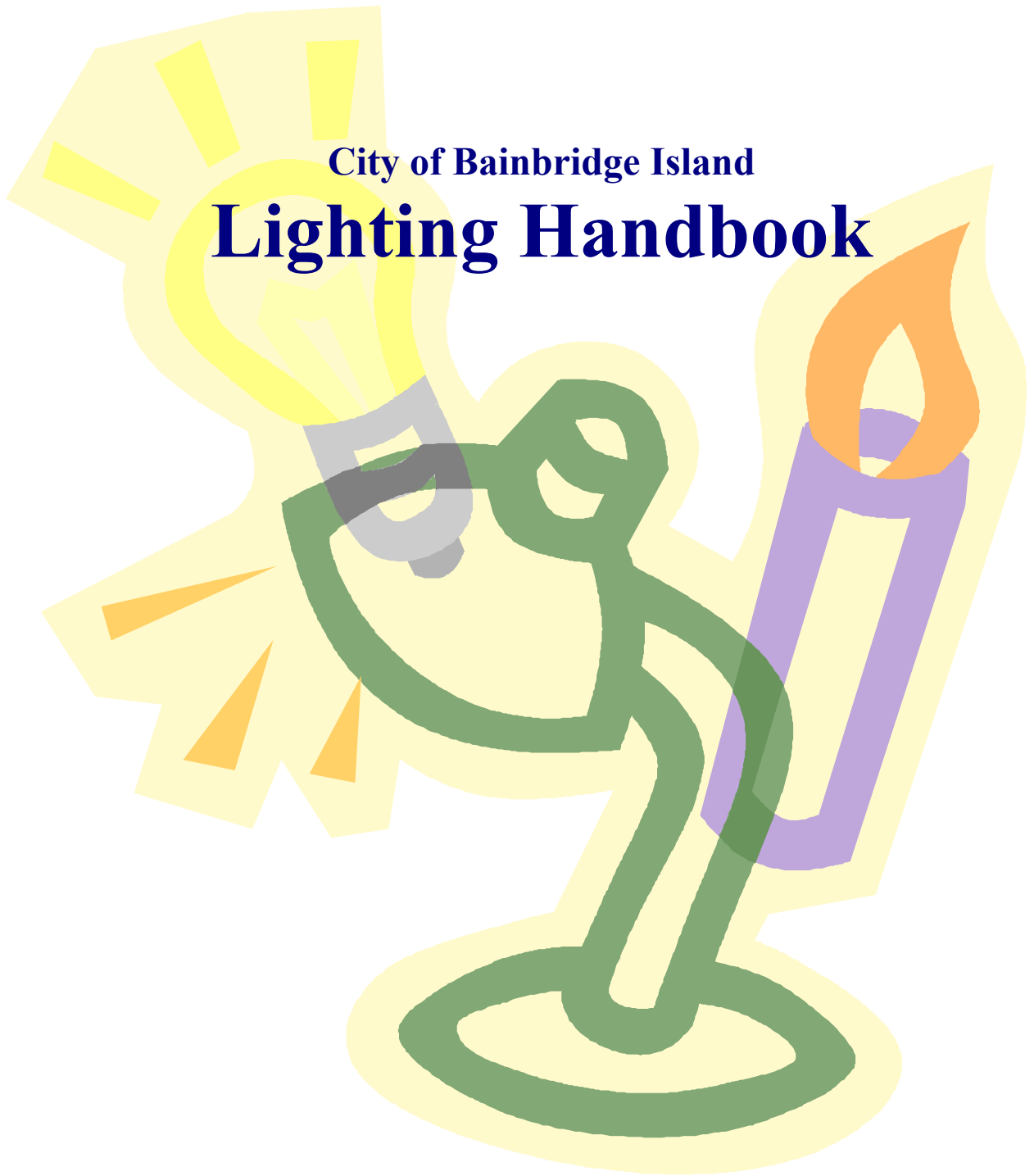


City of Bainbridge Island
Lighting Handbook



Acknowledgement

Much of the material in this handbook was derived from various publications from the International Dark Skies Association or from sources reached through links from their website at www.darksky.org.

