

GUIDELINES FOR GOOD EXTERIOR LIGHTING PLANS

2020

These guidelines have been developed in consultation with lighting professionals (with experience in developing good lighting plans) to aid communities wishing to control light pollution and preserve a view of the stars in the night sky.

Outdoor lighting should be carefully designed with regard to placement, intensity, timing, duration, and color. Good lighting will:

- **Promote Safety**

"More light" is not necessarily "better light". If fixtures are not designed and installed correctly, unsafe glare can result, reducing the effectiveness of lighting, which can contribute to reduced visibility and accidents. Lighting that is too bright can interfere with the eye's ability to re-adapt to darker areas.

Crime Prevention Through Environmental Design (CPTED) stresses that lighting systems should "minimize glare, shadow, light pollution, and light trespass". Lighting that protects our night sky and nocturnal environment also improves visibility and safety by enhancing night vision.

- **Save Money**

Adhering to professionally recommended light levels provides adequate illumination. Shielded fixtures with efficient light bulbs are more cost-effective because they use less energy by directing the light toward the ground. See this website for cost comparisons:

<http://darksksociety.org/lightcost/index.php>

- **Conserve Natural Resources**

Inappropriate or excessive lighting wastes our limited natural resources and pollutes the air and water by unnecessarily burning our limited supply of fossil fuels.

- **Be Better Neighbors**

Excessive or misdirected lighting can intrude on the privacy of others when light or glare trespasses over property lines.

- **Retain Community's Character and Reduce Skyglow**

Our clear view of the starry night sky is a resource to be preserved and protected. Stray and excessive lighting contributes to "light pollution", clutter, and unnatural "sky glow".

- **Protect Ecology of Flora and Fauna**

Research studies indicate that artificial night lighting disrupts the migrating, feeding, and breeding habits of many wildlife species, as well as growth patterns of trees. See references in [The Ecological Consequences of Artificial Night Lighting](#).

