

## Glossary of Lighting Terms

<b>Ambient temperature</b>	The temperature of the surrounding air that comes into contact with the lamp and ballast. Ambient temperature affects the light output and active power of fluorescent lamp/ballast systems. Each fluorescent lamp-ballast system has an optimum ambient temperature at which it produces maximum light output. Higher or lower temperatures reduce light output. For purposes of lamp/ballast tests, ambient temperature is measured at a point no more than 1 meter (3.3 feet) from the lamp and at the same height as the lamp.
<b>Application</b>	The use to which a lighting system will be put; for example, a lamp may be intended for indoor residential applications.
<b>Average rated life</b>	The number of hours at which half of a large group of product samples fail under standard test conditions. Rated life is a median value; any lamp or group of lamps may vary from the published rated life.
<b>Ballast</b>	An electromagnetic device used in fluorescent and HID luminaires to provide the necessary starting voltage and to limit lamp current during operation.
<b>Ballast factor (BF)</b>	The ratio of the light output of a gaseous discharge lamp or lamps operated on a ballast to the light output of the lamp(s) operated on a standard (reference) ballast. Ballast factor depends on both the ballast and the lamp type; a single ballast can have several ballast factors depending on lamp type. Most commonly associated with fluorescent lighting.
<b>Ballast rated life</b>	The number of hours at which half of a group of ballasts fail under standard test conditions. Rated life is a median value of life expectancy; any ballast, or group of ballasts, may vary from the published rated life.
<b>Bi-level switching</b>	Refers to the control of light source intensity at two discrete levels in addition to off. Also referred to as a hi/lo system. Commonly used in conjunction with occupancy sensing devices to reduce power consumption in areas where human occupancy is intermittent.
<b>Color appearance</b>	The resultant color perception that includes the effects of spectrum, background contrast, chromatic adaptation, color constancy, brightness, size and saturation.
<b>Color consistency</b>	The measure of how close, in terms of color appearance, random samples of a lamp or source tend to be.
<b>Color rendering</b>	A general expression for the effect of a light source on the color appearance of objects in conscious or subconscious comparison with their color appearance under a reference light source.
<b>Color rendering index (CRI)</b>	A measure of the degree of color shift that objects undergo when illuminated by a lamp, compared with those same objects when illuminated by a reference source of comparable correlated color temperature (CCT). A CRI of 100 represents the maximum value. A lower CRI value indicates that some colors may appear unnatural when illuminated by the lamp.

	Incandescent lamps have a CRI above 95. Cool white fluorescent lamps have a CRI of 62. Metal halide lamps
<b>Color shift</b>	The change in a lamp's correlated color temperature (CCT) at 40% of the lamp's rated life, in kelvin (K).
<b>Color stability</b>	The ability of a lamp or light source to maintain its color rendering and color appearance properties over its life. The color properties of some discharge light sources may tend to shift over the life of the lamp.
<b>Color variation</b>	Lamps of the same type made by the same manufacturer may exhibit a certain degree of variation in color, even when operated under the same conditions and seasoned for the same amount of time.
<b>Constant-wattage autotransformer (CWA)</b>	The most common type of ballast used for HID lamps, it maintains a constant power (wattage) supply to the lamp when system input voltage fluctuates.
<b>Contrast</b>	Refers to the relationship between the brightness or color of an object relative to its immediate background. Higher contrast equates better visibility. The amount of light necessary to adequately see a given visual task is dependent upon the contrast of that task.
<b>Correlated color temperature (CCT)</b>	A metric that quantifies the color appearance of a light source in units of degrees Kelvin (°K). Generally associated with "white" light sources, CCT typically ranges from 2000 – 6000°K. Higher color temperature corresponds to white light that is cooler (blue) in appearance while lower corresponds to warmer (red).
<b>Current crest factor (CCF)</b>	A measure of ballast power quality defined as the peak current divided by the root-mean-square (rms) current provided to the lamp. Current crest factor ranges from 1 to infinity. ANSI requires current crest factor to be less than 1.7. Lamp manufacturers usually will not warranty their lamps when operated on a ballast having a current crest factor greater than 1.7.
<b>Daylighting</b>	Refers to the use of sunlight to illuminate interior spaces (windows, skylights, clerestories, etc...).
<b>Dimming ballast</b>	A device that provides the ability to adjust light levels by reducing the lamp current. Most dimming ballasts are electronic.
<b>Direct light</b>	Light emitted by a luminaire in the general direction of the task to be illuminated. The term usually refers to light emitted in a downward direction.
<b>Disability glare</b>	A type of glare that causes a loss of visibility from stray light being scattered within the eye.
<b>Discomfort glare</b>	The sensation of annoyance, or even pain induced by overly bright light sources.
<b>Efficacy</b>	The ratio of the light output of a lamp (lumens) to its active power (watts), expressed as lumens per watt.
<b>Electronic ballast</b>	A ballast that uses electronic components instead of a magnetic core and coil to operate fluorescent or HID lamps. Electronic ballasts operate lamps at high frequency, which results in reduced flicker and noise and increased efficacy compared with ballasts that operate lamps at 60 Hz.
<b>Fixture</b>	A complete lighting unit consisting of a lamp (or lamps), housing, optical system, ballast (if required) and parts designed to position and protect the

