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LET THERE BE LIGHT

The daylight factor: should clients ignore the professionals?

CIBSE JOURNAL

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Blindingly obvious?

It's a familiar tale: the sun is blazing through the windows, but the blinds are down and the lights are on; what else are building occupiers to do when natural daylight causes glare and yet their colleagues at the furthest end of the room are practically working in the dark? Academic Kit Cuttle believes he may have an answer: ignore the lighting profession and the daylight factor when it comes to designing inhabitable spaces. Read the thinking behind his argument – and the opposing view of John Mardaljevic – on page 14.

Peter Boyce continues the theme, examining the role lighting criteria play in delivering good quality lighting. According to Boyce, the client and designer should have an ambition to achieve more than simply designing a space that avoids complaints from its occupants. Learn more about his ideas on the obstacles and behaviours that can make or break good quality lighting on page 4.

> Ignore the lighting profession and the daylight factor

And Andrew Bissell explains how the new Priority Schools Building Programme heralds a step change in lighting for schools. Turn to page 8 to find out why Bissell thinks the lighting community is starting to give more credence to daylight and measured weather data than the daylight factor.

Carina Bailey, deputy editor

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THE MEASURE OF QUALITY

Just how do we define good lighting? asks Peter Boyce

Grosvenor Hill, a spec office development in Mayfair, with lighting by Hoare Lea

What role do lighting criteria play in delivering lighting quality? Before any attempt can be made to answer this question, it is necessary to define these terms.

Defining lighting criteria is easy. A lighting criterion is some photometric or colorimetric quantity recommended as a basis for design. The Society of Light and Lighting (SLL) *Code for Lighting* is full of them.

However, defining lighting quality is not so easy. A number of different approaches have been suggested by the academic community: single-number photometric indices calibrated by subjective responses (Bean and Bell, 1992); the results of a holistic design process based on lighting patterns (Loe and Rowlands, 1996); lighting conditions that have desirable impacts on task performance, health and behaviour (Veitch and Newsham, 1998), through to lighting that enhances the ability to discriminate detail, colour, form, texture and surface finishes without discomfort (Cuttle 2008).

Despite these attempts to focus, the most universal definition remains the extent to which the installation meets the objectives and the constraints set by the client and the designer. The objectives can include enhancing the performance of relevant tasks, ensuring visual comfort, creating specific impressions and generating a desired pattern of behaviour, as well as minimising energy consumption and operating cost.

The constraints are usually the budget, the time available for completion of the work and, sometimes, restrictions on the design approach that can be used.

To many people, defining lighting quality in this way must be a disappointment. It is both mundane and obvious. It is not expressed in terms of photometric measures, but rather in terms of the impact lighting has on more distant outcomes. There are three arguments in favour of such an outcome-based definition of lighting quality, rather than any of the alternatives based directly on lighting variables.

The first is that lighting is usually designed and installed as a means to an end, not as an end in itself, so the extent to which the end is achieved becomes the

> At the moment, good quality lighting most frequently occurs when a talented architect and a creative lighting designer work together – neither given to slavishly following numerical lighting criteria

Left and right: 7 More London (PwC HQ), a 2012 Lighting Design Award winner. Architecture by Foster, lighting by BDP Lighting

SLL/CIBSE IRELAND INTERNATIONAL LIGHTING CONFERENCE

This feature is based on the address Peter Boyce will be giving as one of the four keynote speakers at the SLL/CIBSE Ireland International Lighting Conference in Dublin in April 2013. Entitled 'Lighting Focus on Energy, Standards and Quality', the conference will also feature three other keynote speakers: SLL president Iain Macrae will head the energy session; Peter Raynham the standards session; and Mike Simpson new technologies and innovations.

Venue: Croke Park, Dublin. The 80,000 seater stadium is home to the Gaelic Games and was famously visited by the Queen during her Diamond Jubilee.

Date: 14 April 2013.

Cost: Delegate fee is €105. There is an early booking discount (by 28 February) of 10%, as well as a further 10% discount for CIBSE and SLL members. Members of supporting organisations will also get a 10% discount.

More details are available from **kevin.kelly@dit.ie**

measure of success. The retailer does not care about lighting per se, but only about lighting as a tool for increasing sales.

The second is that what is desirable lighting depends on the context. Almost all the aspects of lighting that are considered undesirable in one context are attractive in another.

The third is that there are many physical and psychological processes that can influence the perception of lighting quality (Veitch, 2001a and b). It is this inherent variability that makes a single, universally applicable recipe for good quality lighting based on photometric quantities an unreal expectation.

If this is so, what is the purpose of the recommendations given in the SLL *Code for Lighting*? The answer is to eliminate bad lighting. The recommendations do this by making sure that the amount, spectrum and distribution of light provided is enough for whatever the visual system is likely to be asked to do, ensuring that this light will be provided in such a way that it does not cause visual discomfort.

Is this enough to ensure good quality lighting? The answer is yes, but only if all that the client and designer have in mind is to avoid complaints from occupants. Unfortunately, this appears to be the limit of ambition of many clients and designers, as is evident to anyone who visits many modern workplaces. Or am I being too hard on the designers of such places? When it comes to many workplaces, at the design stage, the designer does not know what work is to be done there, where it is to be done, what the furnishings will be like or even what the surface reflectances are to be. In the face of such ignorance, eliminating the bad is about the best that can be expected and applying the SLL recommendations is enough to ensure that the bad is banished.

This lack of specific information also goes a long way to explaining the persistence of the horizontal working plane as a basis of design. Despite the use of 'task plane' rather than 'working plane' in recent recommendations – and the protests of eminent lighting professionals – the fact is that the horizontal working plane is still the plane of choice for simple lighting calculations. This is because, in the absence of any other information, applying the illuminance recommendations to a horizontal working plane and assuming high-reflectance room surfaces is usually enough to guarantee adequate illumination for most forms of work.

