

OUTDOOR LIGHTING

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PURPOSE:

To establish new regulations governing outdoor lighting in order to reduce wasted energy, excessive and unsafe glare, light trespass, and light pollution from improperly designed or installed outdoor lighting.

BACKGROUND AND PROCESS:

In response to a citizen's concerns, the Public Works Committee discussed the issue of outdoor lighting and requested staff to assemble draft lighting standards for committee review. The Public Works Committee reviewed the draft standards during two meetings and conducted an outdoor lighting tour with the Planning Commission. The Committee then forwarded the draft standards to Planning Commission which held four briefings/public meetings on the issue as well as a public hearing. The City Council held a briefing and a hearing on the issue in early 2009. The issue was sent back to the Public Works committee which held three more meetings before referring it back to the full City Council.

THE ISSUE:

Light pollution: Light pollution is any adverse effect of artificial light whether from glare, decreased visibility at night, light trespass, or sky glow. This is a serious problem that affects your wallet, your health, your safety, and the environment.

Your Money:

Direction of light and wattage

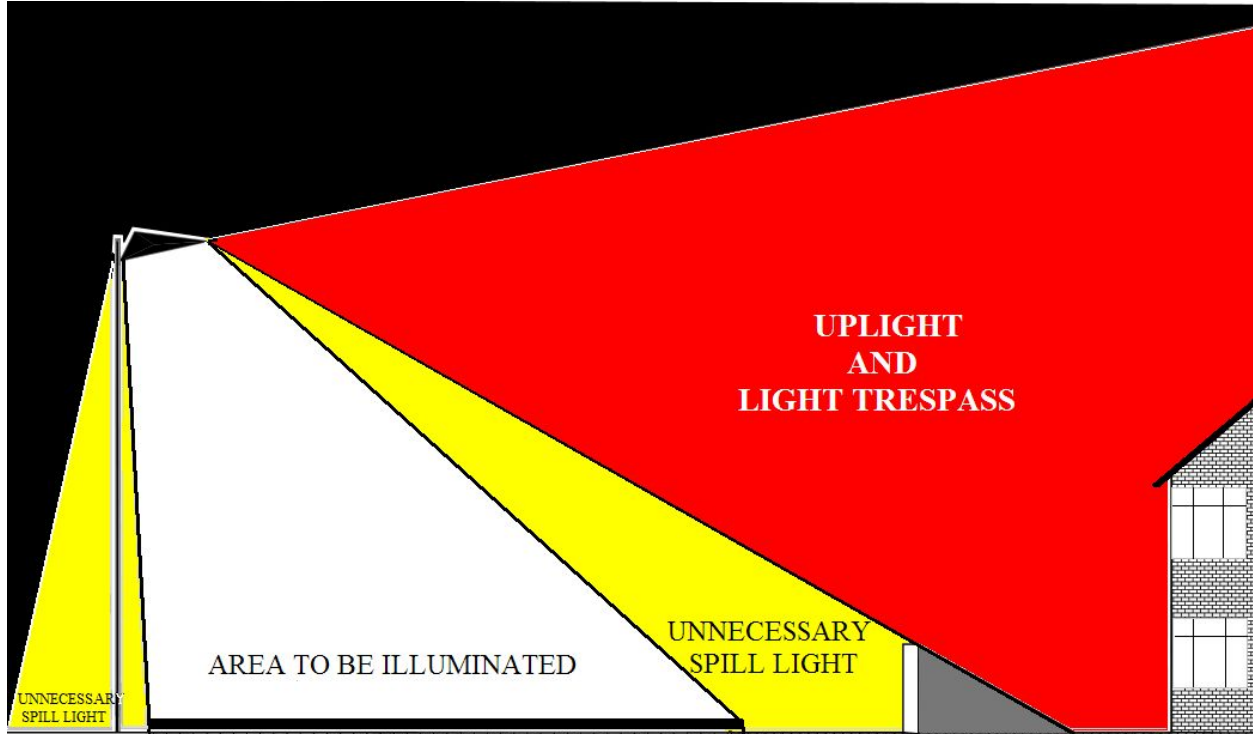
Would you want to pay the electric bill for light that never even touches your own property? Most people wouldn't, however, many lighting fixtures only send a portion of their light where it is intended to go. It has been estimated that a third of outdoor lighting spills out and upward, totally wasted. A conservative calculation of the cost in the U.S. comes to around \$4.5 billion annually. Added to that figure is the waste from excessively bright lighting and the 100% waste from lighting that's on when it is not needed. You are paying the price through higher electric rates, higher taxes for public lighting, and inflated costs for consumer products and services.