	lamp(s) and connect them to the electrical power supply. (Also referred to as luminaire.)
<b>Flicker</b>	A rapid and continuous change in light levels caused by low frequency current modulation. Flicker is typically associated with fluorescent and HID lamps, when operating on ac current at line frequency.
<b>Footcandle (fc)</b>	A unit of measurement associated with illuminance, or light density onto a surface. One footcandle equals one lumen per square foot or 10.76 lux (lumens per square meter, SI unit).
<b>Frequency</b>	The number of cycles completed by a periodic wave in a given unit of time. Frequency is commonly reported in cycles per second, or hertz (Hz).
<b>Gaseous discharge</b>	An electric lamp that produces light from gas atoms excited by an electric current.
<b>Glare</b>	The sensation produced by brightness within the visual field that is sufficiently greater than the brightness to which the eyes are adapted, which causes annoyance, discomfort, or loss in visual performance and visibility.
<b>Harmonic</b>	For a distorted waveform, a component of the wave with a frequency that is an integer multiple of the fundamental
<b>Harmonic distortion</b>	A measurement of the magnitude of voltage and current harmonics that exist in an alternating current waveform, as compared to the amplitude of the fundamental frequency. Harmonic distortion can be generated by a load and fed back into the AC mains, causing distortion of the sinusoidal waveform.
<b>Heat sinking</b>	Adding a material, usually metal, adjacent to an object in order to cool it via thermal conduction.
<b>High intensity discharge (HID)</b>	An electric lamp that produces light directly from an arc discharge under high pressure. Metal halide, high-pressure sodium, and mercury vapor are types of HID lamps.
<b>High pressure sodium</b>	A high-intensity discharge lamp type that uses sodium under high pressure as the primary light-producing element. HPS lamps produce light with a correlated color temperature (CCT) of approximately 2000K, although CCTs for lamps having higher CRI values range from 2200 to 2700K. Standard lamps have a CRI value of 22; others have CRI values from 60 to 80. HPS lamps are among the most efficacious light sources, with efficacies as high as 150 lumens per watt, although those with higher CRI values have efficacies as low as 25 lumens per watt.
<b>Horizontal illuminance</b>	The average density of luminous flux (light) incident on a horizontal surface such as a work bench, desk or floor. Measured in footcandles (fc) or lux (lx). One fc equals 10.76 lx.
<b>Hue</b>	The attribute of a light source or illuminated object that determines whether it is red, yellow, green, blue, or the like.
<b>Ignitor</b>	A device, either alone or in association with other components, that generates voltage pulses in order to start gaseous discharge lamps.
<b>Illuminance</b>	Quantifies the amount of light (luminous flux) incident on a surface area. Illuminance is orientation specific and does not quantify the ability to distinguish color. It is measured in footcandles (lumens/square foot) or lux (lumens/square meter). One footcandle equals 10.76 lux.