But what happens if the client and the designer have greater ambitions than simply avoiding complaints, and are willing to supply additional information about the nature and location of the work, and the furnishing and

Top: Lighting at Grosvenor Hill, designed by Hoare Lea

Inset: The St Botolph Building in London, designed by Grimshaw as a spec office development, with lighting by Speirs and Major

finishes of the space? Good quality lighting can then be delivered, provided attention is paid to context, fashion and opportunity.

Context is important because what would be considered attractive lighting for an office seems unlikely to be so attractive in an intimate restaurant. Fashion is important because we often crave the new to provide interest and variety. There is no reason to suppose that lighting should be any different in this respect from most other aspects of life. As for opportunity, that is partly a matter of technology and partly a matter of being in the right place at the right time.

And what is the right place? An eminent lighting designer, JM Waldram, once said: 'If there is nothing worth looking at, there is nothing worth lighting.' So the right place is presumably a place that contains something worth looking at. Also, given that to be really good the lighting has to be matched in some way to the particular environment, each lighting solution would be specific and not generally applicable.

This combination of fashion and specificity suggests that the conditions necessary to produce good quality lighting are liable to change over time and space. At the moment, good quality lighting most frequently occurs when a talented architect and a creative lighting designer work together – neither given to slavishly following numerical lighting criteria. This should not be taken to mean that numerical lighting criteria is irrelevant. Its purpose is to act as a baseline so that bad lighting is eliminated.

The interesting question then becomes whether or not lighting criteria can be developed to bridge the gap between eliminating the bad and creating the good, particularly where the amount of information, the time available for design and the budget are all limited. If common lighting practice is to advance, some thought will have to be given to answering this question. **CJ**

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● Author and academic **PETER BOYCE** is the technical editor of *Lighting Research and Technology*

> This inherent variability makes a single, universally applicable recipe for good quality lighting based on photometric quantities an unreal expectation

SLL PUBLISHES NEW GUIDE

The Society of Light and Lighting (SLL) has published its new *SLL Guide to Limiting Obtrusive Light*, which will be available later this month. While outdoor lighting is important for people's work, safety and leisure, it can cause issues of sky glow, light trespass or glare, which can affect health if sleep is disturbed, and affect the visibility of the stars and the behaviour of flora and fauna. The guide provides further insight into the factors and considerations around obtrusive lighting. SLL's accompanying *Factfile 7: Design and Assessment of Exterior Lighting Schemes*, will also help designers consider if outdoor lighting is actually necessary. The guide is available at **www.cibseknowledgeportal.co.uk**

IN A DIFFERENT CLASS

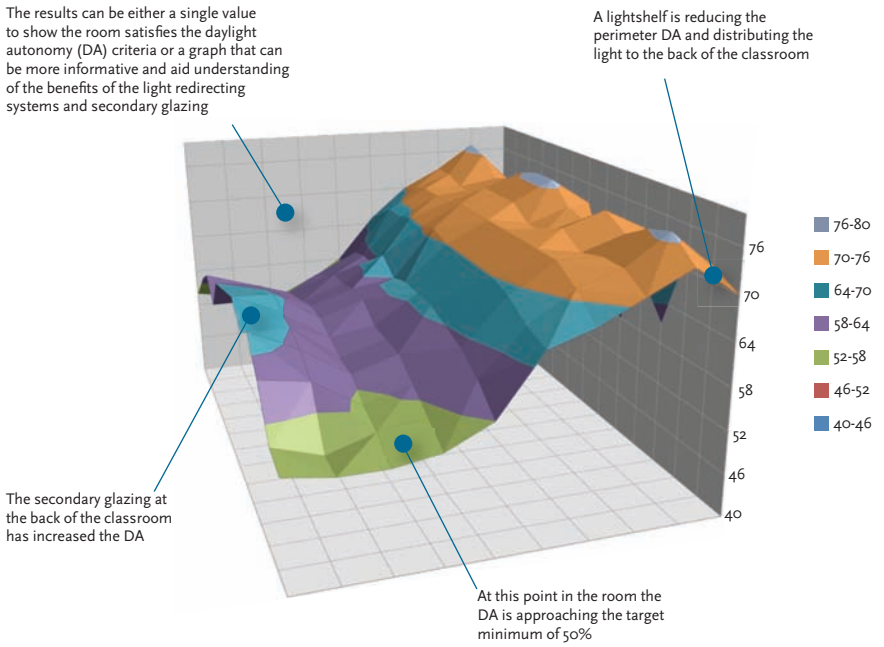
The latest Priority Schools Building Programme marks a step change in lighting for schools, says **Andrew Bissell**

October saw the public launch of the Priority Schools Building Programme (PSBP) and the *Facilities Output Specification: Generic Design Brief* (FOS). The underlying principle of the PSBP is to target the schools most in need of new buildings and facilities – in total, around 261 have been identified. The purpose of the FOS is to set the new criteria for the internal and external spaces. It specifically covers form and structure, fabric and materials, environmental requirements, building services, safety and security, and operation and maintenance.

The lighting community is discussing, with increasing frequency, how lighting designers should take greater ownership of the subject of daylight, change the BREEAM oversimplification of daylight design, move away from daylight factors and in their place use measured weather data. That, and ending the obsession with crunching numbers, so that lighting designers think more about people's needs and their tasks.

To satisfy these discussions the FOS brings together the four components of lighting design in one section: daylight, electric light, lighting control and maintenance. Furthermore, lighting design is the primary heading in the environmental requirements section, a reflection of the value placed on daylight within the learning

Daylight analysis results



environment. This emphasis on daylight is well documented in the Hershone Mahone Group studies, among others. Of equal importance is that lighting is not included within the building services section.

