

LIGHTING 101

THE SCIENCE AND ART OF LIGHTING

THE SCIENCE OF LIGHT

Light is electro magnetic energy that is produced by the sun in different wavelengths-all of them traveling at about the same speed. There are actually different types of light, ultra violet light, infrared light, etc., but the human eye can only see the light categorized as visible light or white light.

Isaac Newton discovered that visible light or white light contains all the colors of the spectrum by using a prism to refract (slow down and bend) the light.. We see this principle each time we see a rainbow. The colors of the spectrum will always be in the same order. Roy G. Biv = red, orange, yellow, green, blue, indigo and violet.

The color of the light changes the way our eye perceives the surface it hits. Understanding the importance of light in interior design applications is critical. As the light changes, color changes.

LIGHT TEMPERATURE

The light given off by various sources differs in color temperature. The color of light is rated in Kelvin (k), a temperature scale. Light is divided into three general tones.

- Orange tones (incandescent) 2700 -3000K
- White (halogen), 3000-3600K
- Blue (fluorescent) 3000K for warm and 4000K for cool.

The color of the light affects how objects will appear in that light. When selecting light for interior purposes, the designer needs to consider what the light will be used for. People look best in the lower temperature, 2700- 3000K, orange light. For example, soft warm candle light. We typically don't look our best under a cool light, 4000 K or higher, fluorescent. The higher Kelvin numbers have a greenish, blue tint that doesn't enhance our skin color.

Another method of determining a good color rendering light source is the color rendering index (CRI). The CRI number indicates how close a color is to daylight. The CRI scales goes from 1-100, with 100 equaling daylight. A CRI of 80 or above is good. The closer the CRI of a light sources is to 100 the more accurately the light will reproduce color.

Look at a light bulb box next time you're in a store. You will see the Kelvin number and the CRI value. Never ever buy a cool white fluorescent bulb again...yuk!! Take a minute and choose a warm, white version. The higher the CRI the better, the lower the Kelvin number, the better.

light, intuitively it represents safety. Commercial Interior Designers use lighted paths to easily guide large numbers of people through unfamiliar, public spaces.

LIGHTING MEASUREMENT TERMINOLOGY

Lumen: the measurement of the amount of light a bulb **produces**.

Foot-candle: the measurement of how much light **reaches** an object or surface. One foot-candle equals one lumen per square foot.

Wattage: the amount of electricity a bulb uses.

Efficacy: Lumens per watt

TYPES OF BULBS (AKA LAMPS)

Incandescent bulbs produce light when an electric current passes through a filament and causes it to glow. Because they are less energy efficient than other light sources, they are best used for task lighting that demands high levels of brightness.

Fluorescent bulbs produce light when an electric arc passes between cathodes to excite mercury and other gases producing radiant energy, which is then converted to visible light by a phosphor coating. They use 1/5 to 1/3 as much electricity as incandescents with comparable lumen ratings and last up to 20 times longer.

Compact Fluorescent Lamps (CFLs) are small fluorescent bulbs that can be used in most types of lighting fixtures. The screw-in types can be used to replace incandescent lamps in standard lamp sockets.

High-Intensity Discharge (HID) bulbs produce light when an arc passes between cathodes in a pressurized tube, causing metallic additives to vaporize. They have long lives and are extremely energy efficient, but - with the exception of metal halides - they do not produce pleasing light colors. In residential settings, HIDs are most often used for outdoor security and area lighting.

Light Emitting Diodes (LEDs) produce light when voltage is applied to negatively charged semiconductors, causing electrons to combine and create a unit of light (photon). In simpler terms, an LED is a chemical chip embedded in a plastic capsule. Because they are small, several LEDs are sometimes combined to produce a single light bulb. LED lighting in general is more efficient and longer lasting than any other type of light source, and it is being developed for more and more applications within the home. LED lighting is the future lighting technology.

Lighting Controls

Lighting controls give you the flexibility to design a lighting plan with multiple uses and decorative effects. With the touch of a button, today's sophisticated dimming systems enable you to:

- Lower light levels to conserve energy and increase bulb life
- Vary the mood of a room
- Alter the intensity of the light to suit the activity

Energy Efficiency

Lighting typically accounts for about 17% of residential electricity use, but there are easy ways you can reduce energy consumption by lighting in your residence without compromising lighting quality or convenience.

- Turn off the lights when you do not need them.
- Install (and use!) dimming controls where possible.
- Use photoelectric lighting controls such as motion or occupancy sensors or timers to automatically turn off lighting, especially outdoors.
- Use the lowest wattage and most efficient bulb that will properly fulfill your lighting needs.

THE LAYERS OF LIGHT

The most successful lighting plan occurs in the initial design phase of the home. The designer needs to know who will be using the space and how they will be using it. People need higher light levels as they age. Detailed hobbies and reading areas need more light, also.

Light should be applied in layers:

Ambient lighting provides an area with overall illumination. Also known as general lighting, it radiates a comfortable level of brightness without glare and allows you to see and walk about safely. In some spaces such as laundry rooms, the ambient lighting also serves as the primary source of task lighting. It can be accomplished with chandeliers, ceiling or wall-mounted fixtures, recessed or track lights and with lanterns mounted on the outside of the home. Having a central source of ambient light in all rooms is fundamental to a good lighting plan.