(Sources: <http://www.selene-ny.org> <https://www.darksky.org/>)

Some basic tenets for light pollution abatement are as follows:

1. Use light only where you need and use it
2. Use fully shielded fixtures to use the light where you want it and no where else
3. Use the appropriate wattage and not more than you need
4. Use a motion sensor if at all possible

Light that is emitted at or above an 80 degree angle generally does not hit the ground and is almost always a waste that is unnecessarily costing you money (180 degrees being straight up and zero degrees being straight down). If the lighting fixture is properly shielded and aimed, a smaller wattage bulb can often be utilized and still illuminate the desired area as much as before. It saves money to only light the areas you want or need.



The illustration above shows how light is distributed from an improperly aimed lighting fixture. Proper aiming & extra shields would narrow the focus to the intended area and remove uplight, light trespass, and spill light.



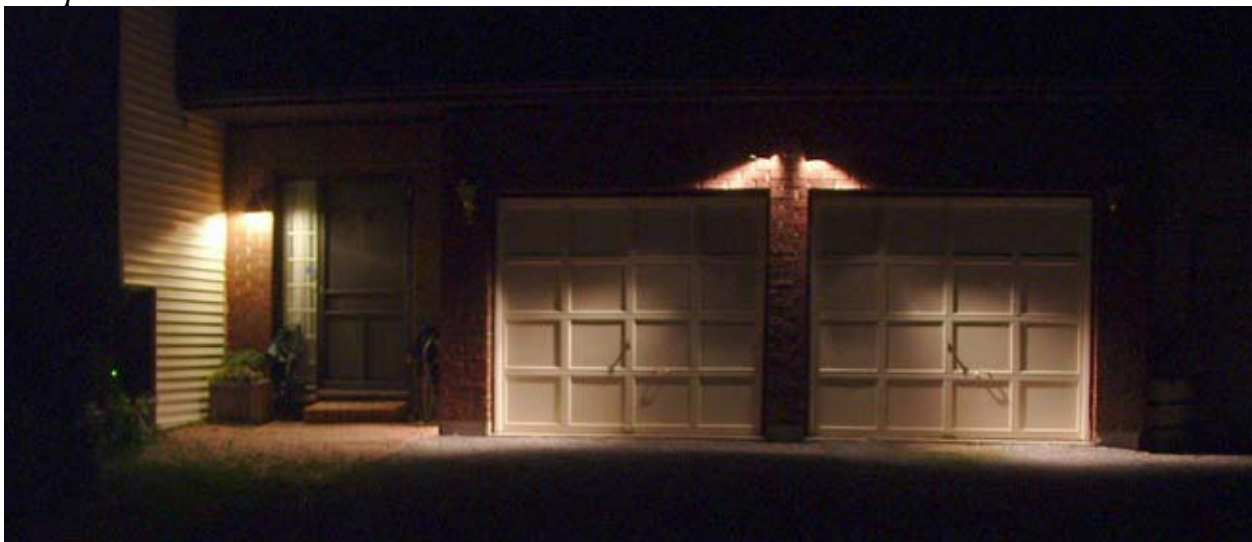
*An unshielded and improperly aimed light resulting in glare, light trespass, and decreased visibility for drivers and pedestrians.
(Floodlight at former Shell tank farm at Linderson Avenue/Tumwater Boulevard)*

The following two pictures and their captions are from Kevin Kell of the Starlight Cascade Observatory just outside Yarker, Ontario (Canada). He submitted a series of articles to the newsletter (called Regulus) for the Kingston Centre of the Royal Astronomical Society of Canada detailing his own lighting modifications at his residence. He was able to provide better lighting, remove glare, and significantly reduce his electricity consumption (600 watts before vs 60 watts after).

Source: <https://starlightcascade.ca/>



The before image [above] shows approximately 600 watts of unshielded incandescent lighting. The human eye adapts to bright point sources of light much like the camera meter and exposes for it, leaving much of the scene dark in comparison.



The after image shows approximately 60 watts of fully shielded compact fluorescent lighting with only a few bright hotspots of lighting on the immediate wall surfaces and much better even lighting.