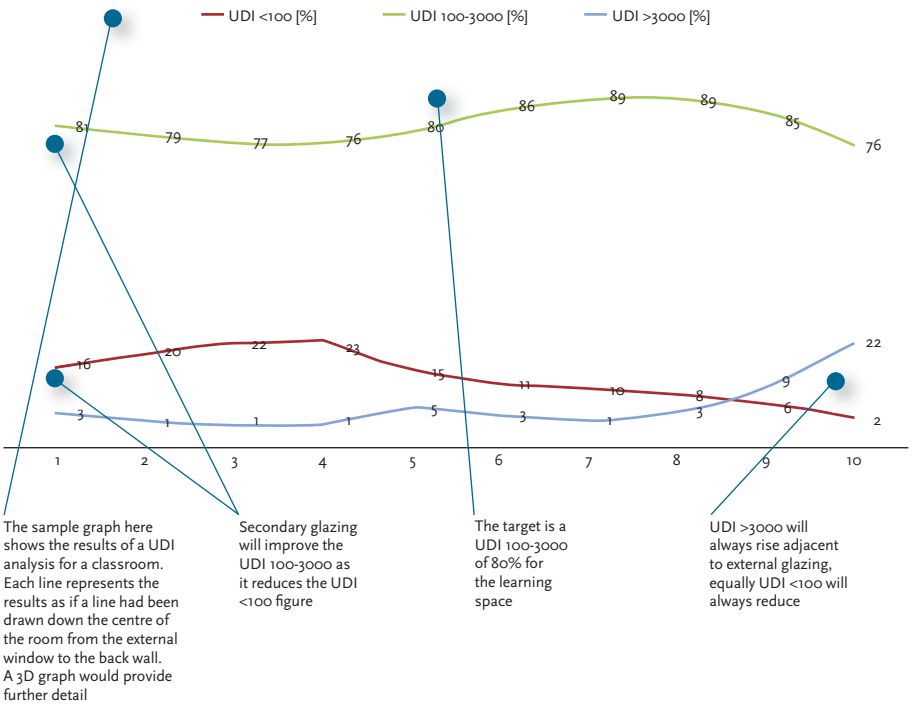
The FOS recognises the crucial relationships that exist when creating a lit environment. Designing for daylight is the priority, followed by an electric lighting solution. The electric lighting solution must both meet the needs of the occupants of the space and respond to the known distribution of daylight. Lighting control is introduced to ensure the systems operate efficiently and in line with user requirements. Finally, the ongoing operation, measurement and maintenance is designed and recorded to ensure the lighting solution delivers what was promised.

The first stage in lighting the learning environment is to consider the daylight available. This is where we see the major change for the PSBP, compared with previous building programmes and associated school lighting guides and specifications. The FOS first describes the desired outcome for the learning environment – for example, light from two sides of the room to create balance, well-lit soffits and walls to give the room brightness, and control of glare to ensure the result is not the familiar 'blinds down, lights on' scenario. The specification then goes on to set numerical daylight parameters and, in place of daylight factors, climate-based daylight modelling (CBDM) has been adopted.

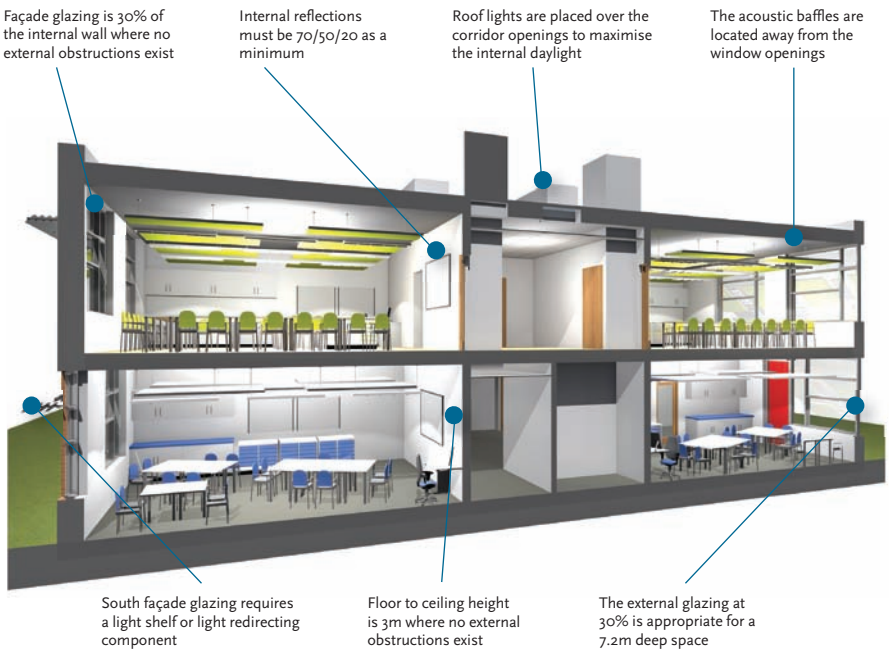
The phrase CBDM was first coined by John Mardaljevic in 2006 when he presented the concept to the CIBSE National Conference. Since then the principles have been discussed at many daylight and lighting events, as well as introduced into the text of *BS 8206-2: 2008 Code of Practice for Daylighting* and *LG5: Lighting in Education* (2011). The concept is quite simple: rather than simulate the quantity of light within a space through the use of an overcast sky model, CBDM makes use of actual weather data and, as a result, time-

> Lighting design is the primary heading in the environmental requirements section, a reflection of the value placed on daylight within the learning environment... Of equal importance is that lighting is not included within the building services section

Useful daylight index (UDI)



Baseline primary school design – section through classrooms



dependent direct and diffuse daylight can now be analysed and used to design the façade and light-directing components.

The importance of using a design process that more accurately simulates the world we experience hardly needs highlighting. However, the benefits when you design buildings in this way are quite significant. For example: with an overcast sky, light shelves appear to act as obstructions with daylight factor modelling; light pipes and light wells don't show a significant benefit, given their cost; and there is little difference when you compare a north and south facade. All in all, the above analysis does not reflect real life.

