Peter Raynham on the new SLL Code for lighting
- LEDs: CRI for help
One of the reasons that new lighting standards and guidelines occasionally cause a bit of controversy is often largely a matter of who they are supposed to be aimed at. The practising lighting professional is frequently frustrated by their conservatism and affronted by assertions which to them are stonkingly obvious. But if we use the SLL Code of Lighting as an example, short of referring to it for an occasional refresh or to check an updated standard, I suspect the lighting professional doesn’t consult it very often because they know how to create a quality, energy efficient lighting scheme without redress to a reference book. They don’t need to be reminded that lighting for people is a priority or that daylight-linking is a jolly good idea.

Publications such as the Code or the updated EN 12464, which was featured in the last issue and which the new Code now reflects, are really for the non-lighting specialist. As author Peter Raynham said to me in a recent interview, it’s not so much about promoting good lighting as stopping people producing bad lighting.

The trick, of course, given this less specialised audience, is avoiding the pitfall of being too prescriptive. In other words allowing a well-intentioned recommendation to become yet another box to tick, or a slogan – ‘Part L and LG7 compliant’ – that can be slapped on the side of a light fitting as a sales ploy.

There is also the argument for gently bringing this audience along and not frightening them with anything too radical. Although goodness knows it takes long enough. The term working plane hasn’t been mentioned in the Code for Lighting since the 1994 edition and yet we are still trying to wean people off this obsession. It shows how long it takes for ideas to permeate through to the workplace.

Peter Raynham outlines the main changes to the latest Code on p8 and Iain Macrae responds to Bob Venning’s criticisms of EN 12464 on p10. The SLL event, Follow the Code?, at the RSA on 13 December might be a good opportunity for an airing of views on both publications.

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Education, education, education. If ever there was a cue for a cheesy chin then that surely must be it. It’s easy for us to fall into the trap of thinking that education stops when we start our working lives but in many ways, that’s when it really begins. While my A-level French has its advantages on occasion, I’ve learned and developed more finely tuned skills in my working career than I ever did in my formative years in a classroom.

Like most of us involved in lighting, my participation was not planned; I did not sit down with my careers officer at school and decide to be a lighting designer. I fell into it and fell in love with it. Since that lucky fall I’ve studied the internationally renowned MSc in Light and Lighting at the Bartlett, supported by my employers. But make no mistake, studying alongside a full-time job is hard work and isn’t suited to everyone.

So what are the other options? Lighting education, or lack of it, is often lamented but there is something for everyone, no matter what stage of their career.

For those new to lighting, there are the courses run by the LIF, but also those run by the SLL. The basic course covers all the fundamentals of light, vision, lamps and luminaires, and also general principles of lighting design and application. Further courses feature energy efficiency and office lighting. All of the courses are run by highly respected SLL members.

For those looking for a higher level of qualification there is the LET Diploma. The Lighting Education Trust runs this distance-learning course aimed at those who either need to fit their study in and around work, and/or are unable to travel to London every week to study at the Bartlett. The diploma can be achieved in as long or short a time as the student wishes and, other than four workshops in London, the learning is all done from home.

Some of you may think you’re too old for formal study, and you’ve been around long enough to know everything you need to know. But this industry is moving faster than ever before so are you sure you’re really up to date? I would certainly urge you to attend a Masterclass. I know from personal experience that I have learned something at every single one. If they were run as commercial entities, you could expect to pay £300-400 for the quality of topics and speakers, so at £50 for members, they are unmissable.

If you can’t afford a whole day away from the office, then get along to one of the evening technical events run by the SLL or to the quarterly Joined Up Lighting meetings. SLL meetings are held by every CIBSE region so there’s no excuse. Quite apart from your obligations as a member of SLL and CIBSE to take part in continued professional development, you owe it to yourself too.

But what about the ones currently studying A-Level French in the belief it will be invaluable to them in their careers? Well, it’s work in progress and one that requires more development but the SLL is still striving to get bachelor degrees in lighting established. At the other end of the scale, through STEMnet, some SLL members already go into schools and teach the magic of light to children aged six upwards, so perhaps some of those kids will be the future of our profession. We certainly need to provide opportunities for them to learn about light. Then maybe one day the careers officer will offer the option of lighting designer as a potential career.

