



Ministry of
Transportation
and Infrastructure

ELECTRICAL AND TRAFFIC ENGINEERING MANUAL

Appendix 300.1

Glossary of Terms

Accommodation: The process by which the eye adapts itself to varying quantities of light.

Adaptation: The process by which the eye adapts itself to varying quantities of light.

Arrangement: The repeating pattern of luminaires on a roadway. Usually described as staggered, one-sided, opposite or medium mounted.

Average Luminance (L_{av}): The average photometric brightness of a surface expressed in terms of the total luminous flux (lm) actually leaving the surface per unit area (cd/m²).

Ballast: A device used with an electric discharge lamp to obtain the necessary circuit conditions (voltage, current and waveform) for starting and operation.

Bikeway: Any road, street, path, or way that in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

Brightness: The luminance in terms of subjective sensation as experienced by an individual person. Brightness is a psychological response to luminous and not synchronous with it.

BUG Rating (Backlight-Uplight-Glare): A method of evaluating luminaire optical performance by partitioning the spherical distribution of light produced by a fixture into 3 specific zones, and quantifying the amount of light incident to each zone. The zones are:

Up: Entire upper half of the sphere.

Front: The front quarter of the bottom half of the sphere.

Back: The back quarter of the bottom half of the sphere.

The *up* zone is divided into *low* and *high* and the lower zones are divided into *low*, *medium*, *high* and *very high*.

The amount of light entering each zone defines the BUG (Backlight – Uplight – Glare) rating for the fixture. This method has superseded the method of describing fixtures by “*cutoff*”.

Candela (cd): The SI unit of luminous intensity, equal to one lumen per steradian (lm/sr).

Candela Per Square Meter: The SI unit of luminance equal to the uniform luminance of a perfectly diffusing surface emitting or reflecting light at the rate of one lumen per square meter or the average luminance of any surface emitting or reflecting light at that rate. The unit is sometimes called a nit.

Cutoff: A means of defining the distribution of a luminaire based on candela per 1000 lamp lumens. Luminaires are rated as Full Cutoff, Cutoff, Semi-cutoff, or Non-cutoff.

Full Cutoff -A luminaire light distribution is designated as full cutoff where zero candela intensity occurs at an angle of 90° above nadir, and all greater angles from nadir. Additionally the candela per 1000 lamp lumens does not numerically exceed 100 (10%) at an angle 80° above nadir. This applies to all lateral angles around the luminaire.

Cutoff -A luminaire light distribution is designated as cutoff when the candlepower per 1000 lamp lumens does not numerically exceed 25 (2.5 percent) at an angle of 90° above nadir, and 100 (10%) at a vertical angle of 80° above nadir. This applies to all lateral angles around the luminaire.

Semi-cutoff -A luminaire light distribution is designated as semi-cutoff when the candlepower per 1000 lamp lumens does not numerically exceed 50 (5%) at an angle of 90° above nadir, and 200 (20%) at a vertical angle of 80° above nadir. This applies to all lateral angles around the luminaire.

Non-cutoff – A luminaire is designated as non-cutoff where there is no intensity (candela) limitation in the zone above maximum intensity.

Efficacy (lm/w): The ratio of the total luminous flux emitted by a lamp to the total lamp power expressed in lumens per watt.

Efficiency (%): The ratio of the total luminous flux emitted by a luminaire to that emitted by a bare lamp.

Footcandle (fc): The unit of illuminance equal to 1 lm/ft² or 10.76 lux.

Glare: The sensation produced by luminances within the visual field that are sufficiently greater than the luminance to which the eyes are adapted. Which cause annoyance, discomfort, or loss in visual performance and visibility.

Direct Glare - Glare resulting from high luminance or insufficiently shielded light

sources in the field of view or from reflecting areas of high luminance. It usually is associated with bright areas, such as luminaires, that are outside the visual task or region being viewed. A direct glare source may also affect performance by distracting attention.

Discomfort Glare - The sensation experienced by an observer when brightness relationships in the field or view cause discomfort but do not necessarily interfere with visual performance.

Disability Glare - The effect of stray light on the eye whereby visibility and visual performance are reduced. A direct glare source that produces discomfort may also produce disability glare by introducing a measurable amount of stray light in the eye.

High Intensity Discharge (HID)

Lamp: An electric discharge lamp in which the light producing arc is stabilized by wall temperature and the arc tube has a bulb wall loading in excess of three watts per square centimeter. HID lamps include groups of lamps known as mercury vapor, metal halide and high-pressure sodium.

High Pressure Sodium (HPS) Lamp:

High intensity discharge (HID) lamp in which light is produced by radiation from sodium vapor operating at a partial pressure of about 1.333104 Pa (100 torr).

Illuminance (E): The density of the luminous flux incident on a surface measured in lux or fc.

Horizontal illuminance – Luminous flux incident on a horizontal surface.

Vertical illuminance – Luminous flux incident on a vertical surface.

Illumination: Commonly used in a qualitative or general sense to designate the act of illuminating or the state of being illuminated.