With CBDM the direct sun and diffuse components will be dynamic in their intensity and altitude for each facade: north, south, east and west. Therefore, while orientation has always been understood, the analysis and results will now detail the impact of the sunlight and daylight, and inform the designer of the quality and quantity of light within the space.

The key measure of CBDM is the Useful Daylight Index (UDI). For the baseline designs we have set a target for each learning space of a UDI of 100-2,000 lux for 80% of the occupied time during daylight hours. Previously, daylight factors concentrated on minimums and averages, but in moving to a maximum and minimum we are ensuring there is always a level of daylight without having too many occasions where the blinds will be pulled down to combat too high a level of daylight. The UDI measure is very much driving a quality of light within a space.


Baseline secondary school section

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Baseline primary school section

> There are new techniques for many lighting designers and architects to become familiar with, and those who do so have an opportunity to be innovative and stand out from the rest

A secondary measure extracted from CBDM is daylight autonomy (DA). The purpose of this measure is to ensure that we create spaces that are predominantly lit by daylight and, as a result, the electric lighting will be off. The criterion is that the learning environment should receive its target illuminance – say 300 lux average – for 50% of the occupied hours.

The electric lighting design follows the strategy and guidance set out in *LG5* and the research completed by Fagerhult, Lund University and University College London in the paper: *Influence of Ambient Light on the Performance, Mood, Endocrine Systems and other Factors of School Children 2009*. The importance of ambient light has been adopted and, as such, all of the baseline design schools have exposed soffits with sufficiently high ceilings to allow suspended luminaires. Using suspended luminaires delivers direct and indirect light to the space to create a bright and visually comfortable learning environment.

Cylindrical illuminance has been adopted as it is seen as a way to eliminate poor quality schemes, where a room that truly requires three rows of luminaires is reduced to two rows. The double-row designers often maintain they have achieved the working plane light levels. However, they fail to comment on how the teacher's face will be poorly illuminated.

Ensuring the space operates efficiently and for the benefit of occupants, the lighting control system must be simple and intuitive, yet also maximise the energy savings. In many Building Schools for the Future (BSF) schools, the outer row of luminaires were linked to a daylight sensor but often, through 'value engineering', the remaining rows would be on or off via a manual switch. The FOS and baseline design cost plan require that each row of luminaires have their own combined Passive InfraRed Sensors (PIR) and/or photocell operating dimmable luminaires.

An often forgotten element of any design discipline is the operating and maintenance post completion. One proposal with the PSBP is to link payments to the energy performance of the building. What that means for the lighting design is that the school will be provided with a LENI (lighting energy numeric indicator) rating by the lighting designer, and the electrical load and occupation data will be recorded and assessed against the original estimation.

Clearly, there can be many reasons why the original estimation and actual data do not align and there will be a 12-month period to investigate any discrepancy and adjust the target. This is a significant change to previous building programmes as, over the years, a significant amount of energy and building usage data will become available for future designs.

In conclusion, the PSBP and FOS have raised the bar in relation to lighting design for the learning environment. However, it is important to note that it has done so by taking on board the latest research and thinking in how these spaces should be lit and analysed. There are new techniques for many lighting designers and architects to become familiar with, and those who do so have an opportunity to be innovative and stand out from the rest.

The baseline school designs can be found on the Education Funding Agency website. These should be taken as a starting point, and not as the only solution. **CJ**

● **ANDREW BISSELL** is lighting design director at Cundall Light4. For more information on baseline designs for schools, visit **www.education.gov.uk/schools/adminandfinance/schoolscapital/buildingsanddesign/baseline**

DAYLIGHT DESIGN GUIDE

A guide to lighting design in schools is available from the Society of Light and Lighting, entitled *LG5: Lighting for Education*. The publication is available through CIBSE's Knowledge Portal at **www.cibseknowledgeportal.co.uk**

2013 SEES LED DOMINANCE OVER FLUORESCENT

The light quality and output from LED fittings now surpasses those of fluorescent or halogen products and the reliability far exceeds traditional light sources. The main constraints in specifying LED of performance and price have now been removed.

"The JCC Skytile is extremely efficient and reliable, and gives us the standard of lighting that we need for our critical assembly work."

Kevin Lee, Marussia F1 Team

The price of an integrated LED light fitting is comparable to conventional technology when the total cost of ownership is included. LED fittings are more energy efficient, have greater reliability and can be instantly controlled to further save energy.

LED changes the jargon

Many building services professionals have a working knowledge of lighting performance; however the introduction of LEDs has changed those measures:

- **Total Fixture Lumens** is the measured light output from an LED fitting.
- **Circuit Wattage** is the tested electrical usage of the complete fitting.
- **Lumens per Circuit Watt** is therefore the true measure of energy efficiency including driver losses.
- **Light Output Ratio (LOR).** Total fixture lumens has replaced LOR for integrated LED light fittings.
- **Colour Rendering Index (CRI)** is a comparison to natural daylight. LED fittings should have a CRI above 80%.
- **Colour Temperature** is the "appearance" of emitted light in degrees Kelvin. The lower the number the warmer the light; 3000 is considered warm and preferred in many UK households, where as above 4000 is cooler and generally specified for commercial applications.

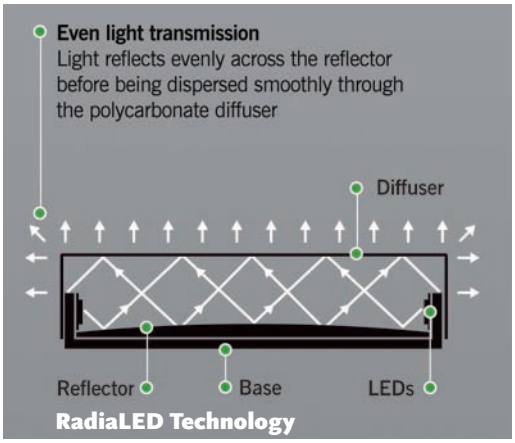
Selecting a fitting?