Your Money (Continued):*Type of lamp (bulb/luminaire)*

There are a number of different types of lamps (also referred to as bulbs or luminaires) that can be used for outdoor lighting. The table below shows the differences in efficiencies, expected life, and color of light produced of the different types of lamps. All three of these can be factors in deciding which lamp is appropriate in a given location.

Table 1. Lamp Output.

Name	Nominal efficiency (lumen/Watt)	Lifetime (hours)	Color
Incandescent	12-17	1000-2500	Warm white (yellowish)
Halogen lamp	16-23	3000-6000	Warm white (yellowish)
Fluorescent lamp	52-100	8000-20000	White (with a tinge of green)
Metal Halide lamp	50-115	6000-20000	Cold White
Sulfur lamp	80-110	15000-20000	Pale green
High pressure sodium	55-140	10000-40000	Pinkish orange
Low pressure sodium	100-200	18000-20000	Yellow, virtually no color rendering

Note: CFL's produce ~60-72 lumens per watt (http://en.wikipedia.org/wiki/Luminous_efficacy)

Sources: http://en.wikipedia.org/wiki/Electric_light and http://en.wikipedia.org/wiki/Mercury_vapor_lamp and http://www.selene-ny.org/homeowner_tips.html



*Mercury vapor lamp
(Point Tavern)*

Lumen depreciation is another important factor to consider when deciding which kind of lamp to use. Mercury vapor lamps (below left), including the closely related metal halide lamps (right), have been popular in the past for outdoor area lights. However, these types of lamps suffer from lumen



*Metal halide flagpole lights
DOT Bldg (Linderson Way)*

depreciation. Mercury vapor lamps dim by half every five years while still using the same amount of electricity. The closely related metal halide lamps, which have started to take the place of mercury vapor lamps, also suffer from lumen depreciation. They tend to lose approximately 40% of their lumen output over their lifetime. This comes about because the mercury sticks to the glass and the electrodes over time which reduces the amount of mercury available to produce light.



*Low pressure sodium
(City Hall steps)*



*High pressure sodium
(New Market Streetlights)*

Low pressure sodium lamps (above left) are good choice for replacement of the aforementioned inefficient mercury vapor outdoor lights. Low pressure sodium is the most efficient lamp in regards to average lumens per watt and it is near the top of the list of long life lamps. These are often easily spotted due to their yellow/orange colors. High pressure sodium (above right), while not quite as efficient, is utilized in situations where color rendition is more important, such as streetlights.

Sources: http://en.wikipedia.org/wiki/Electric_light and http://en.wikipedia.org/wiki/Mercury-vapor_lamp and http://www.selene-ny.org/homeowner_tips.html and <http://tristate.apogee.net/lite/lhimhlm.asp>

Your Money (Continued):

Lighting costs for different types of lamps (luminaires/bulbs)

The online lighting cost calculator from Sensible and Efficient Lighting to Enhance the Nighttime Environment (SELENE) was utilized for the lighting cost calculations in this section. The U.S. average residential electricity rate of 10.5 cents/kilowatthour was used for all calculations. Source: <http://www.selene-ny.org/lightcost/>



Yardblaster area light costs:

The cost to operate that \$55 yard blaster (\$54.47 at Home Depot) can vary substantially depending on the type of bulb used. Some types of bulbs will cost more per year to operate than the entire cost of the fixture while others only cost a fraction of that amount.



*Yard blasters with mercury
vapor lamps (Point Tavern)*

Mercury vapor: A 175 watt (7400 lumens) mercury vapor lamp will cost you ~\$77 to operate dusk to dawn per year.

High pressure sodium (HPS): A 100 watt (9500 lumens) HPS lamp costs only \$45.82 per year with dusk to dawn operation. Note that even though the HPS is a lower wattage than the mercury vapor discussed above, the light output (lumens) is substantially higher.

Low pressure sodium (LPS): A 55 watt (7650 lumens) LPS lamps costs \$35.03 per year with dusk to dawn operation. (<http://selene-ny.org/lightcost.asp>).

Compact fluorescent: If a 65 watt (4300 lumen) compact fluorescent lamp (CFL) is used in the yard blaster then the operating cost drops to \$31 per year. RAB Lighting has just begun selling a 65 watt CFL yard blaster with an optional shield (called a Down Blaster). The shield eliminates uplight and increases light on the ground by 45% making the lower watt/lumen CFL a viable option for use in this style of light (see p.8 for discussion on light shields).