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Taken to task
Peter Raynham outlines the changes in the new edition of the SLL Code for Lighting

Daylight saving
Energy efficiency with natural and artificial light in the latest LR&T. Iain Carlile reports

Raising the standard
Iain Macrae responds to Bob Venning’s review of EN 12464

Project profile
Science Storms: Excellence winner in the IES Illumination Awards 2011 by Focus Lighting

Events
LIF and LA agree to merger

The Lighting Association and the Lighting Industry Federation are to merge following Extraordinary General Meetings at the end of September where members of both organisations voted in favour of the amalgamation.

The new association will be known as The Lighting Industry Association and will be incorporated in early 2012.

‘LIF members believe that the merging of operations of the LIF and the LA into one new expanded association will be beneficial to them and the market generally, both in terms of better representation of the industry and the provision of services to members, during a period of rapid technological change for the industry,’ said Rune Marki, UK managing director of Osram and current LIF president (pictured above left).

‘A great deal of work has gone into the proposal to merge during the course of this year and I am delighted that the members have voted in favour,’ said Jonathan Lucas, managing director of Elstead Lighting and current president of the LA (above right). ‘A single, stronger association will better equip the whole industry for the challenges that we are now facing in a rapidly changing business environment.’

Better light means brighter pupils, says school study

Improving the ambient light in the classroom will help pupils perform and feel better. That is the conclusion of a study carried out at a London primary school by the Bartlett, UCL and Lund University, in conjunction with lighting manufacturer Fagerhult.

The aim of the study was to research how pupils were affected over a whole study year by working in a classroom with a lighting solution that directed a greater proportion of light on to the walls and ceiling. Instead of the usual illuminance of around 100 lux in the ambient area, a new lighting system with a light level of around 300 lux was used.

Among the key findings were that pupils achieved better school results in the three subjects that were studied (mathematics, reading and writing) during the whole of the school year, but especially during the darker part of the year (October-January). Children also tended to feel better throughout the whole school year. The most significant result came from the classroom on the ground floor with normal daylight conditions.

For the first time in a field study, the pupils displayed significantly greater alertness in the morning (8.50 am) with a lower level of sleep hormones (melatonin) in the darker part of the year. They also showed significantly greater alertness in the morning with a higher level of alertness hormones (hydrocortisone) during the whole of the school year.

The survey was also linked to the issue of whether, together with the improvement in ambient light, an intelligent control system with presence and daylight control could reduce energy use.

‘Energy saving is a matter of priority in all public environments, and lighting often takes centre stage in this respect. There is therefore considerable risk that the quality of lighting in schools might be neglected purely for financial reasons,’ said Fagerhult’s lighting technology manager Tommy Goven. ‘At the same time, there are indications that a higher quality of lighting can contribute to a better educational result.’

The study was carried out in four different classrooms with pupils in the eight to nine age group. All the classrooms used in the study were the same size, around 50sq m. The two experimental classrooms were equipped with a lighting solution with more ambient light in relation to the two control classrooms.

NEWS IN BRIEF

■ The SLL has awarded two new fellowships. The first went to Kelvin Austin, and was presented by Iain Maclean, chair of the Fellows Panel. Austin chaired the task group for LG4 (Sports Lighting), and has also been instrumental in the Lighting Education Trust, providing and updating content for the diploma course.

The second fellowship was given to Peter Le Manquais, by SLL president Peter Raynham. Le Manquais chaired the SLL Technical and Publications committee for a number of years, and the LG6 (Outdoor Environment) task group. He was also instrumental in establishing the Masterclasses.

■ The new course programme from Mild Career College is now available. Supported by the SLL, the programme covers all areas of building services and has a dedicated group of courses focusing on lighting. See Events on p12 for upcoming lighting courses. For a full list visit www.cibsetraining.co.uk/mcc or contact the events team on 020 8772 3616.

On the lighter side...

Lighting designers have probably been asked to illuminate a few weird and wonderful things in their time but we suspect that brains don’t crop up very often. But not only did Atelier Ten in New York light 400 of them, in jars, they also won an IES Illumination Award for it (Energy and Environmental Lighting Design category). They are housed in the Cushion Center, a new subterranean space beneath the Yale School of Medicine library. Following many drawings, calculations and mockups, it was decided to use tiny warm-white LED strips in a channel located at the bottom front of each cabinet to uplight the jars. This has provided a nice glow for the delicate specimens and the handwritten labels, without overheating or overlighting them. No brainer really.
Event report

LEDs: CRI for help

Speakers Rick Fisher, Stuart Mucklejohn and Robert Yeo give their perspectives on solid state technology and the issue of colour rendering based on their presentations at the recent SLL event

Rick Fisher: How do LEDs perform compared to conventional lamps?