Other information used in this handbook came from other jurisdictions – states and municipalities – with lighting regulations.

Introduction

Most outdoor electrical lighting is used for general illumination, to provide simple visibility for pedestrians, bicyclists, or motorists. It enables people to see essential detail to undertake activities at night.

Other reasons to use outdoor lighting include enhancing people's feeling of security, emphasizing significant details of buildings or landscape, and advertising.

There are also some disadvantages to ineffective outdoor lighting:

- Bright lights shining into a neighbor's home can be annoying.
- Glare can cause temporary blindness that has resulted in vehicular accidents.
- Biological studies show that artificial lighting adversely affects the behavior of some wildlife.
- Many security experts believe that the deep shadows created by bright lighting gives criminals hiding places that would not be available with lower-intensity lighting or lights that come on when motion is detected.

This handbook is intended to assist the citizens of Bainbridge Island in making choices about outdoor lighting.

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Following are some questions that may help you determine whether or not an outdoor fixture complies with the lighting code:

- Look at the light fixture. Do you see any part of the light bulb when you view it from the side? If so, the light is not fully shielded.
- If the fixture is made of glass or has glass panes, what color glass is used? Opaque glass reduces the amount of glare from a fixture.
- In which directions does the light shine? It should shine down, not out or up.
- What wattage of bulb is being used? Try a lower-wattage light bulb if you think the existing one is too bright.
- Where is the fixture in relation to the property line? The goal is to contain the light from the fixture within your property.
- Are there trees or other obstructions between it and the property line?

No more than .1 foot-candle - approximately the light shining from a 60-watt incandescent light bulb at a distance of 25 feet - may cross your property line.

Note: It is usually better to use multiple fixtures that have less intensity than one fixture that is really bright.

How to correct existing fixtures

For indoor lights that shine past the property line:



Move the lamp away from the window or doorway through which it shines.



Replace the bulb with a lower wattage or less luminous bulb.



Block the light with heavier curtains, drapes, or blinds.

For outside lights that shine past the property line:



Turn the light off at 9:00 p.m.



Use a flashlight shining toward the ground for short outside trips.



Adjust the fixture so that the light is directed down instead of up or out.



Replace the bulb with a yellow “bug” light or other lamp with lower luminescence.



Paint inside the top and sides of the globe or other fixture to better direct where the light shines.



Install shielding to direct the light and keep glare from creeping over the property line.



Install a motion-detector on the lighting circuit.



Replace an unshielded fixture with a shielded one.

Believe it or not, lighting design does not begin (or end) with the selection of light fixtures, but with an idea or concept. Aesthetics, functionality, and maintenance are major points to consider as you design a lighting system.

- Will it work? Is the light delivered to the right places?
- Are there appropriate light levels for safety? (Not just minimum light levels, is there too much light?)
- How does it look? Do the fixtures and lighting conform to an appropriate design aesthetic?
- Is there even light distribution and low glare? Uniformity and low contrast can aid visibility.
- Will there be high long-term maintenance costs?

After the concept, you need to decide what light bulb (or lamp) will best help to implement that idea. Some lamps shine in a given direction, others shine in all directions, some radiate even, shadowless light, while others have direct focused light that creates shadows and contrast. Start by looking for a certain effect (or concept) and use lamps that are best suited for a different effect.

The importance of proper lamp selection early in the design phase cannot be overstated. It is also a good idea at this point to think about other characteristics of the lamp as they relate to various applications.

- What is the lamp life? (Will the bulb need to be changed frequently?),
- Is this a special bulb? (Will it be hard to buy replacements?),
- Does the lamp give enough light and how much power will it require? (Do not forget the electric bills!)

Once the lamp has been selected then the optimal location for the lamp is addressed. You are trying to locate the lamp where it will best meet its purpose.

Think about layering - using multiple low light level fixtures instead of one very bright fixture. Just as no one lamp type is right for all applications, no one fixture type is correct everywhere either. Using multiple fixtures lets you put the light in the key areas of interest: near signs, by doorways and stairs, thus more evenly distributing the light. Not only does layering give more options for how the space is lit, (more than just on or off), but each type of fixture can do what it does best.