*Yard blaster with low pressure sodium lamp
(The partial homemade shield is to stop light from entering a neighbors upstairs bedroom window)*

Alternative area lights:

One of many alternatives to the yardblaster style of light is an area light called a Glarebuster. These fully shielded lights (~\$66 at AceHardwareOutlet.com and Amazon.com) work well for the typical homeowner who needs patio, porch, or driveway illumination. The use of a 26 watt CFL (1750 lumens) results in a yearly operating cost of \$12.98 for dusk to dawn operation and only \$1.15 if a motion sensor is used.



Glarebuster lighting fixtures

Security spotlights:

A fully shielded incandescent spotlight with two 90 watt bulbs (1280 lumens each) and a motion sensor would cost approximately \$7.65 per year to operate. If the same fixture were to use two 23 watt CFL bulbs (1200 lumens each) it would cost you only \$2.54 per year to operate (like the residential retrofit by Mr. Kell on p.3).

Note: These types fixtures use PAR38 bulbs (PAR=Parabolic Aluminized Reflector)



Homemade shields (Kevin Kell)



Commercially available shields by Parshield

Your Money (Continued):

Shielded lights = more light where you want it

Keep in mind that utilizing energy efficient light bulbs is only part of the picture. Putting the right amount of light only where you need it is another key component to saving money. Typical unshielded yard blaster lights waste about half of their light skywards. Shields for these types of lights redirect and focus the wasted light to the area where it is needed.