In the live theatre in which I work lighting is there to tell the story. It is the one thing that touches everything – performers, costumes, props and the scenic environment – and links it all directly to the audience. Light is the glue that holds everything together to make a show work.

Not only should the lighting be working to provide illumination, but especially in the theatre it also needs to give focus, atmosphere, rhythm and texture to the performance. In order to give the stage shape, contrast, depth, mystery, and perhaps even some darkness, I have always felt that the most important decisions I have made in any of my lighting designs is not what I turned on but what I have turned off.

Many of the new sources are not as flattering to the performer as the tungsten lights with which I started working. Even though the arc, LED and other emerging low energy lights are getting better, I am grateful for the range of new tungsten moving lights that have allowed me to light much of Billy Elliot, for instance. I find this more pleasing for the look of this particular show, as well as for the performers, costumes and scenery. These lights give me much greater control and subtlety. Even with the supposed inefficient energy use of these units, I think a light that is only on when you are using it might well consume less energy than the ones that are on for many hours a day but need to be mechanically dimmed with a shutter.

As an industry we have to look at our energy usage, but in a complete way that intelligently assesses how to use less power in everything from the manufacture of lights, through to their use and finally their disposal. If we do not do this as an industry, bureaucrats will do it for us. Instead of banning the tungsten sources we definitely need more efficient tungsten tools and I do hope more are coming.

When it comes to LED light sources, the truth is that I have not used them much at all in the theatre. My reasons? Cost, cost, cost, cost. But after I get past those little recurring issues there is the much larger and more important issue of the quality of the light that most LED fixtures produce. Unless you are using LEDS for trim – the kind of eye candy that can edge scenic pieces or applications where the light itself is what is of interest – most of the LED units I have seen (and certainly the ones I can afford to hire for the run of a theatrical production) are not really up to the job of lighting people or scenery. In other words, if LEDs are the point of interest they are fine, but if what the LEDs are supposed to be lighting is the point, they are just not able to produce the subtle colours needed to make performers and delicately coloured scenery come alive.

Where LEDs do seem to be getting it right is in the area
of floods. At last some units not only include RGB and perhaps a cool white, but the more sophisticated units aimed at the theatre and TV markets are now including warm white and cool white to give a variety of white looks and more flesh-friendly colour mixing. However, while I have tried to use them on a number of occasions, their cost is still prohibitive for most of the budgets I am given.

The development in LED lighting units to light people is coming along, albeit at a much slower pace. I have seen some promising prototypes at some of the trade shows, and I have no doubt that soon fixtures with the requisite subtlety and colour rendering will become available – but at what cost? The sad fact is that the cost is way out of proportion to the savings in energy costs. This is a shame, but for the short use that theatre shows involve, the economics do not work out as they may do for other types of installations.

There have also been some promising developments in the delivery of some of the more saturated colours. Deep blues and reds and magentas can be delivered more efficiently, with less power, brighter outputs and no maintenance issues such as re-gelling. But once again, where lights are used for only a few hours a day – and even within those hours may only be on for a fraction of the time the show is playing – the energy cost savings simply do not add up to the capital or hire costs of these units.

Stuart Mucklejohn: Colour metrics – are they any use?

My fellow authors [see bottom right] and I recently undertook experimental studies to identify the characteristics that would be favoured by end users when seeking a replacement for incandescent light sources in domestic lighting. Not unexpectedly, subjects showed a preference for light sources with instantaneous or fast run-up times. However, when it came to assessing the preferred colour characteristics of light sources, the results were far more difficult to interpret.

The abilities of subjects to discriminate between colours under various lamps were examined using the widely used Farnsworth-Munsell 100-hue test which involves placing a series of coloured tiles in order of hue. Subjects carried out the tests inside a colour-matching booth with the following five different sets of light sources, each of which gave an illuminance of 400 to 500 lux on the floor of the booth:

- CFL Compact fluorescent lamps, cool white with integral control gear
- D65 Poly-phosphor linear fluorescent lamps
- TL84 Tri-phosphor linear fluorescent lamps
- LED Strip with phosphor-based, warm white LEDs
- INC Tungsten filament candle lamps

The ability to discriminate between colours varies widely from person to person and so a large number of test subjects were needed to ensure that the findings of the experiment would be valid for the population as a whole. Moreover, there is a clear trend that as subjects age their colour discrimination becomes poorer and so it was also important to ensure that subjects had a wide range of ages. Subjects were given training prior to being asked to perform the 100-hue test with each of the light sources in turn.