<b>Illumination</b>	The process of using light to enable visibility at a particular location.
<b>Indirect lighting</b>	Light arriving at a surface after reflecting from one or more surfaces (usually walls and/or ceilings) that are not part of the luminaire.
<b>Initial light output</b>	A lamp's light output, in lumens, after 100 hours of seasoning.
<b>Lamp</b>	A radiant light source, commonly referred to as a "light bulb".
<b>Lamp envelope</b>	Refers to the shape and size of the bare lamp or the capsule surrounding the lamp.
<b>Light loss factor (LLF)</b>	The product of all factors that contribute to lowering the illumination level including reflector degradation, dirt, lamp depreciation over time, voltage fluctuations, etc.
<b>Light power density (LPD)</b>	Sometimes referred to as power density. A measurement of the amount of electric power required to illuminate an area. Light power density is equal to the electrical power used to produce light in a given area divided by the floor area served by that light. Measured in watts per square foot. Usually associated with energy codes.
<b>Light trespass</b>	A undesirable condition in which spill light is cast where it is not wanted.
<b>Lumen (lm)</b>	A unit measurement of the rate at which a lamp produces light. A lamp's light output rating expresses the total amount of light emitted in all directions per unit time.
<b>Lumen depreciation</b>	Refers to the decrease in lumen output that results from lamp component degradation occurring as a consequence of lamp ignition and operation. Also referred to as lamp lumen depreciation (LLD).
<b>Lumen maintenance</b>	Refers to the ability of a lamp/ballast system to retain its lumen output over time. Greater lumen maintenance means a lamp will remain brighter longer. The opposite of lumen maintenance is lumen depreciation, which represents the reduction of lumen output over time. A lamp lumen depreciation factor (LLD) is commonly used as a multiplier to the initial lumen rating in illuminance calculations to compensate for lumen depreciation when calculating "maintained" light levels. The LLD factor is a dimensionless value between 0 and 1.
<b>Lumens per watt (LPW)</b>	A measure of light source efficacy. Equal to the total light output in lumens, divided by the electrical power consumed in watts.
<b>Luminaire</b>	A complete lighting unit consisting of a lamp (or lamps), housing, optical system, ballast (if required) and parts designed to position and protect the lamp(s) and connect them to the electrical power supply. (Also referred to as fixture.)
<b>Luminance</b>	The photometric quantity most closely associated with the perception of brightness, measured in units of luminous intensity (candelas) per unit area (square feet or square meter).
<b>Luminance contrast</b>	Luminance contrast quantifies the relative brightness of an object against its background.
<b>Luminous flux</b>	The rate of flow of light, measured in lumens. The overall light output of a lamp

<b>Luminous intensity</b>	The total luminous flux (light) within a given solid angle, in units of candelas, or lumens per steradian.
<b>Lux (lx)</b>	A measure of illuminance in lumens per square meter. One lux equals 0.093 footcandle.
<b>Maximum ballast case temperature</b>	The maximum temperature of the ballast case for which the manufacturer's life rating is valid.
<b>Mean light output</b>	Light output typically evaluated at 40% of rated lamp life. In combination with initial light output, mean light output may be used to estimate lamp lumen depreciation for the purpose of establishing maintained lighting conditions over time.
<b>Mean lumens</b>	Light output typically evaluated at 40% of rated lamp life. In combination with initial light output, mean light output may be used to estimate lamp lumen depreciation for the purpose of establishing maintained lighting conditions over time.
<b>Mercury vapor lamp (MV)</b>	A high-intensity discharge lamp type that uses mercury as the primary light-producing element. Mercury vapor lamps produce light with a CCT from 3000 to 7000K. Mercury vapor lamps with clear outer bulbs have CRI values from 15 to 25, whereas phosphor-coated lamps have CRI values from 40 to 55. Mercury vapor lamps are less efficacious than other HID lamp types, typically producing only 30 to 65 LPW, but they have longer lamp lives and lower initial costs than other HID lamp types.
<b>Metal halide lamp (MH)</b>	A high-intensity discharge lamp type that uses mercury and several halide additives as light-producing elements. Metal halide lamps have better color properties than other HID lamp types because the different additives produce more visible wavelengths, resulting in a more complete spectrum. Metal halide lamps are available with CCTs from 2300 to 5400 K and with CRI values from 60 to 93. Efficacies of metal halide lamps typically range from 75 to 125 lumens per watt.
<b>Minimum ambient temperature</b>	The minimum temperature at which a lamp or ballast is warranted to start. Usually associated with fluorescent lighting systems.
<b>Minimum starting temperature</b>	The minimum ambient temperature at which a ballast will reliably start a lamp. Usually associated with fluorescent lighting systems.
<b>Multitap</b>	A passive electrical distribution component composed of a directional coupler and a splitter with two or more output connections. Multitap ballasts provide a number of output connections for various voltages, frequencies, etc... This allows a single ballast to be used for a variety of purposes or to power multiple lamps having different requirements.
<b>Nadir</b>	In the lighting discipline, nadir is the angle pointing directly downward from the luminaire, or 0°. Nadir is opposite the zenith.
<b>Pendant mounting</b>	A suspension device between a mount and a luminaire.
<b>Photopic</b>	Corresponds to day vision, which is mediated essentially or exclusively by the cones. It is generally associated with adaptation to a luminance of at least 3.4 cd/m <sup>2</sup> .
<b>Photosensor</b>	A device used to integrate an electric lighting system with a daylighting system so lights operate only when daylighting is insufficient.
<b>Photometric</b>	Relating to photometry