Task lighting helps you perform specific tasks, such as reading, grooming, preparing and cooking food, doing homework, working on hobbies, playing games and balancing your checkbook. It can be provided by recessed and track lighting, pendant lighting and under-cabinet lighting, as well as by portable floor and desk lamps. Task lighting should be free of distracting glare and shadows and should be bright enough to prevent eye strain.

Accent lighting adds drama to a room by creating visual interest. As part of an interior design scheme, it is used to draw the eye to houseplants, paintings, sculptures and other prized possessions. It can also be used to highlight the texture of a brick or stone wall, window treatments or outdoor landscaping. To be effective, accent lighting requires at least three times as much light on the focal point as the general lighting surrounding it. Accent lighting is usually provided by recessed and track lighting or wall-mounted picture lights.

FIXTURE SHAPES AND FORM

Chandeliers add style and a decorative focal point to almost any room in the house. Though they have traditionally been used in the dining room, they are now commonly featured in bedrooms, kitchens, family rooms, living rooms, foyers and even bathrooms.

Hall/foyer fixtures can create a beautiful focal point at the entrance to your home. They can provide the ambient lighting that you need to greet guests and to assure safe passage into other areas of your home. The ceiling height of the space will determine the type of fixture that you should use. In taller ceilings and over stairways, large chandeliers and chain-hung foyer fixtures are most appropriate. Use surface-mounted and close-to-ceiling fixtures in foyers with lower ceilings and in hallways.

Pendants can provide both task and ambient lighting. They are extremely popular and available in an unlimited range of styles, shapes and colors. Equipped with shades or globes to avoid glare, they are suspended from the ceiling over kitchen counters, breakfast areas, game tables or other work areas. When used over bedside tables, they provide good task lighting and also free up the space occupied by table lamps. The use of a dimmer provides you with the flexibility to vary the light to suit the occasion.

Ceiling-mounted fixtures are excellent as a source of ambient lighting and are especially practical in areas with much activity, such as foyers, hallways, bedrooms, kitchens, baths, laundry rooms, playrooms and dens.

Cove lighting fixtures are also mounted near the ceiling. Fluorescent light is directed upward, giving indirect light only. Cove lighting provides good general lighting; however, you must supplement it with local lighting. It also gives a room a feeling of height.

Wall-mounted fixtures can provide a unique sense of elegance and sophistication to any home. They can also furnish ambient, task and accent lighting. Many are designed to match and supplement chandeliers and other fixtures in sets or families. They are excellent sources of light in foyers, hallways, bedrooms, living rooms, home offices and home theaters. Wall brackets also are often used for task lighting at the sides of bathroom mirrors

Bath/vanity fixtures supply task lighting, while supplementing the general lighting provided by ceiling fixtures. They are available in a wide range of styles, colors and shapes and are being used much more frequently today than the older bath/vanity lighting strips. Newer versions of bath/vanity fixtures are available with either glass or fabric shades, which provide glare control as well as excellent task lighting for grooming, applying makeup or shaving.

Portable lighting can deliver ambient, task and accent lighting while giving you the flexibility to move the light wherever you want. Table lamps, floor lamps and **torchieres (floor lamps with an upright component)** are available in a variety of styles to complement your interior design. Small specialty lamps, such as clip-on-lights, adjustable task lights and desk and accent lamps, fill a variety of task, ambient and accent lighting needs.

- **Torchiere:** a tall thin floor lamp that directs light upward. It is a portable, non-structural fixture.

Track lighting has undergone many changes in recent years. The trend in track lighting has been toward smaller fixtures, which are much less noticeable in the space. Track lighting is excellent for its flexibility and can provide ambient, task or accent lighting. You can move, swivel, rotate and aim the individual fixtures in any direction along the track, giving you the versatility to change the lighting

scheme when the need arises. With special attachments, you also can hang chandeliers and pendants from the track.

Rail lighting is increasing in popularity. As the demand grows for bendable, flexible rail lighting systems, rail lighting has been rejuvenated not only for function, but to add an additional decorative element to the space.

Recessed lighting can provide general, task and ambient lighting in a very subtle manner. Installed in the ceiling with only the trim showing, recessed fixtures can be used anywhere in the home, including outdoors, under eaves and on porches. They are ideal for any type of ceiling, including tall ceilings, shorter ceilings and sloped ceilings. They are available as downlights for ambient and track lighting, and as adjustable accent lights or wall washers for accent lighting.

Under cabinet fixtures offer both task and accent lighting. Mounted under kitchen wall cabinets, they provide excellent task lighting at the countertop. Used in display cabinets, they provide accent lighting for three-dimensional art and sculpture. In workshops or laundry rooms, they are an ideal source of task and ambient lighting. They include slim, energy-efficient fluorescents, miniature linear lighting and strips of line or low-voltage xenon, halogen mini-lights or LEDs.

Wall washers are also installed in the ceiling. They have contoured inner reflectors that direct nearly uniform light on walls from ceiling to floor. This gives walls a smooth look. If the wall washer fixtures are located closer to the wall, they can emphasize a textured surface.

STRUCTURAL AND NONSTRUCTURAL LIGHTING

Structural Lighting is permanently built in the home.

Nonstructural lighting is lighting that is not a structural part of the house, you can move, change, and replace these lights more easily than any other form of lighting. Lamps are the most common type of non-structural lighting. They can serve decorative purposes as well as provide good general and task lighting.