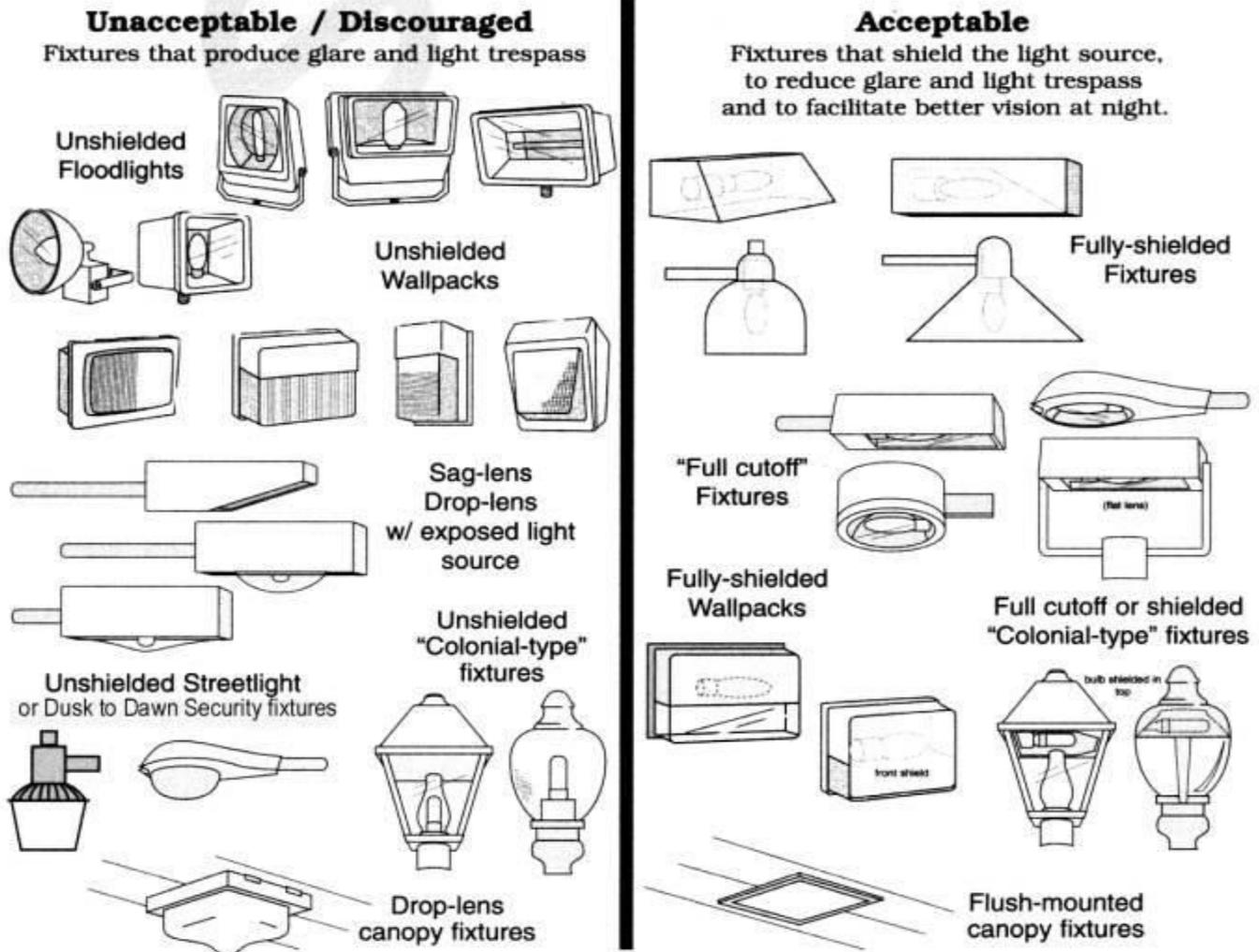
- **Reduce Health Risks**

Light at night not only disrupts your sleep but also interferes with your circadian rhythms. Recent research indicates that intrusive lighting may reduce the production of melatonin, a beneficial hormone, and a resulting raise in the rates of breast and other cancers.

The American Medical Association (AMA) endorses dark-sky friendly lighting at or below 3000 Kelvin to reduce hazardous glare (especially for older drivers) and excessive light trespass which has many implications for human health including the correlation of melatonin suppression with the growth of cancerous tumors. In 2009 the AMA passed a resolution urging federal, state, and local legislative action to reduce light pollution.

- Included:**
- 1. Diagrams of Acceptable/Unacceptable Lighting Fixtures**
 - 2. How to Develop an Acceptable Lighting Plan**
 - 3. Definitions of lighting Fixtures**
 - 4. Lighting Plan Submissions**
 - 5. Recommended Illumination Levels for various tasks**

Examples of Unacceptable/Acceptable Fixture Types



Diagrams courtesy of Bob Crelin

Ask your local electrical suppliers for IES designated "Zero Uplight" or "Fully Shielded" light fixtures. Once you have selected fixtures which are compatible with your architecture and community, contact the manufacturer's representative to see a sample of the fixture(s), the "cut sheet" to show your client and municipal officials, and to ask for a free lighting plan. If you have a CAD file, the plan can be easily provided in a short period of time.

*****Definition of "Fully Shielded/Zero Uplight": A light fixture with an opaque shield above the lamp (bulb), so that, as designed and installed, the light fixture projects all its light below the horizontal plane through the lowest light emitting part of the fixture.**

Most lighting manufacturers have Application Departments which will execute free lighting plans to meet local lighting codes if they are provided these Guidelines.

How to Develop an Acceptable Lighting Plan

Deliver these requirements to a manufacturers' representative or send to the manufacturers applications department with a site plan (CAD file) shading in the areas to be illuminated and the hours of anticipated use for each area. Manufacturers will provide a lighting plan at no costs once you and your client have chosen the style of fixture that meets your aesthetic design.

1. Identify where as well as when lighting is needed. Minimize lighting to the extent necessary to meet safety purposes. Plans should define the areas for which illumination is needed for safe pedestrian passage and indicated when those areas are expected to be used. Itemize each area (e.g. parking lot, doorways, walkways, signage, foliage) with the anticipated hours of use. Commercial outdoor lighting should be used for safe pedestrian passage and property identification, and lit during active business hours and shut off afterward. Use a highlighter on a site plan for those areas to be lit to professional recommendations.