Ensure that the quoted lumens is actually delivered by the fitting. For example, initial lumens means the output from the LEDs and not that delivered from the fitting with the diffuser or optic included. Ask for the total fixture lumens.

Check the total energy consumption of the fitting. Often the Wattage consumed by the LEDs is mentioned and the circuit Wattage including the electronic controls and drivers is conveniently ignored.

What is the life of the fitting? LEDs are very reliable and can exceed 10 years continuous operation. The electronic control circuit is the weak link and dependent on the quality of the components. Check the expected life of the total fitting and for added assurance get an extended warranty from a reputable supplier.

Integrated LED fitting or separate LED lamp? LED lamps are generally less reliable than an integrated fitting but can be replaced when they fail. It is JCC's view that designing an LED light source to fit a traditional lamp size is unreliable. We design integrated LED fittings from scratch to optimise light output and improve heat dissipation, removing the need for lamp replacement.



Fluorescent office lighting is finished

LED office lighting is now more reliable, aesthetically appealing and easier to install than fluorescent. JCC's Skytile is a stylish 600 x 600 LED ceiling panel and at 2,700 lumens is equivalent to a 4 x 18W fluorescent. At 79 lumens per circuit Watt it is double the energy efficiency. The standard colour temperature of 4700K provides near perfect daylight. The ambient light and shallow cut off angles of Skytile also lend themselves to CIBSE LG7 compliance.

2D fittings are unsightly

For years bulkhead lights have contained unsightly fluorescent 2D lamps that can be seen through the diffuser. JCC has launched a range of LED bulkheads that use patented RadiaLED technology with the LED light evenly distributed. The need for a continuous program of re-lamping is eliminated along with the associated environmental issues of lamp disposal.

Integrated LED downlights look great

Halogen and CFL lamps are unsightly and unreliable. Integrated LED downlights avoid lamp replacement and enhance an interior design. For domestic downlights, JCC Fireguard is the market leader with FGLED7, using a startling 8 circuit Watts versus a 50W halogen equivalent.

For commercial applications the 2,200 lumens Coral LED is a direct replacement for the old fashioned 2 x 26 watt CFL downlighter, 50% more efficient and requiring no lamp replacement.

Change is always scary

Sticking your head in the sand doesn't help. LED lighting is now viable and widely specified; the only questions are which product and which supplier? JCC have developed innovative LED products through extensive design and testing. We work closely with LED chip manufacturers to ensure our products use the latest technology and we provide a 5 year extended warranty.

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A GUIDING LIGHT?

Academics **Kit Cuttle** and **John Mardaljevic** debate the relevance of the daylight factor: would people be better off ignoring the advice of the lighting profession, or should the standards be improved?

> So, with all this computational power at out elbows, why are architects not beating paths to our doors for advice? Why are they doggedly hanging on to control of everything to do with windows?
> – *Kit Cuttle*

THE INTUITIVE ARGUMENT

KIT CUTTLE

As discussion among lighting professionals revolves around the role of the horizontal working plane, it is generally overlooked that this concept remains firmly embedded in the definition of the daylight factor (DF) – and, furthermore, that this factor is becoming ever more prominent in sustainability regulations and guidelines.

Really, we all understand daylight. In our living rooms we arrange the furniture for view and for that sense of contact with the outside, and to allow a flow of light into the space that creates light and shade patterns, within which we can place an object, such as a vase of flowers, to 'catch the light'. We do this intuitively and derive pleasure from the ever-changing visual effects.

But then if we find ourselves involved on a project where someone mentions daylight, we forget all that intuitive stuff and switch into technocrat mode. The distribution of daylight is specified in terms of the daylight factor, being the daylight illuminance at a point on the horizontal work plane, relative to the simultaneous illuminance due to an unobstructed 'standard overcast sky'. This concept is supposed to enable us to evaluate daylight objectively – that is to say, to treat daylight as an alternative source for providing work plane illuminance.

And it has become so much easier to do this. The protractors, graphical techniques and tables of data developed in the last century to enable point-by-point calculations were tedious to use, but these have given way to computer programs that generate colour-coded DF

contours across the entire floor area, so that we can compare daylight performance with that of electric lighting with minimal effort.

So, with all this computational power at our elbows, why are architects not beating a path to our door for advice? Why are they doggedly hanging onto control of everything to do with windows? The answer to that, I submit, is because they have not detached their brains from that intuitive sense of what the experience of daylight is all about. Our glossy print-outs of DF distribution leave them cold.

As well as the delights of daylight, all of us have, at some time, experienced its capricious nature. We have been exposed to debilitating sun glare, intolerable summertime overheating, winter down-draughts, puddles of condensate and traffic noise – there is so much scope to get it wrong. However, developments in glazing technology, window frame design and shading devices offer an ever-growing range of ingenious opportunities for maintaining the visual openness of windows, while minimising their negative effects.

But before we can make any useful contribution towards balancing these conflicting demands, we absolutely need to recognise that there is far more to daylighting than delivering lumens onto a work plane.

The daylight factor has got us into a hole, and it is getting deeper. Sustainability rating systems are taking daylight into their scope by specifying measures, such as requiring some value of DF contour to extend over some substantial percentage of the floor area, and of course this is just another way of reducing daylight to work plane lumens. While these systems used to be advisory, they are increasingly being imposed through the consent process, making then unavoidable.

We cannot blame the regulators for this situation. Sustainability has to be a worthwhile goal, and in devising these systems they have referred to the guidelines and reference documents published by the lighting profession, and have, quite reasonably, assumed these to be the distillation of our knowledge. It is us who have misguided them.

The unavoidable conclusion is that we, the lighting profession, have got it absolutely wrong and are continuing to do so, and the only people who have a chance of getting it right are those who ignore everything the lighting profession proclaims through daylighting codes, standards and recommended practice documents. The progressive imposition of sustainability regulations is making it increasingly difficult for anyone to do that.