A total of 23 subjects took part in the study, with an age range from 20-54 and an average age of 32. The results were recorded using the Farnsworth-Munsell scoring tool software. The spectrum of the light received on the floor of the booth was measured and colorimetric values (Correlated Colour Temperature, x & y chromaticity coordinates, Colour Rendering Index Ra(8) & Ra(14), Colour Quality Scale) calculated for each light source (see table). The light sources are listed in the rank order of the average root total error rate (TER). The lower the TER value, the greater the ability of the subject to discriminate between colours.

<table>
<thead>
<tr>
<th>Lamp</th>
<th>CCT/K</th>
<th>x</th>
<th>y</th>
<th>Ra(8)</th>
<th>Ra(14)</th>
<th>CQS</th>
<th>AV root</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFL</td>
<td>5642</td>
<td>0.329</td>
<td>0.352</td>
<td>83.8</td>
<td>76.2</td>
<td>82.9</td>
<td>4.11</td>
</tr>
<tr>
<td>D65</td>
<td>6621</td>
<td>0.311</td>
<td>0.329</td>
<td>97.9</td>
<td>97.9</td>
<td>96.8</td>
<td>4.46</td>
</tr>
<tr>
<td>TL84</td>
<td>4155</td>
<td>0.377</td>
<td>0.385</td>
<td>77.9</td>
<td>66.8</td>
<td>74.8</td>
<td>5.11</td>
</tr>
<tr>
<td>LED</td>
<td>4300</td>
<td>0.371</td>
<td>0.382</td>
<td>76.6</td>
<td>69.3</td>
<td>70.0</td>
<td>5.44</td>
</tr>
<tr>
<td>INC</td>
<td>2430</td>
<td>0.488</td>
<td>0.422</td>
<td>96.5</td>
<td>95.4</td>
<td>76.6</td>
<td>6.46</td>
</tr>
</tbody>
</table>

The average root TER under the incandescent lamp is significantly different from the corresponding values for the other lamps. The average root TER values for the other four sources are not significantly different from each other.

So despite having high CRI values for both Ra(8) and Ra(14), subjects’ ability to discriminate between colours under the incandescent source is poorer than under the other lamps. These results illustrate the difficulties light source developers have in determining the appropriate metrics for colour rendering.
Robert Yeo: Are your white LEDs giving you the blues?

The colour rendering index or CRI is an important metric which describes the quality of illumination produced by a light source. For those developing energy efficient lighting based on LEDs, the holy grail is to achieve the perfect balance between luminous flux, luminous efficacy (lumens per watt), colour temperature and colour rendering.

The CRI system in use today is defined in CIE document number 13.3 published in 1995. This standard refers to 14 ‘special’ colour rendering indices (Ri where i = 1-14) which define the colour rendering of the test light source when used to illuminate 14 standard colours. For lamps with correlated colour temperatures of up to 5000K, the reference illuminant used is a blackbody source (such as an incandescent lamp), while for colour temperatures greater than 5000K, the reference light source is a CIE daylight illuminant.

The so-called general colour rendering index (Ra) is the average of the first eight special colour rendering indices (which correspond to non-saturated colours) with a scale that goes up to 100. For general illumination, an Ra of 80 is considered the minimum acceptable, while for certain safety critical jobs or for those tasks which rely upon precise colour matching, an Ra of 95+ may be necessary. By definition, a tungsten lamp will have an Ra of 100.

Measuring colour rendering is a specialised business. Traditionally, the output of a lamp was measured in an integrating sphere combined with a photometer or colorimeter. Notwithstanding the well-established colour correction errors associated with ordinary filter photometers and colorimeters (see CIE 127:2007 and IESNA LM-79-2008 for an explanation), the main problem with these types of light meter is that neither is capable of measuring colour rendering. This requires a spectroradiometer, an instrument that measures the spectral power at each wavelength and which computes the required photometric or colorimetric parameter with respect to the standard CIE observer or colour-matching functions. To compute colour rendering you must know the exact shape of the light source spectrum – the spectral power distribution (SPD). Simply knowing the colour (chromaticity) of a light source will not allow you to calculate colour rendering.