<b>Photometric report</b>	Generally refers to the results of controlled laboratory measurements that characterize the performance of a lighting product. Used to compare lighting products and to predict system performance in application.
<b>Photometry</b>	The measurement of light and related quantities.
<b>Power</b>	The power (in watts) used by a device to produce useful work (also called input power or active power). In lighting, it is the system input power (in watts) for a lamp and ballast combination.
<b>Power factor (PF)</b>	The ratio of active power (in watts) to apparent power (in rms volt-amperes), power factor is a measure of how effectively an electric load converts power into useful work. Power factor (PF) is calculated using the equation $PF = \frac{\text{active power}}{[(\text{rms voltage}) \times (\text{rms current})]}$ . Phase displacement and current distortion both reduce power factor. A power factor of 0.9 or greater is indicative of a high power factor ballast.
<b>Power quality</b>	Refers to the degree to which the current and voltage wave forms conform to a sinusoidal shape and are in synchronous phase with each other. Poor power quality results when the wave forms are distorted and/or out of phase and can interfere with data communications, cause inefficient operation or failure of other electrical equipment on the same supply line, and result in excessive current in electrical distribution lines.
<b>Probe-start</b>	Method of starting mercury vapor and specific metal halide lamps in which an additional electrode at one end of the arc tube assists in lamp ignition.
<b>Pulse-start</b>	Method of starting high pressure sodium and specific metal halide lamps in which a high voltage starting pulse is responsible for lamp ignition.
<b>Re-strike</b>	Refers to lamp ignition after having been extinguished.
<b>Re-strike time</b>	The time required for a lamp that has been extinguished to reignite.
<b>Stroboscopic effect</b>	A condition whereby rotating machinery or other rapidly moving objects appear to be standing still due to the alternating current supplied to light sources. Sometimes called "strobe effect".
<b>Sound rating</b>	Magnetic ballasts sometimes produce a humming noise caused by vibration of the magnetic core. Electronic ballasts operate at high frequencies and are usually less noisy. Ballasts are rated from "A" to "F" based on their noise levels. Ratings define the range of ambient sound levels in which people will not notice the ballast noise. The higher the rating, the more noise that will be required to mask the ballast hum.
<b>Spectral power distribution</b>	A representation of the radiant power emitted by a light source as a function of wavelength.
<b>Spill light</b>	Light that falls outside of the area intended to be lighted
<b>Starting time</b>	The time it takes the lamp to start from the point at which voltage is applied to the lamp until stable operation.
<b>Total harmonic distortion (THD)</b>	The combined effect of all of the harmonic distortion on the AC waveform produced by a ballast or other device. Excessive levels of THC can create large currents on the neutral line of a 3 phase 4 wire wye power system. See Harmonic Distortion.

<b>Uniformity</b>	The degree of variation of illuminance over a given plane. Greater uniformity means less variation of illuminance. The uniformity ratio of illuminance is a measure of that variation expressed as either the ratio of the maximum to the minimum illuminance or the ratio of the average to the minimum illuminance.
<b>Uplight</b>	Light directed upward at greater than 90° above nadir. The source of uplight can be from a combination of direct uplight and reflected light.
<b>Venting</b>	Refers to a reflector assembly or luminaire that utilizes holes or other air passages to ventilate the system for the removal of heat or convective cleansing.
<b>Vertical illuminance</b>	The average density of luminous flux incident on a vertical surface, measured in footcandles (fc) or lux (lx). One fc equals 10.76 lx. Typically applies to storage areas, machinery, and other visual tasks that are specifically vertical in orientation.
<b>Visual performance</b>	The quantitative assessment of the performance of a visual task, taking into consideration speed and accuracy.
<b>Warm-up time</b>	The time it takes for a lamp to produce 90% of its initial light output when it is started, unless otherwise indicated.
<b>Wavelength</b>	The distance between two corresponding points of a given wave. Wavelengths of light are measured in nanometers (1 nanometer = 1 billionth of a meter, or $1 \times 10^{-9}$ m)
<b>Work plane</b>	Plane at which visual work is done and at which illumination is specified and measured; unless otherwise indicated, it is assumed to be a horizontal plane 30 inches above the floor (table-top height) having the same area as the floor.
<b>Zenith</b>	In the lighting discipline, zenith is the angle pointing directly upward from the luminaire, or 180° vertical. Zenith is opposite nadir. In astronomical usage, zenith is the highest point in the sky, directly above the observation point.