"It's Watts - It's Lumens - It's $$$"

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So far we have looked at *Footcandles, Color Temperature and Color Rendering*. All of these are quantifiable traits of light, and all help us to express what we are looking for in light. ***Footcandles*** helps us to numerically quantify light in terms of **how much**, ***Color Temperature*** helps us to determine what **color the light will be** and ***Color Rendering*** helps us to predict how accurately different lamps will **portray the color** of objects viewed. All three of these are powerful tools for quantifying light and color.

Some lamps produce more light for the same input power than others. An understanding of Wattage, Lumens and how the two interact together is essential to quality lighting design. We need to be able to look at the different efficiency for different light sources, and factor that into our lighting designs.

Lighting accounts for nearly 40% of a typical commercial building's power bill. This does not take into account that HVAC loads are greatly affected by lighting loads, as every watt of power used in a lighting system will introduce 3.414 BTU's (British Thermal Unit) of heat that the HVAC system has deal with. For this reason, lighting retrofits, changing older inefficient lighting systems to new, efficient systems can offer extremely quick payback to the end user, often as fast as 18 months!

Wattage

All lamps require electricity in order to produce light. The amount of electricity is measured in Watts (W). Watts, expressed as kilowatts (1000 watts = 1 Kilo Watt) is what the utility companies' measure to calculate monthly electrical bills. Controlling the wattage used for lighting is one way to control a power bill.

When measuring wattage, it is important to look at the entire lighting system. Most incandescent lamps operate at 120 volts or 'line voltage'. This means that they are able to function without the use of any additional parts above and beyond a socket to screw into. Therefore, a lamp that is rated at '60 watts' will use 60 watts and perform to manufacturer specifications.

Fluorescent and HID lamps require a ballast to operate. The ballast requires its own power, so it is essential that a lighting designer take the entire lighting system, lamps and ballast, into consideration when utilizing these sources. For example, a 400W Steeler high bay way will draw 400 watts to operate the lamps, and an additional 60 watts for the ballast (known as ballast loss). That means that for every 400W fixture, a total of 460 Watts are required!

It is important to note that manufacturers of lighting products like Cooper Lighting design their catalog nomenclature to reflect the wattage of the lamp only.

For example:
MHSS-SA18-M-400-MT is a Steeler high bay that will operate a 400 W Metal halide lamp.
2GR8-432A-UNV-EB81-U is a two foot wide lensed troffer that will operate 4 32 watt T8 fluorescent lamps.

Lumens

Different lamps produce different amounts of light. A 100-Watt incandescent lamp produces more light than a 40-Watt incandescent lamp. To help us define this, we express the quantity of light of light in lumens. Different lamps have different lumen ratings or lumen packages as the industry sometimes calls this.

Lumen ratings are outlined on the manufactures packaging, along with the input wattage, and in the case of fluorescent and discharge sources, color temperature and color rendering.

Different types of lamps will produce more light per watt than others. Put another way, some types of lamps are more efficient than others. One way to describe this efficiency, or more accurately efficacy since we are comparing dissimilar sources is ***Lumens Per Watt (LPW).*** Lumens Per Watt is an expression of how many lumens we get from a light source compared to how much energy (wattage) we put in. Sound confusing? Think of it this way. A car's fuel efficiency is rated in miles per gallon. The car that can travel the furthest distance (highest number of miles) on a single gallon of gas is the most fuel efficient car. ***Lumens Per Watt*** is a similar expression. The lamp that produces the greatest number of lumens per one watt of energy is the most efficient.

Incandescent lamps typically give us around 17-20 LPW, while some fluorescent lamps can give us 90 LPW. This is extremely important when working on a design for a 100,000 square foot office!

The importance of understanding the Lumen per Watt ratio cannot be ignored. It is easily calculated by taking the lamp lumens and dividing it by the total wattage required to operate the luminaire. Also worth noting, fluorescent and high intensity discharge sources depreciate in lumen output over their life. These sources are typically rated in both initial and mean, or design lumens (sometimes called maintained lumens). What is found on a manufacturers packaging is typically initial lumens, not design lumens, and so to ensure that accurate measurements are being calculated, designers should refer to a lamp catalog. In some cases the difference between initial lumens and design lumens can be as much as 33%!

In today’s competitive business environment, everybody is looking for ways to save money. Energy legislation restricting watts consumed per square foot and total system wattage are appearing all over the country. On July 15th, 2004, the United Sates will have Federal guidelines that provide maximum energy allowances for lighting on all new construction and some large renovations in all 50 states. Given these new, nationwide restrictions on energy consumption, a revised and published document entitled ASHREA/IESNA 90.1-2001 (this document is also approved by ANSI), details the limits required for energy usage compliance. So it is essential that an understanding of the different efficacies of light sources be understood and applied to develop a competitive lighting design.

Throughout this series of articles we have examined different terms relevant to lighting and lighting design. A firm understanding of ***Footcandles, Color Rendering, Color Temperature, Wattage*** and ***Lumens*** all help designers and end users to quantify their needs from a lighting system, and help to answer, **“What are we looking for in Light.”**