

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 our 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 them 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

“ 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* ”

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.

● **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



6 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 intuitively 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 Mardaljevic on climate-based daylight modelling and a critique of daylight and compliance.