While CIE 13.3 reports the rendering of most types of light source quite well, there is general dissatisfaction with the way that the system reports CRI for LEDs. The problem derives from the different spectral powers emitted by LEDs compared to traditional lamps. LEDs produce white light in one of two ways: a blue LED plus phosphor or by additive colour mixing of red, green and blue LEDs. The most common method is to take the light from a blue LED and transmit it through a phosphorescent material. The resulting spectral power distribution combines a distinct blue peak with a broad, secondary peak which results from the fluorescent emission of the phosphor. The alternative approach, using separate red, green and blue LEDs (or separate LED dies in the same package), features a spectral power distribution with three quite distinct spectral peaks.

The shape of an LED’s SPD is thought to explain why Ra values computed using CIE 13.3 can disagree with visual observation. CIE 13.3 computes the general colour rendering index Ra based upon the mean of the first eight special colour rendering indices. These indices are computed from the difference in colour of non-saturated hues when illuminated by the test light source compared with the reference illuminant. LEDs, with their characteristic spectral peaks, render saturated colours very well, and can give illumination that we would all regard as very appealing compared to more traditional lamps. CIE 13.3 fails to account for this phenomenon.

The Colour Quality Scale (CQS), devised by researchers at the National Institute of Standards and Technology (NIST) in the USA, is a more meaningful metric which better describes the perceived rendering performance of LEDs [see Showing their True Colours by Peter Raynham, p4 NL Sept/Oct]. One standout point that promotes CQS over CRI is that it brings into play the preference of the human vision system for those light sources that promote increased chroma, which in turn makes objects stand out more.

There is an elective field in the EULUMDAT (.ldt) standard photometric data file into which the CRI (Ra) of the light source can be entered. No colour or colour rendering modelling is attempted by existing lighting design programmes – this would necessitate a measurement of colour rendering as a function of angle. However it won’t be long before modelling software adds this capability – the latest generation of goniophotometric equipment now has the ability to measure colour rendering as well as colour temperature and luminous intensity as a function of angle.

An important final point – don’t assume that the rendering of the lamp or LED will be the same as the luminaire fitting as a whole. A white LED with a CCT of 6000K will give a temperature of 9000K when fitted to a luminaire with particular reflectors and/or lenses. In the same way that the luminous flux of an LED is modified (reduced) when fitted to a luminaire, so is CRI. Basing luminaire specifications on theoretical LED outputs is a risky business – for reliable data the output of the luminaire as a whole must be measured.

Robert Yeo is owner of Pro-Lite Technology, which specialises in measuring the colour and brightness of LEDs, luminaires, lamps and displays.

LEDs: CRI for help was held at the London Transport Museum, Covent Garden, on 11 October
Taken to task

Peter Raynham, author of the new SLL Code for Lighting, outlines the changes in the latest edition which is launched at the end of the year.

The new revised edition of the SLL Code for Lighting will be significantly different to the previous editions both in content and in format. There are two major reasons for the changes in content: the first is the revision of existing European standards and building regulations, and the second is the introduction of the SLL Lighting Handbook, which now covers some material traditionally covered by the Code. The Code in book form will now have a similar format to the Handbook so that the two together will become the definitive lighting reference.

The new Code no longer contains all the old material relating to lighting equipment and lighting design, for example, as this is fully covered in the Handbook. This means it can now focus on providing a digest of all of the regulations and standards that impact on lighting. All of the terms used are defined in a glossary based on the newly revised BS EN 12665 Light and Lighting: Basic Terms and Criteria for Specifying Lighting Requirements. The exact details of many of the key terms used are further supported by a series of chapters that mathematically define the terms and give methods by which their values may be calculated in a number of situations.