> If we find ourselves involved on a project where someone mentions daylight, we forget all that intuitive stuff and switch into technocrat mode – *Kit Cuttle*

● **KIT CUTTLE** is an author and lighting academic Go to **www.kit-lightflow.blogspot.com** for discussion by Kit Cuttle on a new basis for lighting practice

THE STANDARDS-BASED APPROACH

JOHN MARDALJEVIC

While I share many of Kit Cuttle's concerns, emphatically made in his jeremiad, I'd like to offer something that is rather more positive than a blanket recommendation to 'ignore everything the lighting profession proclaims'.

Early on he makes the reassuringly democratic statement that: 'Really, we all understand daylight.' What follows suggests that the experts' transition to daylight 'technocrat' is akin to a fall from grace.

I am not convinced. Many of us do, indeed, value the daylighting qualities afforded by, say, Victorian dwellings with high ceilings and commensurately proportioned windows. However, many of the selfsame people who occupy and enjoy those buildings will, when given a free hand, select a conservatory extension that is woefully overglazed, rendering the space uncomfortable – if not unusable – for much of the year. I don't believe that 'we' would be any less error-prone in our daylighting judgement, given projects larger than a domestic extension.

I do, however, agree with Kit Cuttle that the daylight factor (DF) is a crude measure of actual daylighting performance. A half-century or more of uncritical use of the DF

> The designer will probably also carry out a daylight factor analysis because it's a snip to do, looks techie and they can charge the client for it – even if they take minimal notice of it themselves
> – *John Mardaljevic*

has unfortunately led to a conflation, in many minds, of actual daylighting performance with what the DF tells us. It is, of course, a proxy for daylight, but how good or bad a proxy depends on those important parameters that the DF approach cannot account for, such as prevailing climate (meaning the totality of sky and sun conditions) and building/site orientation. The expert daylight designer does, of course, appreciate these intrinsic deficiencies. If sufficiently experienced, the designer can roughly guesstimate the likely daylighting performance of the space and so recommend suitable façade treatments to temper the luminous environment.

Thus, the expert intuits what (in technocrat speak) is called the spatio-temporal dynamics of natural illumination. We, of course, shouldn't be surprised to learn that the designer recommends different treatments for the north, south and east/west elevations. Nor that the advice would change if the building were relocated from, say, Stockholm to Madrid. After all, 'climate-adapted design' is a notion that relates closely to vernacular architecture. The designer will probably also carry out a DF analysis because it's a snip to do, looks techie and they can charge the client for it – even if they take minimal notice of it themselves.

If, however, the client demands that the daylight credit from a particular guideline document (BREEAM, LEED and so on) must be achieved, then the success of the design will hinge, to a large degree, on the nature of the target sought – invariably some measure based on the daylight factor. In that case, the best the designer can do is try to make good the failings that might – and often do – result from compliance chasing. The client may even decide that the expert is not required since the façade treatment will be 'optimised' by someone using a software tool: tweaking until the compliance target is reached.

If the standards are proving to be insufficient to ensure good daylighting design, then we should look to improving them rather than ignoring or ditching them altogether. Climate-based daylight modelling (CBDM) is the prediction of luminous quantities founded on standardised meteorological files specific to the locale for the building under evaluation. CBDM delivers predictions of, say, internal illuminance on an hourly (or shorter) basis for a full year, accounting for the contribution from varying sun and sky conditions. Thus, it models how daylight is experienced: holistically – the illumination effect of sun and sky together. CBDM is more than a decade old and has been used effectively on a number of projects, large and small, from the *New York Times* Building to residential dwellings.

Metrics founded on CBDM include useful daylight illuminance (UDI) and daylight autonomy (DA). While as yet there are no target values for these metrics – they are currently under formulation/debate – designers have always remarked to me how much easier it is to understand the daylighting performance of a space from, say, UDI plots than trying to guess how a DF relates to actual daylight. Although it is work yet to be done, I'd wager a good supper that metrics founded on CBDM will be able to distinguish between what are generally agreed to be good, bad and mediocre daylighting designs.

The intention is not to engineer out the expert designer. Architect Lisa Heschong made a memorable comparison between design and gastronomy: 'The standard should ensure that a minimum 'nutritional' value is achieved, while the chef (designer) imparts their own flair using the available "ingredients".'

Not all buildings will get the design input of the *New York Times*, and not all meals will be a la carte, but better standards can ensure that even our most commonplace buildings get a 'good helping' of daylight – well-balanced, avoiding both too much and too little. **CJ**

● **JOHN MARDALJEVICH** is professor in building daylight modelling at the School of Civil and Building Engineering, Loughborough University.
Go to **www.climate-based-daylighting.com** for material by Mardaljevich on climate-based daylight modelling and a critique of daylight and compliance.

A BRIGHT NEW DAWN?

Next year sees the release of the latest Part L regulations. **Liz Peck** outlines the proposed changes, which could see a major leap forward in lighting energy efficiency

In March 2012, the consultation on the proposals for Part L of the Building Regulations for 2013 was released and, for most involved in lighting, there was rejoicing that the government had listened to our calls for change.

I have been among many who have condemned previous incarnations of Part L – the loopholes enabled efficient lamps to be used in completely inefficient luminaires, and luminaires to be left on all night in unoccupied buildings, as long as the luminaire itself was efficient.

We argued that efficient lighting, by definition, met the demands of the users in terms of comfort, lighting level and, crucially, suitable control, so that it was dimmed or switched off when not required. Not rocket science you might think, but a harder case to argue than you might imagine. But with understanding came agreement and compromise.

The March consultation paper then outlined the government's plan for lighting in non-domestic buildings from 2013 and there were changes – big changes, and for the better.