Glare is caused either by direct view of an unshielded light source or by too much contrast if the rest of the exterior is relatively dark. A contrast ratio of less than 5 to 1 is desirable to softly accent an area without creating glare. When someone leaves an excessively lit building, it takes the eye longer to adapt from a bright entry to the darker walkways outside, making it difficult to see.

Finally, start looking at light fixtures.

- Should the fixtures blend in with the architecture or make some sort of statement?
- Will the fixture itself be highly decorative or plain?

Before finalizing the fixture selection you may want to consider other aspects of the fixture. Evaluate the fixture with the proper lamp and from a normal viewing angle (for glare control).

- Is the fixture efficient? (How much of the light from the lamp actually exits the fixture.)
- What is the availability of the fixture? (Will it need to be ordered from overseas?).
- Long term costs of the lighting system (to buy, operate and maintain) and durability (is it appropriate for this application and will it need replacement parts?).



Lamp efficiency is measured in lumens per watt. A lumen is a unit for measuring the amount of light; a watt is a unit for measuring the amount of electrical energy used. The lamp that gives the most lumens per watt is the most efficient lamp. The table below lists the lighting efficiency of some of the common light bulbs used for outdoor lighting.

Type of lamp (bulb)	Lumens per watt	Average lamp life (in hours)
Fluorescent	60 – 600	10000 - 24000
Incandescent	8 – 25	1000 – 2000
High Pressure Sodium	45 – 110	12000 – 24000
Low Pressure Sodium	80 – 180	10000 - 18000
Metal halide	60 – 100	10000 – 15000

Fluorescent

Fluorescent bulbs are about four times as efficient as incandescent ones. The best compact fluorescent sources have several advantages over metal halide: longer life, a much shorter warm-up time to full brightness, ability to be switched on and off without shortening bulb life, and a white light that is less polluting than that produced by metal halide. The primary disadvantage of this type of bulb is that it is somewhat undependable at very low temperatures. The bulbs also need precise voltage amounts to work properly, and a dimmer mechanism, (even if not dimmed) will cause a fluorescent bulb to fail within hours.

Incandescent

This type is the most common and most inefficient bulb used in and around homes. Only ten percent of the energy used produces light – the other ninety percent produces heat. The 40-watt bulb is often adequate for most outdoor lighting applications, especially if it is used in a fixture that controls the light output rather than scattering it everywhere or has a time- or motion-detector attached.

High Pressure Sodium (HPS)

Generally more efficient than metal halide lamps, HPS lamps produce an orange-gold color of light. These lights are used primarily for street and parking lot applications.

Low Pressure Sodium (LPS)

This light source is the most energy efficient and a good choice for street, parking lot, and security lighting. There is no color rendering at all, but adequate color rendering is possible with system designs that also use a few metal halide or fluorescent fixtures to add a little white light.

Metal Halide (MH)

Metal halide and fluorescent are now in a dead heat as the most efficient “white light” source. Use this light source at night when it is necessary to render colors close to their daytime appearance.

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The following table summarizes the most relevant differences in the lamp types for the most common sizes encountered in outdoor lighting (except sports lighting). The values given are approximate and relative comparisons will depend on the details of the application.

Factor	Incandescent	Fluorescent	Metal Halide	High-pressure Sodium	Low-pressure Sodium
<i>Wattage</i>	25 - 150	18 - 95	50 - 400	50 - 400	18 - 180
<i>Output (lumens)</i>	210 - 2700	1000 - 7500	1900 - 30000	3600 - 46000	1800 - 33000
<i>Efficiency (lumens/watt)</i>	8 - 18	55 - 79	38 - 75	72 - 115	100 - 183
<i>Lumen Maintenance (%)</i>	90 (85)	85 (80)	75 (65)	90 (70)	100 (100)
<i>Lamp life (hours)</i>	750 - 2000	10000 - 20000	10000 - 20000	18000 - 24000	16000
<i>Energy use</i>	High	Medium	Medium	Low	Lowest
<i>Color rendition</i>	Good	Good	Good	Moderate	None*

Efficiency numbers represent the mean efficiency for the output range at 50% of mean lifetime. Lumen maintenance is the percent of initial lamp output that can be expected at 50% of mean lamp life and at end of mean lifetime (in parentheses).