The biggest change in the standards on which this Code is based has come from the new edition of BS EN 12464-1 Light and Lighting, Lighting of Workplaces – Part 1: Indoor Workplaces, released last July. The new standard has changed in a number of ways:

- Each task now has its own uniformity requirement
- There is now a requirement for a background illuminance
- There is a requirement for illuminance on the walls and ceiling although the levels are below that recommended by the SLL
- There is a requirement to provide a certain amount of semi-cylindrical illuminance in all spaces to make it possible for people to see each other’s faces

A key point that has been made more explicit in the new edition of the Code in the requirements for indoor workplaces is that the lighting should be on the stated visual tasks. This has in fact been the case since the 2002 edition, and the term ‘working plane’ has not been used in the Code since 1994. The latest edition of the Code takes this one step further. In the section on indoor workplaces it gives particular advice that it is wasteful of energy to light the whole space when a particular task is carried out over a relatively small area.

There is also a section that then describes the lighting requirements in such an area and how rate of change of horizontal illuminance needs to be controlled. This theme is then picked up in the chapter on energy in the section Light in the Right Place. It explains the basic rules of lighting an area and then looks at a typical situation where there are a number of different lighting requirements. In discussing the lighting in an office it states:

‘Faced with this long list of requirements it may be tempting for the lighting designer to just put 500 lux everywhere on a plane parallel to the floor at desk height safe in the knowledge that all requirements will be met or exceeded. However, this approach is highly wasteful and may well result in an unnecessary increase in energy consumption of over 50 per cent.’

This move away from the concept of lighting the whole working plane may be hard to achieve for many designers with clients used to blanket lighting solutions, but the basic fact is that it can no longer be considered sustainable to spread light into areas where it is just not needed.

Another departure for the Code is the inclusion of a section covering the CDM (Construction Design and Management) Regulations. While these date back to 2007, introducing this chapter makes the Code the first SLL publication to distil the complicated regulations into six pages of concise guidance to the various duties of the people involved in a construction project.

The final point to make about the new edition is that for all the changes the principle nature of the publication has not changed. It is still a definitive reference document that provides a distillation of a huge number of standards, guides and regulations. For that reason alone it will remain an important publication for all people who work with lighting.

The new SLL Code for Lighting will be launched in December. For more details go to www.sll.org.uk

‘This move away from the concept of lighting the whole working plane may be hard to achieve for many designers with clients used to blanket lighting solutions, but the basic fact is that it can no longer be considered sustainable to spread light into areas where it is just not needed’
From daylight, road lighting and properties of LEDs through to human factors and investigations into existing technologies, the theme of energy saving runs through many of the papers of the latest Lighting Research and Technology, whether it is through the classification of road lighting systems or increasing the efficiency of daylight design for buildings.

Three of the papers published in this issue have previously been summarised within these pages (see NL September/October 2011 for a synopsis of the papers by Viliūnas et al, Alvi et al and Bullough et al).

HM Brandston’s opinion piece opens this issue of the journal. In it he derides the politicians who are directing the design of lighting systems through the banning of incandescent lamps. Brandston further notes that this ban undermines the value of the professional judgement of lighting professionals.

Three papers relate to different aspects of natural light. The first, by Whang et al, investigates a natural light guiding system and presents a method of improving the efficiency of the system’s optical switch component (a switch to control and change the direction of transmitted light).

The paper by Cantin and Dubois presents a method for assessing the daylight quality of a space using metrics related to illuminance, distribution, glare and directivity. Their investigations indicate that the most informative set of metrics for assessing daylight quality are useful daylight illuminance (UDI), daylight glare probability and the vector/scalar illuminance ratio. They also propose replacing the currently used daylight factor with the UDI metric.

The third paper relating to daylight, by Ferrón et al, looks at optimising the refractor shape for a passive daylight collector system. They develop an equation to calculate an appropriate shape dependent on the latitude of the location where the system is to be installed. This method negates the need for a complex software-controlled, electro-mechanical system to track the sun position, thereby lowering equipment, installation and ongoing maintenance costs.

P Pracki’s paper proposes a method to classify the energy efficiency of road lighting where vehicular traffic is dominant. The proposed classification is strongly influenced by the road surface luminance, thereby linking the quality of the road lighting with the energy efficiency of the installation.

Figueiro and Rea investigate how sleep and light exposure impact on a subject’s biomarkers, performance and sleepiness. Their findings suggest that it may be possible to use tailored light/dark schemes to help those with circadian disruption where, due to extreme working conditions, sleep is not an option to maintain operational readiness (military personnel, for instance).

Majithia et al analyse the electrical properties of a number of different lamps. They propose a framework against which new lighting technologies should be assessed so as to reduce harmonic pollution, keep costs low and efficiency high.

