apps + ANSWERS

BY DON PEIFER

When I was in graduate school, one of the first things I learned was never to trust a cutsheet. At the time, I found that unbelievable, but what's amazing is how frequently the performance data reported by manufacturers fails to reflect reality. For example, over-reporting, by double-digit percentages for output, is not uncommon. Unsuspecting designers regularly go to manufacturers' sites, pull down IES files loaded with inflated stats and drop them into light rendering programs. When using these puffed-up metrics to do layouts, the potential for not designing to specification, or even code, exists. It is a classic example of garbage in/garbage out, but what is to be done?

Well, it turns out that there is a reason for this disconnect. In the world of lamps and fixtures, different lamps can populate different fixtures and vice versa. The number of lamp/fixture combinations for products developed in one calendar year alone is overwhelming. Naturally, questions arise around how to characterize the output for any particular lamp/fixture combination, and until now, relative photometry has been the industry convention.

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Here is how relative photometry works: Each fixture can be assigned an efficiency based on its optical characteristics. Each lamp has a measured output in lumens. Multiplying the lamp output by fixture efficiency brings you to the fixture output. Here's the trouble: Fixture efficiencies are often inaccurate and relative photometry only considers lamp sources out of the fixture in ideal conditions. Issues such as losses due to heat build-up and ballast factor, which further erode the relative photometry numbers, are ignored. But, how much of a difference are we talking about?

INDEPENDENT TEST

A big difference, it turns out. To prove the point, I sent a fixture away for independent lab testing. The fixture's *absolute photometry* was compared to the manufacturer's reported data, which presumably reported its relative photometry (**Table 1**). According to James Brodrick, lighting program manager for the DOE, absolute photometry—borrowing a sports analogy—simulates "real-game performance." Brodrick compares relative photometry to running a 40-yard dash in shorts and a T-shirt and absolute photometry to the same run encumbered with the full equipment (pads and helmets) worn in the actual game (*LD+A*, February 2008). During absolute testing, lamps, fixtures *and* power supplies are *all* tested together as a system.

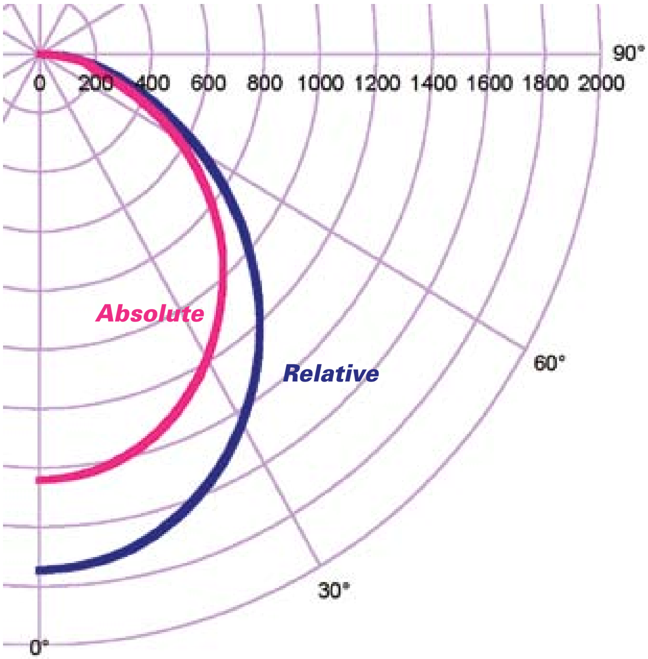

Figure 1

	Output (lumens)	Power (W)	Luminaire Efficacy (L/W))	CRI
Reported Performance Data	5686	82	69	85
Absolute Photometry	4309	81	53	81

Table 1

	Average (FC) Illumination	Fixture Count	Lighting Power Density (W/SF)
Relative Photometry	40	81	0.7
Absolute Photometry	40	110	0.9

Table 2

The fixture tested was a popular 2-ft by 4-ft recessed-indirect basket troffer equipped with three T8 lamps from the catalog of a popular fixture manufacturer. This fixture type is represented in all of the major manufacturers' lines. Care was taken to test the exact same model for all components.

The tested fixture measured 25 percent less light output than the manufacturer claimed. While this may not seem significant, the candela plots of the two fixtures' distribution (**Figure 1**) are telling in their differences. If you imagine two of the same fixtures side-by-side, you can see how this reduction in distribution can affect the spacing criteria.

IES files representing both the absolute and relative photometry data were generated and dropped into a 100-ft by 100-ft open office plan. All the variables were the same for both fixtures and both layouts. In order to generate an average of 40 footcandles on the work surface, the program generated how many fixtures would be needed (**Table 2**). The result was that the relative photometry report underestimated the optimum fixture count by 29.

BALANCED REPORTING

Capturing that disconnect between absolute photometry and relative photometry is difficult, but, as seen in the example, it is important. The delta between the absolute and relative photometry could be the difference between thousands of dollars in initial costs, benefits like LEED points, or, most importantly, the difference between a well-lighted and a poorly lighted space. Because of the exacting nature of characterizing individual LED output, absolute photometry has become the de facto testing method for LED fixtures. As LED fixtures begin to compete alongside other technologies on specs, they suffer the burden of their real-world data not measuring up to the relative photometry numbers. Emerging technologies fail to flourish due to the absence of balanced reporting.

The question becomes, why hasn't the industry mandated methodologies that would lead to apples-to-apples comparisons? The biggest reason is cost. Absolute photometry testing costs me roughly $500, which certainly wouldn't seem prohibitive for the behemoths of the industry. Lighting fixture manufacturers, however, have attacked the market with numbers—some companies generating tens of thousands of new fixture types a year in search of a few hits. When the potential cost of testing product lines reaches into the millions, influence checks change.

The DOE has done *some* benchmark testing of other technologies through its CALiPER program. However, with such few fixtures it is a meager sampling. The DOE also issued a strict "No Commercial Use" policy on any third-party testing that it commissions. If you were an individual designer, for example, attempting to utilize the information you found on the DOE website—say poor performance data for a product under consideration—would be taboo. Specifiers deserve to not only know but benefit from the truth. Designers could insist on independent lab testing for all fixtures speced on their projects. The design community in aggregate doesn't gain from this approach however. Better still would be an online database, where designers could log in and access independent lab reports and IES files, and share post-installation readings as an open-source community. While there is the potential for fraud, a frank and open forum developed to proliferate truth in advertising in our industry far outweighs the alternative. The potential for public disclosure may get manufacturers to better align their reported data with real-game performance.

Don Peifer began his career designing the lighting for such famed photographers as Annie Leibovitz and Steven Klein. Architectural projects include the Flagship Nike Media Store in New York City. A graduate of the Lighting Research Center at RPI, Mr. Peifer is the founder and chief innovation officer for Lunera Lighting.