

The color of quality

Whether you're trying to show merchandise or artwork at its best, or to set a mood, it's not just the quantity of light that matters but the quality of light.

According to the International Association of Lighting Designers (IALD), studies show the quality of light affects everything from retail sales to the satisfaction and productivity of office workers. They say good lighting adds value, reduces costs, and enhances the mood and desirability of spaces; and contributes to people's sense of well-being. In order to achieve these benefits, lighting must:

- Meet the needs of the people who use the space
- Be cost-effective and energy-efficient
- Achieve a balance of function and aesthetics

When considering lighting, people often ignore a key component of high-quality lighting—color. But these color considerations can dramatically impact the function and aesthetics of your lighting:

- The right color of white
- Consistent initial color
- Consistent color over time

Most people have noticed differences in supposedly “white light.” As lighting designers also realize, all lighting will experience some change in color over time. Since you've taken the trouble to get good lighting, you need to make sure you continue to get good color over the life of your lighting system.

Here we explore the differences in “white” light, what causes the variations, how and why initial color changes over time, and what you need to know to maintain the lighting you want.

In Figure 1 you can see an LED module on the black body locus. If the light from the module changes by moving above or below the black body locus, the light will become greenish or pinkish. In technical terms, the degree of change is called delta u prime v prime ($u'v'$). If the module moves along the black body curve then the light becomes “warmer” or “cooler” (e.g. 2700K CCT vs. 4000K CCT).

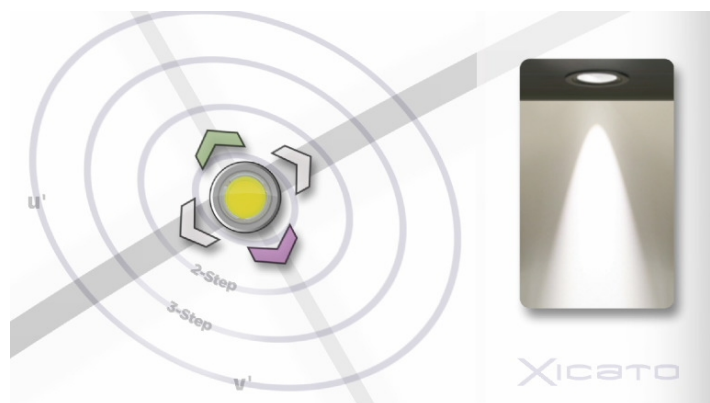


Figure 1 – Color space at 3000K CCT

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About white light

All lighting technologies can produce a range of white light because white light, as our eyes see it, is actually a combination of multiple colors. So it's not unusual to see "white" light that actually looks somewhat more yellow, blue, greenish, or even pink. This difference in shade can dramatically affect the look of artwork, merchandise, food, and skin tone.

Many users are moving to LED lighting because it saves energy and has an extraordinarily long life. But LED lighting, like conventional lighting, has a very wide range of differentiation in the shades of white light it produces. It's important to know the factors that affect this range of color consistency-initially (when you first install the LED luminaire) and over the life of that luminaire.

LED luminaires are composed of a number of components including reflectors, heat sink, power supply and the light source itself. Of these, a high-quality light module is the most important element for consistent color. Even quality components in other parts of the system will not make up for the problems introduced by a low-quality module.

The materials used in LED modules can make a difference in their color consistency. With many modules, manufacturers make compromises with regards to plastics, silicones, and complex electronics. High-quality modules like those from Xicato have a protective, long-lasting aluminum enclosure and carefully selected phosphors and LEDs. This eliminates many of those quality compromises.

In summary, when considering an LED luminaire, you need to make sure the modules inside are of high quality to get better initial color consistency.



Figure 2: The Problem

Inconsistent color shades can make your lighting look obviously mismatched. This could affect both the visual appeal of the space and cause merchandise or materials to appear off color or less appealing to shoppers.

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Consistent color for life

Once you achieve consistent initial color, the stability of your color is the next issue.

As we said, all lighting will experience some color change over time. To maintain the best possible lighting, you want the lighting to have consistent change across all the lights. This will give you an appearance that is closest to the lighting you originally installed, and is still visually consistent to the human eye. As an example, consider the scenario below with a set of matched couches.



Initially the couches look the same.



After a period of years, they should still look alike (consistent).



The couches should not have visually inconsistent change.

The LED technology used in the module, such as cold vs. traditional hot phosphor, can dramatically impact the consistency of the color the LED light source over time. Patented Xicato Corrected Cold Phosphor technology[®] provides the best color stability. This technology separates the phosphors that convert blue light to white light, from the blue LEDs themselves. This “cold” phosphor approach mitigates the effects of high temperature over time on the phosphors and ensures a much more uniform and consistent light over the full life of the lamps.

Tighter tolerances, smaller shifts

Understanding how lighting changes will allow you to start with the “right” light for your application, and maintain that light for a predictable period of time.

For the best initial color, you want to look for lights that cluster most closely in the same color “region.” These regions are measured along two color axis. Most manufacturers describe their starting region as a three step space (3 SDCM). Xicato’s initial space is described as one step by two steps which is a significantly smaller area. This means that any variation between Xicato’s modules is imperceptible. You should always ask for lights that are initially no more than one “step” apart on the vertical axis and two “steps” apart on the horizontal axis.

How your lights change on the color axis over time will determine how consistent your color remains. When the U.S. Department of Energy tested LED lighting sources, the chromatic changes for some were quite erratic. So, even if your initial color was evenly matched, these lamps could give you quite a wide range of color shift over time. To most closely maintain the lighting you originally specified, be sure to request LED light sources with demonstrated good color consistency along those same axis.

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Complete specifications and data showing initial and maintained consistency over time should be available from the light source manufacturer. Xicato provides this on its website and through its luminaire manufacturer partners.

With careful and considered selection of light source and luminaire, you can be assured of color stability in your LED lighting.

Xicato: Consistent color quality you can count on

For color quality you can count on to put everything you light in the best light, specify an LED luminaire that features Xicato modules. With Xicato modules, you get the initial color you want, with color consistency between modules that is closer than any other manufacturer on the market. And you'll get color that will stay close for the life of the system.

In fact, Xicato color is so consistent that, not only do our modules start out with the tightest color specification in the market, but we're the first to guarantee they will be consistent within a three step color range over five years. This means the consistency over time of Xicato modules is smaller than the initial consistency other manufacturers define for their starting point. The Xicato Color Consistency and Lumen Maintenance Warranty is backed by Munich RE, an international leader in risk management.

You can also see the difference in the field. Years of real-world installations prove the reliability and consistency of the light from Xicato modules. To see what consistent color looks like, visit the Xicato projects gallery at www.xicato.com.

To learn more about color consistency and how you can light spaces confident that your vision will stand the test of time, please visit our website at www.xicato.com or contact Xicato at 1.866.223.8395.

About Xicato

Xicato is passionate about light. Light has an emotional effect on people and a direct impact on business profitability. It ultimately influences everything in our lives. Xicato is a recognized leader in creating LED modules that provide superior aesthetics, economics and durability. Xicato aspires to be the trusted partner of the global lighting design community and luminaire manufacturers.