearance alongside the carriageway to the concrete barrier. For the design, the twin central arrangement enabled the peak of the distribution to fall nearer the faster offside lanes rather than on the hardstrip [B3].

Environmentally, the preferred scheme was beneficial because it minimised light spill into the verges and reduced the need for intrusive works in the verge. It also managed to reduce upward light by removing SOX lanterns and replacing them with flat glass SON lanterns [E3].

From a maintenance point of view, the final scheme proved advantageous in that it avoided maintenance works in the narrow verges on embankment and even though it requires offside lane closures to access the twin central lighting, it does mean that bulk lamp changes and the like, can be undertaken in 'one sweep' [B3].

I do recognise however that for other locations it may be necessary to opt for a verge (opposite or staggered) arrangement and this is what helped in developing a lighting maintenance scheme along the A3 near Guildford in Surrey (Wooden Bridge).

A34 Peartree Interchange, Oxfordshire (2004-2005)

In 2004, I was involved in a Highways Agency Area 3 scheme to improve safety at a major trunk road junction near Kidlington, Oxfordshire. The A34 dual carriageway in Oxfordshire has many grade-separated junctions and the one at Peartree Interchange, between Oxford and Wendlebury, had been identified as attracting accidents above the national average. One of the accident mitigation measures was directed towards the unprotected steel lighting columns on the slip roads. I looked at several options [B2] including:

- Installing Safety fence to protect the columns (at non-standard clearance)
- Replacing with steel lighting columns and installing safety fence (at standard clearance)
- Replacing the steel lighting columns with passively safe lighting columns (crash tested polymer-composite columns with crash-friendly electrical connections)

The preferred option at £16,000 (approx.) per slip road, was actually the cheapest in terms of capital cost. In addition, there were advantages gained

ECUK – B2
Feasibility and value management assessment.
ECUK – B3
Following the design process with full evaluation.
ECUK – E3
Reduced environmental impact in a sensitive area. Worked with environmental engineers to determine impact of the works.
ECUK – B3
Ensuring that consideration is given in the design to maintaining the lighting.
ECUK – B2
Options assessment and incorporating the costs of new 'Passively Safe' material. Safety benefits through reduced impact in collision, a lack of safety fence to strike and rebound into other traffic, and reduced maintenance and hence reduced exposure for road workers. Maintenance benefits due to longer life material and lighter weight.

through reduced maintenance (longer life columns and no corrosion) and easier replacement (in the event of a crash). The columns were approved for use by the Highways Agency and site works were completed in March 2005 [B3].

ECUK – B3
Approval by HA following interpretation of results and performance analysis.

The installation of the passively safe polymer composite columns (tested to EN 12767) represented the first use on a UK Trunk Road and gave me the ideal opportunity to tell others of the safety and maintenance benefits through various conferences, seminars, ILE technical meetings and office talks. Much of my CPD has come from this presentational work [E4].

ECUK – E4
Updating the ILE with national issues at appropriate venues.

A27 Arundel Lighting Maintenance Scheme (2000/2001)

In 2000, the lighting equipment along 4km of the A27 trunk road around Arundel in West Sussex was justifiably in need of major maintenance. The scheme included the replacement of all of the lighting stock (columns and SOX lanterns) including the electrical cabling and distribution pillars. The replacement scheme was designed using BS5498:1992 and TD34 'Design of Trunk Road Lighting' and comprised an opposite arrangement of 150W SON's for this single carriageway trunk road.

ECUK – E1
An understanding of the contract type adopted within this HA Maintenance Contractor commission.

With a value of just over £360,000, the scheme needed to go out to tender as works for the Area 3 Term Maintenance Contractor were restricted to a threshold of £250,000. Using the guidance available for the NEC Contract type B, I managed the delivery of all of the tender documentation which amounted to 7no. volumes [E1]. The Main Contractor, Colas, completed the works in good time and to within 10% of the final works estimate [B3].