The closing paper by Dugar and Donn investigates the interactions between humans and lighting control systems.

SLL members can access LR&T online via the SLL website (www.sll.org.uk/resources/lighting-research-and-technology and follow the links) and view the current issue, past issues and a number of papers published prior to being printed (OnlineFirst)
Raising the standard

Iain Macrae responds to Bob Venning’s criticisms of new workplace lighting standard BS EN 12464-1 in the last issue

It’s true that it’s never easy to produce a standard. It takes time and commitment from many people, it is often criticised by people unwilling to do the hard job of writing, and finally it is often a compromise that takes into account many regional practices and cultural differences.

So for EN 12464 to have advanced to the point where it includes comments on daylight, energy measures (other than W/sq m/100 lux) and lighting practices such as cylindrical illuminance and a modelling index is an achievement to be celebrated. Certainly this standard and others can never offer the advice that documents such as the Code and other guides do, and it wouldn’t be fair to expect it to do so. But it does offer advice to those of us who are not experts in good lighting practice. As Bob Venning suggests, the vast majority of people involved in light planning do not share his experience – this standard is for them.

Does this revision contain new stuff? Well it depends on how you define ‘new’. It’s fair to say that cylindrical illuminance is not new. It’s been defined in many places, including the Codes, for a long time. It’s not defined in words in EN 12464 as such, but then most terms aren’t – that’s why EN 12665 exists. What is new for EN 12464 is that the concept of cylindrical illuminance is applied for the first time. Other values are also added for the first time to encourage practitioners to think more about the task in a space, not just a desk or screen-based task, but involving communication between people, face to face. As with the ceiling and wall illuminances, it’s not a perfect measure, and not easy to measure in practice unless you have time and a good meter.

But equally the luminance approach talked about by Bob Venning would have problems in the real world. For one, knowing the final surface reflectance is a problem for most schemes. Luminance design also requires this information. He is perhaps right in that standard writers need a dose of the real world, but I think most people reading this standard can see how the real world has been included.

So is it practical for a standard to take years of design practice and distill them down into a few pages? Yes, but it can’t tell you everything. It can’t teach you design or lighting. But if you already know these things it allows you room to manoeuvre. Take reflectance, recommended for walls, ceiling and floor cavities. Is it possible to get floor cavity reflectance in the region of 20-40 per cent? I know one hospital that achieved floor cavity reflectances above 50 per cent without furniture, making it difficult to see the limits of the space. The furniture was the saving grace that turned a white box towards something reasonable to work within. If the interior designer had read EN 12464 we might have had a better scheme from day one.

Of course there are discussions to be had over wording and numbers. Take stage rigging at floor level. If Bob Venning is correct that most rigging is done at 1.5m then the specification of a floor level illuminance is not an unsafe measure – at least if the rigging is carried out at floor level there will be enough light. On the other hand, if the task illuminance were specified at 1.5m, would there be enough light at floor level for when the electrician puts a spotlight there to work on momentarily before hanging it on the lighting rig? You could argue both points, and that’s before we start thinking about cylindrical illuminance.

Could we write the perfect standard, improving it in all the ways that Bob Venning suggests? Perhaps, but to do so takes time, persuasion, involvement and understanding. It would also have to include so much advice and be so deep in its information that I suspect most readers would look onaghast and just apply the few bits they could understand.

I’m not sure that would be any better than having a standard that provides a prod in the right direction. One that reminds people that utilised energy, daylight, controls, colour and task lighting measures, beyond horizontal illuminance, are important. A work in progress? Yes. A lot of new stuff, included here for the first time? Yes. New to experienced lighting designers? No, perhaps not, but that isn’t the fault of the standard or its writers. I put that one down to a design industry that has spent years designing for cost and not for performance, efficiency and comfort in equal measure. The new BS EN12464-1 is at least a step in the right direction.

Iain Macrae is president elect of the SLL

‘As Bob Venning suggests, the vast majority of people involved in light planning do not share his experience – this standard is for them’
Glowing down a storm

Exhibiting panache at Chicago’s Museum of Science and Industry, an Excellence winner in the IES Illumination Awards 2011

The recently opened Science Storms at Chicago’s Museum of Science and Industry is a permanent exhibit organised around 50 interactive ‘experiments’ that feature dramatic lighting to explain the science behind seven natural phenomena: lightning, fire, tornadoes, avalanches, tsunamis, sunlight and atoms in motion.