Previously, areas have been described as 'desk-based', 'display' and, well, 'everything else', and other than desk-based activities, the metric has been lamp-lumen efficacy. This meant that it did not matter how inefficient a luminaire was – as long as the lamp was efficient then it complied.

This has been removed and we now have luminaire efficacy for everything. This in itself is real progress and should not be overlooked. Away with those ubiquitous 'black box' luminaires with their efficient lamps – now manufacturers must deliver efficient luminaires.

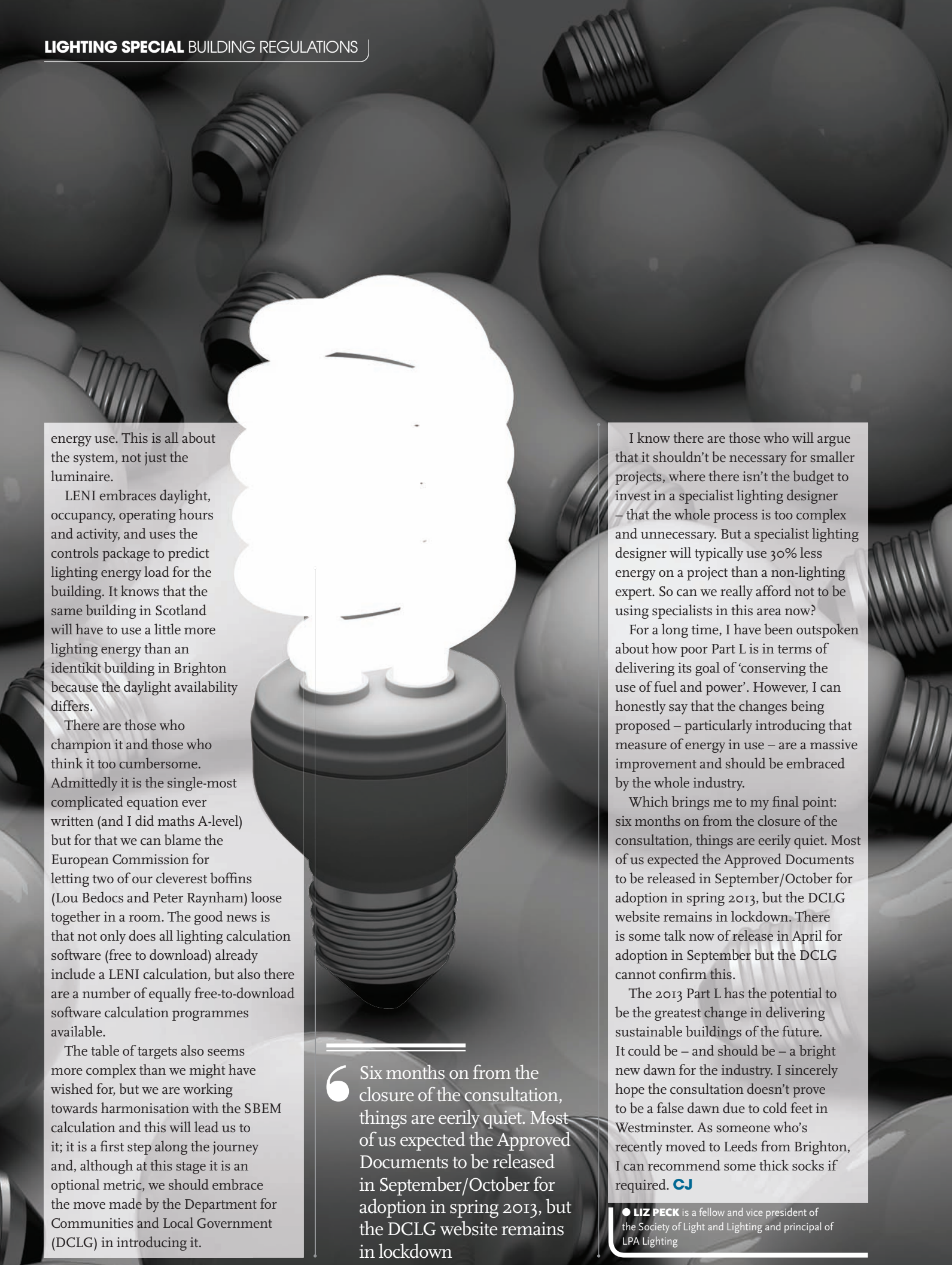
While this is generally a good thing, if efficiency was the only driver in delivering good, sustainable lighting solutions, we'd have low pressure sodium or bare batten T5 lamps in every office, hospital and school in the country. Thankfully it is not, and although producing metrics (let alone targets) for user comfort and a good working environment has challenged the experts for years, we can rely on the designers to deliver these environments in an efficient way, and the secret to this is often controls.

The proposed move away from occupancy and daylight controls as the only deliverable and measured controls is a huge step forward; the controls package can now deliver up to 30% reduction on the original luminaire efficacy.

In other words, there's no excuse not to use the right luminaires for the application, just make sure they are controlled properly. We don't need to have a situation where inappropriate luminaires get specified because of their efficacy, because we can use whichever luminaire we like (within reason) and control it. The most efficient luminaire is the one that is off when it is not needed, and the new controls package drives this very positively.

The consultation actually outlined two options for lighting compliance: aside from the luminaire efficacy (with or without controls), there is also a proposal to adopt LENI (Lighting Energy Numeric Indicator) as the metric of energy use for the future.

The lighting industry has campaigned hard and loud to introduce LENI into the Building Regulations. In itself it is just a measure, but the philosophy behind it makes it different. It measures predicted energy in use – not how efficient a luminaire is, hopefully with its new set of controls – actual, real, predicted



energy use. This is all about the system, not just the luminaire.

LENI embraces daylight, occupancy, operating hours and activity, and uses the controls package to predict lighting energy load for the building. It knows that the same building in Scotland will have to use a little more lighting energy than an identikit building in Brighton because the daylight availability differs.