2. Direct light downward by choosing the correct type of light fixtures. (See Appendix 3). Specify IES (Illuminating Engineering Society) "Zero Uplight" or "fully shielded" fixtures, so that no light is emitted above the lowest light emitting part of the fixture. Top mounted sign lighting is recommended with "RLM" (dish) type shields, and aimed so that the light falls entirely on the sign and positioned so that the light source (bulb) is not visible from any point off the property or into the roadway to reduce glare. For each one square foot of sign, usually no more than 200 lumens is necessary for good visibility.

3. Select the correct light source. Compact fluorescent (2700K or less) or High Pressure Sodium is recommended unless the light is motion sensor activated, in which case LED, incandescent, or the instant start compact fluorescent bulbs can be used. Metal Halide (due to its higher costs, energy use, impact on the environment, and greater contribution to "sky glow") is discouraged, as well as LED light sources rated over 2300 Kelvin. Outdated Mercury Vapor bulbs are prohibited. Limit the use of LEDs to fixtures that are motion sensor activated and with less than 2300 Kelvin; or in 1800 Kelvin fixtures that are not operated dusk to dawn.

4. Utilize "shut off" controls such as sensors, timers, motion detectors. Automatic controls turn off lights (or sections of lights) when not needed. Interior and exterior lights should be extinguished no later than one half hour after the close of business. Additional motion sensor activated lighting can be used for emergency access. Avoid "dusk-to-dawn" sensors without a middle-of-night shut off control. Lights alone will not serve to "protect" property and are a poor "security" device. Examine other means of protecting property to discourage criminal activity. Let your local police know that you have a "lights out" policy so that they can investigate if they see lights "on" after hours.

5. Limit the height of fixtures. Locate fixtures no closer to the property line than four times the mounting height of the fixture, and not to exceed the height of adjacent structures. (Exceptions may be made for larger parking areas, commercial zones adjacent to highways, or for fixtures with greater cut off shielding behind the pole mount in commercial zones.)

6. Limit light crossing property lines, i.e. "light trespass". Limit spill light across the property lines. Light levels at the property line should not exceed 0.1 footcandles (fc) adjacent to business properties, and 0.05 fc (the brightest moonlight is 0.01 fc) at residential property boundaries. Utility leased floodlight fixtures mounted on public utility poles in the public right-of-way or on property lines shall not be used for private property due to excessive light trespass "spill light".

7. Use the correct amount of light. Light levels and uniformity ratios should not exceed recommended values, per IESNA RP-33 or 20. (See Appendix 5, Recommended Illumination Levels for

various tasks). "Lumen cap" recommendations for areas to be illuminated should not exceed: commercial properties in non-urban commercial zones = 25,000 lumens per acre; for projects in residential and LBO zones = 10,000 lumens per acre. For residential properties: for suburban: 50,000 lumens per acre cap, and in urban areas: 100,000.

8. Ask for Assistance Your Planning Department and local lighting sales representatives can assist you in obtaining the necessary information for good lighting. For large projects over 15,000 lumens: greater energy conservation and control of light pollution, light trespass and glare, may be achieved with the help of a professional lighting designer with "dark sky" lighting plan experience.

9. A post installation inspection should be conducted to check for compliance with a light meter against the approved lighting plan. Substitutions by electricians and contractors are common and should not be accepted.

10. Design interior lighting so that it does not illuminate or project glare to the outdoors. Provide interior lighting photometrics for the building's perimeter areas, demonstrating that the interior lighting falls substantially within the building and not through the windows. When glass or windows on a commercial use property face a public right of way or a residential property, a lighting plan shall be submitted that demonstrates that all interior light fixtures shall be located, aimed, or shielded so that the light source and all parts of the fixture which transmit light shall not be visible at the property line or into the right of way. Shield glare from bare bulbs. After closing, interior lighting needs to be extinguished by the use of shut off timers. Avoid "wall washing" (upwardly directed lighting to illuminate the building).

11. Free Lighting plans can be provided by a lighting manufacturers' Applications Departments. Select a manufacturer based on the type and range of fixtures. Submit criteria (attached) along with a site plan (electronic preferred) that has been marked with a highlighter on those areas that are to be lit for pedestrian safety and where pedestrians and cars are in conflict. Separate areas that are to be lit at different times so that they can be placed on separate circuits. Specify motion sensors to be used on all areas and doorways that are not active during nighttime hours.

12. Flag Lighting can be accomplished with a top mounted fixture with automated shutoffs for middle of the night energy conservation. Flags are not required to be lit.