Color rendition is the relative ability of the average observer to accurately perceive colors under lighting from the indicated lamp type.

Fixtures

Floodlights

Pole- or building-mounted floodlights are frequently used to light an area with a minimum of fixtures or to light an area from the periphery. When floodlights must be used, choose those with external glare shields or internal louvers or cutoff floodlights with a backlight shield option. Make sure the floodlight is pointed down as much as possible. A tilt of just 25% is often adequate, but the angle should never be more than 45% above horizontal.



Wall Packs

Typically used for lighting entryways, wall packs should have full cutoff or shielding. These lights should be mounted as high as possible to create a well-lit entryway or building perimeter without glare or light shining up into the sky.



Security and street lights



Security and streetlights allow motorists and others to move safely at night. Maintaining visibility and safety without creating unnecessary glare and deep shadows may be accomplished by shielding as shown on the left) or using either a cobra head fixture with a flat lens(as shown on the right) or a “shoebox fixture (as shown on the right).



Accent or decorative lighting



Decorative lighting of building exteriors, landscaping, and other man-made or natural features can be accomplished using down-directed and fully shielded fixtures. When that is not possible and the structure is set back from the property line, fully-shielded fixtures may be directed toward a non-reflective surface.

Web sites to check for more information:

www.bicomnet.com/ritchieobspages/lights.htm (Battle Point Astronomical Association)
Examples of "good" and "bad" lights on Bainbridge Island

www.darksky.org (International Dark Skies Association)
Information on other dark sky initiatives and numerous links to background information and supplies

www.scn.org/darksky (Dark Skies Northwest)
Information on other dark sky initiatives and numerous links to background information and supplies

www.lightsearch.com (Lightsearch.com)
Background information and links to lighting fixtures

Members.aol.com/outdoorltg/ola.html (Outdoor Lighting Associates, Inc.)
Information about the Hubbell Skycap and other outdoor lighting fixtures

www.ge-lightingsystems.com (GE Lighting Systems, Inc.)
Information about "Glarefighters" roadway lighting fixtures

www.skyandtelescope.com (Sky and Telescope Magazine)
Information about astronomy and light pollution

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Local Businesses Supporting the Ordinance:

Roger Katz & Associates
(Architect)
571 Ericksen Ave
Bainbridge Island, WA 98110
206.842.8351

Paul Von Rosenstiel (Architect)
566 Stetson Pl
Bainbridge Island, WA 98110
206.842.2205

Miles Yanick & Co (Architect)
600 Winslow Way #247
Bainbridge Island, WA 98110
206.842.6516

Laurie Larson (Landscape Design)
PO Box 1736
Kingston, WA 98346
360.297.2444

DH Briant & Associates (Architect)
755 Winslow Way #202
Bainbridge Island, WA 98110
206.842.4993

Mark Lubovich (Electric
Contractor)
7351 Sportsman Club Rd
Bainbridge Island, WA 98110
206.842-5478

Lil Electric
PO Box 10571
Bainbridge Island, WA 98110
206.842.6209

McCabe/Tanaka (Landscape
Design)
PO Box 11794
Bainbridge Island, WA 98110
206.842-0695

Bainbridge Architects Collaborate
435 Ericksen Ave #250
Bainbridge Island, WA 98110
206.842.2011

Priscilla Zimmerman (Architect)
PO Box 10128
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Raven Electric
22370 Indianola Rd
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206.842.9932

Wenzlau Architecture
900 Winslow Way #150
Bainbridge Island, WA 98110
206.780.6882

Rolling Bay Electric
13136 Sunrise Drive
Bainbridge Island, WA 98110
206. 842-4643

CPS Electric
19689 Seventh Ave. NE #249
Poulsbo, WA 98370
360.697.3225