Lighting designer Focus Lighting also developed three lighting-experiment concepts that each illustrate a different principle of illumination. Colors from Light demonstrates colour mixing using a 4m-tall box lined with red, green and blue LED strips. Wave Guides uses hundreds of tightly bundled fibre optic cables to demonstrate internal light reflection. Light Behavior allows children to create colourful beams of light by adjusting two moving dichroic glass fins up and down in front of a large mirrored cylinder.

The 2415sq m area on two floors is enclosed by a twilight-blue surround which incorporates blue LED strips to backlight the metal mesh panels that envelop the exhibit entrance. Key sources are LEDs and metal halide which are used with theatre lighting fixtures and techniques.

Inside the enclosed space, visitors can manipulate a 12m-tall column of swirling vapour and light to experience the forces that cause tornadoes. A Tesla Coil that replicates bolts of lightning overhead is grazed in amber light to make its copper coils stand out against the dark blue ceiling. Liquid wave dynamics is evoked by spotlights that shoot 18m down through large liquid-filled disks and project ripple patterns on to the floor. One exhibit uses tennis balls that shoot from one side of the hall to the other in a study of projective motion. Focus used ultraviolet lights to brightly illuminate the yellow balls in order to avoid the unwanted effects of conventional lighting which would have washed out other nearby exhibits or created glare.

‘I have never worked with a lighting designer so deeply involved in every aspect of the exhibition design, fabrication and installation process. In fact, some of the interactive exhibits are a direct result of Focus Lighting’s input’

– Christopher Wilson

MSI project manager

Client: Museum of Science and Industry, Chicago
Lighting design: Focus Lighting
Exhibition design: Evidence Design
2011

8 November
How to specify lighting:
office lighting
(The inter-relationships between
art and science)
Mid Career College
Trainer: Barrie Wilde
Venue: Avonmouth House
London SE1 6NX
www.cibsetraining.co.uk/mcc

9 November
Lux Awards 2011
Venue: Chelsea Football Club,
London SW6
www.luxawards.co.uk

9-10 November
LuxLive 2011
(Organised by Lux magazine and LIF)
Venue: Earls Court, London
www.luxmagazine.co.uk

15 November
Lighting and energy efficiency
(From regulations to design process
and lighting practice)
Mid Career College
Trainer: Lou Bedocs
Venue: CIBSE, 222 Balham Road
London SW12 9BS
www.cibsetraining.co.uk/mcc

24 November
Lighting Masterclass
One Building a Minute
Speakers: Brian Charman, Iain
Macrae, Peter Le Manquais,
Stewart Langdown, Helen Loomes
Plus IALD guest speaker
Time: 10am-4.30pm
Location: The Cube, Manchester
www.sll.org.uk

7 December
Lighting Basics 1:
Light, sight and colour
Mid Career College
Trainer: Dr Robert Bean
Venue: Avonmouth House
London SE1 6NX
www.cibsetraining.co.uk/mcc

8 December
Lighting Basics 2:
Lamps and luminaires
Mid Career College
Trainer: Dr Robert Bean
Venue: Avonmouth House
London SE1 6NX
www.cibsetraining.co.uk/mcc

13 December
Follow the Code?
(The new SLL Code for Lighting)
Venue: Royal Society of Arts
John Adam Street, London WC2
www.sll.org.uk

20 March
Ready Steady Light
Location: Rose Bruford College
Sidcup, Kent
www.sll.org.uk

15-20 April
Light and Building
Venue: Messe Frankfurt
www.light-building.
messefrankfurt.com

2012

19 January
Lighting Basics 3:
Interior lighting applications
Mid Career College
Trainer: Dr Robert Bean
Venue: Avonmouth House
London SE1 6NX
www.cibsetraining.co.uk/mcc

25 January
Lighting Masterclass
One Building a Minute
(see 24 November)
Location: The Watershed, Bristol
www.sll.org.uk

29 February-1 March
The Arc Show
Venue: Business Design Centre,
Islington, London N1
www.thearcshow.com

Mid Career College: the college
runs various courses across the
whole spectrum of lighting and at
sites across the UK. Full details at:
www.cibsetraining.co.uk/mcc

LIF courses: details from John
Hugill, 0208 529 6909, or email
training@lif.co.uk