There are those who champion it and those who think it too cumbersome. Admittedly it is the single-most complicated equation ever written (and I did maths A-level) but for that we can blame the European Commission for letting two of our cleverest boffins (Lou Bedocs and Peter Raynham) loose together in a room. The good news is that not only does all lighting calculation software (free to download) already include a LENI calculation, but also there are a number of equally free-to-download software calculation programmes available.

The table of targets also seems more complex than we might have wished for, but we are working towards harmonisation with the SBEM calculation and this will lead us to it; it is a first step along the journey and, although at this stage it is an optional metric, we should embrace the move made by the Department for Communities and Local Government (DCLG) in introducing it.

> Six months on from the closure of the consultation, things are eerily quiet. Most of us expected the Approved Documents to be released in September/October for adoption in spring 2013, but the DCLG website remains in lockdown

I know there are those who will argue that it shouldn't be necessary for smaller projects, where there isn't the budget to invest in a specialist lighting designer – that the whole process is too complex and unnecessary. But a specialist lighting designer will typically use 30% less energy on a project than a non-lighting expert. So can we really afford not to be using specialists in this area now?

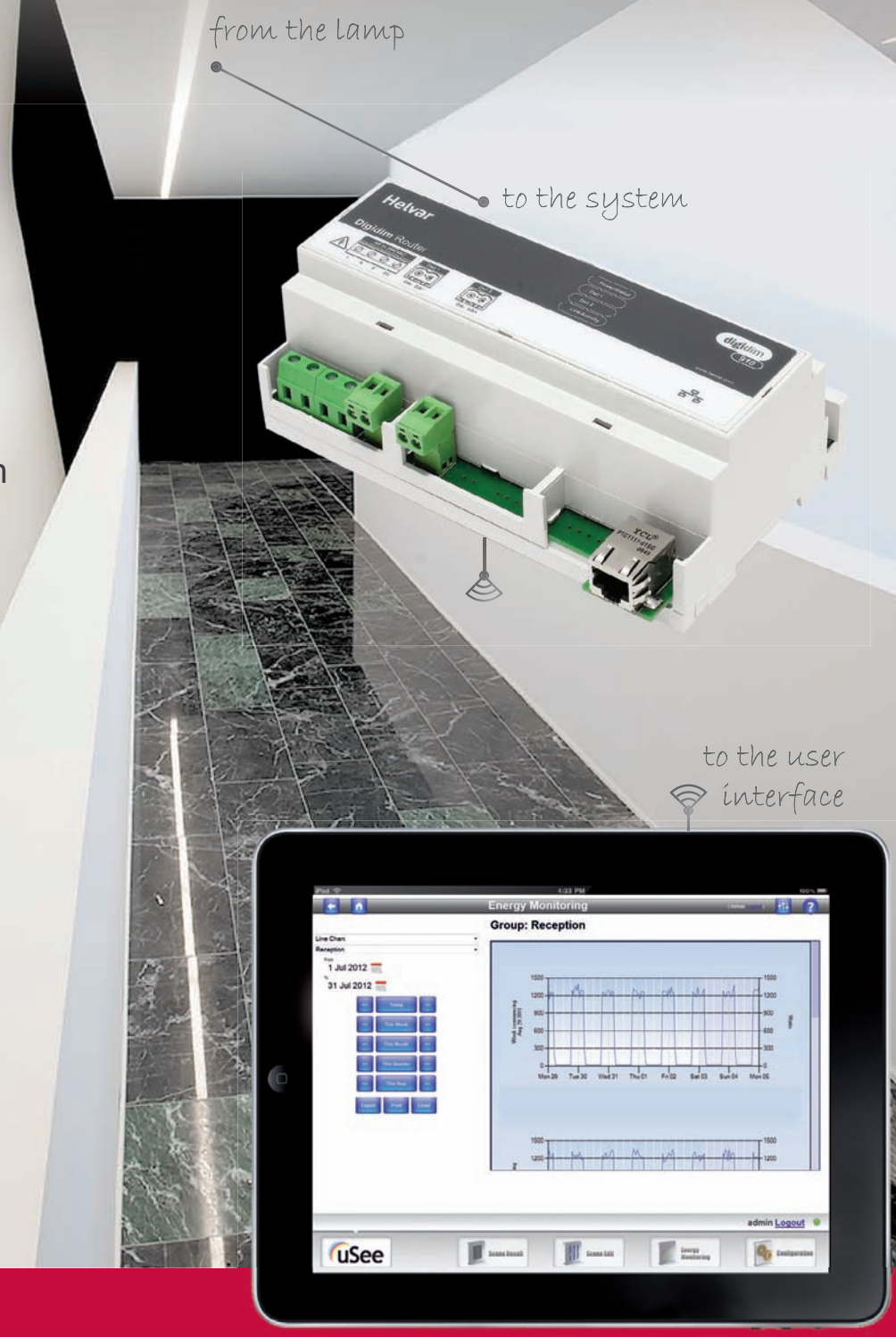
For a long time, I have been outspoken about how poor Part L is in terms of delivering its goal of 'conserving the use of fuel and power'. However, I can honestly say that the changes being proposed – particularly introducing that measure of energy in use – are a massive improvement and should be embraced by the whole industry.

Which brings me to my final point: six months on from the closure of the consultation, things are eerily quiet. Most of us expected the Approved Documents to be released in September/October for adoption in spring 2013, but the DCLG website remains in lockdown. There is some talk now of release in April for adoption in September but the DCLG cannot confirm this.

The 2013 Part L has the potential to be the greatest change in delivering sustainable buildings of the future. It could be – and should be – a bright new dawn for the industry. I sincerely hope the consultation doesn't prove to be a false dawn due to cold feet in Westminster. As someone who's recently moved to Leeds from Brighton, I can recommend some thick socks if required. **CJ**

● **LIZ PECK** is a fellow and vice president of the Society of Light and Lighting and principal of LPA Lighting

freedom in lighting



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