Incident Light: Light falling on an object or surface.

Intensity: A shortening of the terms luminous intensity and radiant intensity. Often used for level of illumination or illuminance.

Lamp: A generic term for an artificial source of light.

Lamp Life: The average life of a lamp defined as the point in time when 50 percent of a statistical sample of lamps has failed.

Lamp Lumen Depreciation (LLD)

Factor: The multiplier to be used in illuminance calculations to relate the initial rated output of light sources to the anticipated minimum rated output based on the relamping program to be used.

Light: Radiant energy that is capable of exciting the retina and producing a visual sensation. The visual portion of the electromagnetic spectrum extends from about 380 to 780 nanometers.

Light Loss Factor (LLF): A factor used in calculating illuminance after a given period of time and under given conditions. It takes into account temperature and voltage variations, dirt accumulation of luminaire, lamp depreciation, maintenance procedures and atmospheric conditions. Formerly called maintenance factor.

Light Pollution: The scattering of electric light onto the atmosphere, usually caused by luminous flux above the horizontal. Often referred to as sky glow or sky brightness.

Light Trespass: Light that strays from its intended purpose, causing visual annoyance. A severe form of light trespass involves glare.

Low Pressure Sodium (LPS) Lamp:

A discharge lamp in which light is produced by radiation from sodium vapor operating at a partial pressure of 0.13 to 1.3 Pa (10⁻³ to 10⁻² torr).

Lumen (lm): The SI unit of luminous flux. Photometrically, the luminous flux emitted within a unit solid angle (1sr) by a point source having a luminous intensity of 1cd.

Luminaire: A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply.

Luminaire Component Depreciation

(LCD) Factor: The multiplier to be used in illuminance or luminance calculations to relate the initial flux output of a clean luminaire to the reduced flux output due to permanent component deterioration at a particular time in the future chosen for desirable maintained values.

Luminaire Dirt Depreciation (LDD)

Factor: The multiplier to be used in luminance or illuminance calculations to reduce the initial light level provided by clean, new luminaires to the reduced to the light level that they will due to dirt collection of the luminaires at the time at

which it is anticipated that cleaning procedures will be instituted.

Luminance (L): The luminous intensity of any surface in a given direction per unit area of that surface viewed from that direction.

Luminous Flux (F): The time rate of flow of light, expressed in lumens.

Luminous Intensity (I): The luminous flux per unit solid angle in a specific direction. It is the luminous flux on a small surface normal to that direction divided by the solid angle (in steradians) that the surface subtends at the source, expressed in cd.

Lux (lx): The international unit of illuminance, equal to one lumen evenly distributed over a surface of one square meter. One lux is equal to approximately 0.093 fc.

Maintenance Factor (MF) or Lumen

Maintenance: A factor formerly used to denote the ratio of the illuminance on a given area after a period of time to the initial illuminance on the same area.

Light output from all lamps deteriorates over time at various rates. These must be addressed if the system is to be effective when “minimum” operational levels are attained.

Mean Lamp Lumens: The mean lumen output of a lamp is calculated by determining the area beneath the lumen maintenance characteristic curve of that source over a given period of time and dividing that area by the time period in hours.

Mounting Height (MH): The vertical distance between the roadway surface and the centre of the apparent light source of the luminaire.

Nadir: The vertical projection beneath the apparent light source of a luminaire.

Offset: The distance from the face of curb or edge of the traveled roadway to the traffic hazard (lighting poles, etc.).

Reflectance: The ratio of the reflected light (flux) to the incident light (flux).

Reflector: A device used to redirect the luminous flux from a source by the process of reflection.

Refractor: A device used to redirect the luminous flux from a source primarily by the process of refraction.

Setback: The lateral offset of the pole from face of curb or edge of traveled roadway.

Small Target Visibility: A method of design that determines the visibility level of an array of targets on the roadway. The weighted average of the visibility level of these targets results in the STV.

Spacing: The distance in metres between successive lighting units measured along the control line of a street.

Street Side: The horizontal direction that is toward the roadway from the nadir of the luminaire.

Veiling Luminance: A brightness superimposed on the retinal image that reduces its contrast. It is this veiling effect produced by bright sources or areas in the visual field that results in decreased visual performance and visibility.

Veiling Reflection: Regular reflections superimposed upon diffuse reflections from an object that partially or totally obscure the details to be seen by

reducing the contrast. This sometimes is called reflected glare.

Visibility: The quality or state of being perceivable by the eye. In many outdoor applications, visibility is defined in terms of the distance at which an object can be just perceived by the eye. In indoor and outdoor applications it usually is defined in terms of the contrast or size of a standard test object, observed under standardized view-conditions, having the same threshold as the given object.

Visibility Level (VL): A contrast multiplier to be applied to the visibility reference function or provide the luminance contrast required at different levels of task background luminance to achieve visibility for specified conditions relating to the task and observer.

Visual Angle: The angle subtended by an object or detail at the point of observation. It usually is measured in minutes of arc.