ECUK – B3
Engaged closely with the site team to ensure that the design was followed through to implementation.

A significant aspect of this scheme was the impact on the environment and in particular the requirement to mitigate the night-time visual impact in the vicinity of Arundel Castle. To this end, I assisted with the production of an Environmental Impact Assessment report, which included Isolux plots, information about flat glass lanterns and photomontages. For the final scheme, the columns were painted green and were limited in height to 2m above the surrounding treeline [E3].

ECUK – E3
An awareness of the effect of reducing column height and the potential for closer spacings.

A13 Thames Gateway Design Build Finance Operate (1992 – 1999)

New Roads and Streetworks Act

In 1992, I commenced work on the A13 Thames Gateway project in East London and worked extensively on the DBFO contract document preparation. This very large project (£250M) also enabled me to gain first-hand experience in coordinating Statutory Undertakers works. Over time, I became technically proficient in matters pertaining to the NRSWA and was even given responsibility to speak at a regional ICE meeting [E4] on the subject. I also became the office champion for SU Diversionary works as applicable to the NRSWA Code of Practice [D2].

ECUK – E4
Involved with the professional body to promote learning on the subject of SUs. Developed good appreciation of SU works through on-the-job learning

ECUK – D2
Presenting to ICE meeting.

The competence gained in NRSWA provided a good platform for future understanding of underground plant and equipment and how it can have a

significant impact on a project in terms of delay and cost.
Working on the A13 project I was able to coordinate the SU works and include respective requirements within the contract documentation. At the time, it was helpful for me to visit A13 sites in Tower Hamlets, Canning Town and Newham boroughs whilst construction took place. I was able to gain better appreciation of the designed and specified work as it was being installed. Being aware of the juxtaposition of SU plant and equipment and the potential costs of their relocation has helped me to fully appreciate the importance of underground and above ground services [B3].

ECUK – B3
Site visit s helped to develop a good awareness of engineering problems and how appropriate design practice can apply.
ECUK – D3
Development of good working relationships and production of meeting minutes.

I was able to gain experience of liaison with SU company representatives in order to discuss their requirements and to prepare for the agreement of cost estimates. I even arranged and chaired a meeting involving all relevant SU companies in East London and this helped to reduce design costs on the project [D3].

Column Pad Foundation

Along the A13 in East London, it is common to find a considerable amount of SU plant including gas, telecoms, electricity and water (mains and sewer). Added to this it is usual to include highway lighting equipment, cabling and columns.

ECUK – B3
Application of appropriate theory and practice to overcome an engineering problem.

For one site, near the junction of Commercial Road and Butcher Row the new lighting column position was severely restricted by SU plant. My solution was to design a pad foundation at reduced depth in order to allow for the SU equipment to run beneath. This avoided the possibility of expensive and protracted service diversions [B3].

M3 Bassett to Compton Improvement (1991-1992)

My site experience for 14 months in 1991/1992 enabled me to develop a sound understanding and appreciation of major construction activities. I joined the site as a Graduate Engineer and moved between different departments, including the Section Engineers office, the Quantity Surveyors team and the Bridges team. Whilst on site I was able to gain first hand knowledge of construction works (including temporary works) and follow the construction sequencing and traffic management layouts. I also assisted with a full review of the contractor's Cl.14 works programme [B1].

ECUK – B1
An early consideration of a contractor programme showing how activities were programmed and linked.
ECUK – E1
Use of the older style Conditions of Contract adopted in Civil engineering projects.

The type of contract used for the M3 Bassett to Compton scheme was the old style ICE 7th Edition, a re-measurement type contract which required the Engineer to agree measurement of the built scheme with the Contractor and to agree payment against tendered rates [E1]. My time with the QS team proved to be very useful for understanding the processes required before submitting the agreed monthly valuation to the Client.

This type of contract can lead to adversarial relationships between the Engineer and Contractor and I can appreciate why most of the industry moved to the New Engineering Contract. A benefit resulting from the 1994 Latham Report.