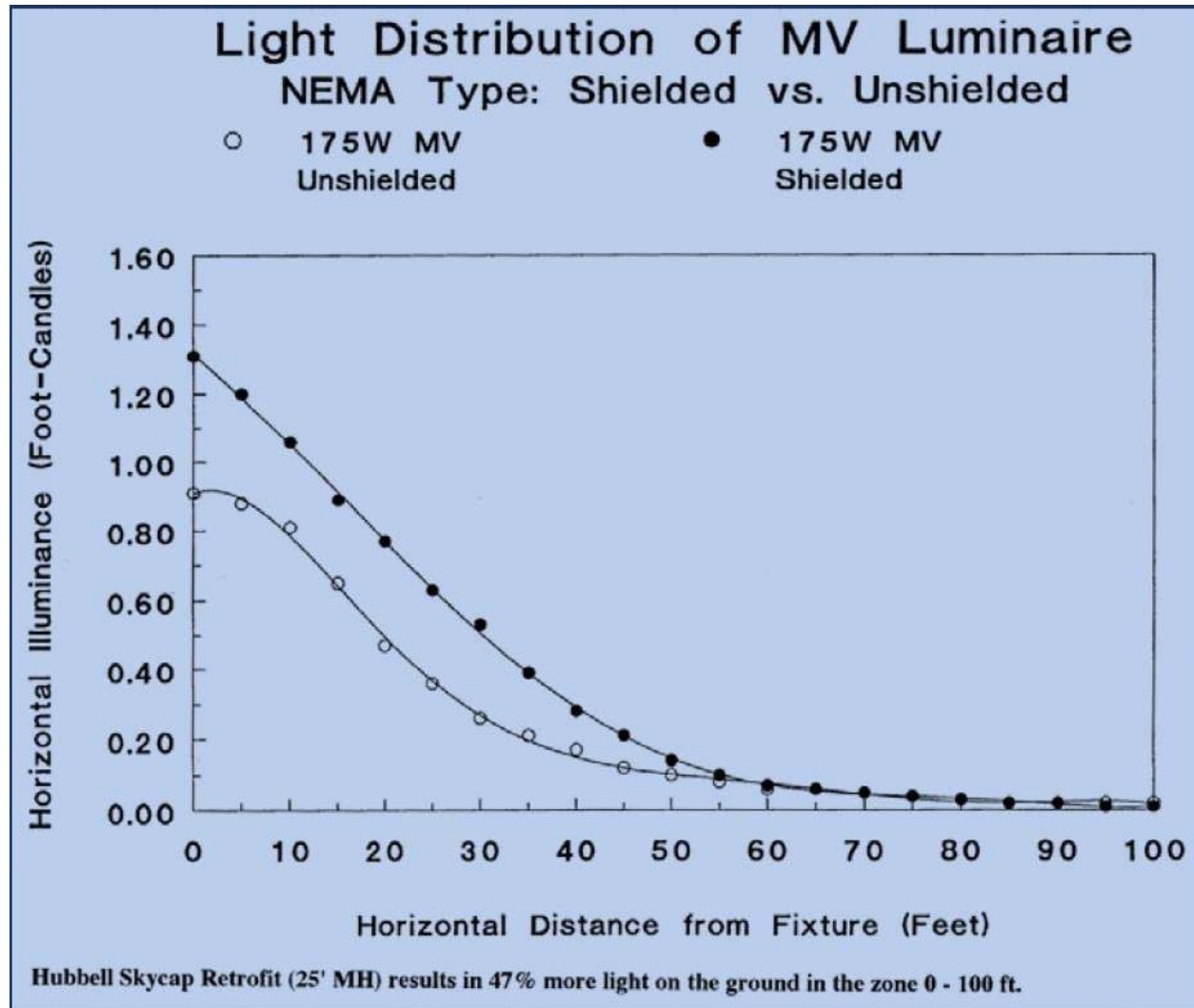


Unshielded yard blaster light at Point Tavern



Shielded version at former State Parks & Rec Bldg

Several manufacturers make shields for the yard blaster style of lights. GE makes a shield called the Skyguard, Hubbell makes one called the Skycap, and RAB Lighting makes one called the Shy Shield/Down Blaster. Several studies have been conducted showing substantial increases in illumination of parking lots and other areas after a yard blaster has been fitted with a shield.



Outdoor Lighting Associates, Inc – Ames IA

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The graph above shows results for a test before and after a shield was placed on a mercury vapor yard blaster light. The shield utilized was a Hubbell skycap on a 25 foot tall pole. As can be seen, there is a substantial increase (47% on average) in the amount of light on the ground. Even all the way out to 55 feet from the light the shielded light outperforms the unshielded light. After 55 feet the amount of light on the ground is similar for both shielded and unshielded.

A lighting project at the University of Wisconsin Madison (called the “Full Cutoff Lighting Demonstration Project”) showed that adding shields resulted in a doubling of illumination under the fixtures with no increase in power consumption. Due to the increase in illumination levels as a result of the shields, lower wattage bulbs (100 watt vs. 150 watt) were able to be utilized and the illumination of the parking lot was still 25% above recommended engineering levels. Approximately \$22 per year per light was saved by switching from 150 watt to 100 watt lamps (\$62.86 vs \$41.91). The \$22 savings will make up for the ~\$27 purchase price of the shield and the \$13 price of the new bulb in less than two years.



Unshielded Light

Shielded Light (Shield by RAB Lighting)

Studies and demonstration projects such as these show how the use of fully shielded lighting can directly result in saving money, provide better levels of illumination, as well as reduce unsafe glare, light trespass, and skyglow.

<http://darkskywisconsin.uwex.edu/about/publications/Cutoff%20Demonstration.pdf> (Univ. of WI-Madison Full Cutoff Lighting Demonstration Project)

Note: Goodmart.com and Prolighting.com both sell full shields for these fixtures for ~\$27.



Unshielded yard blaster (far side of street)



Shielded yard blaster (foreground)

Note: Photos from General Electric showing their shield called a Skycap vs an unshielded yard blaster

<http://www.mediasoft.net/macdowell/oldandnew.htm>

Health:

Medical evidence is mounting that exposure to light at night disrupts the body's natural renewal cycle and might even put you at greater risk for certain diseases. Exposure to light at night has been shown to cause suppressed melatonin production in humans. Suppressed melatonin production has been proposed as a potential risk factor in breast cancer. Researchers at the National Cancer Institute and the National Institute of Environmental Health Sciences have concluded a study that suggests that artificial light during the night can be a factor for breast cancer. A study in Israel showed a correlation between nighttime lighting levels and cancer. Another study on nurses who work the night shift also showed a correlation between night time lighting and breast cancer.

In addition, light shining into windows is a nuisance that often leads to the poor sleep. Insufficient sleep has been linked to health problems such as high blood pressure, diabetes, depression and obesity, according to the American Academy of Sleep Medicine.

<http://www.illinoislighting.org/links.html>

<https://www.darksky.org/>



Ridgeview Loop (Tumwater Hill)



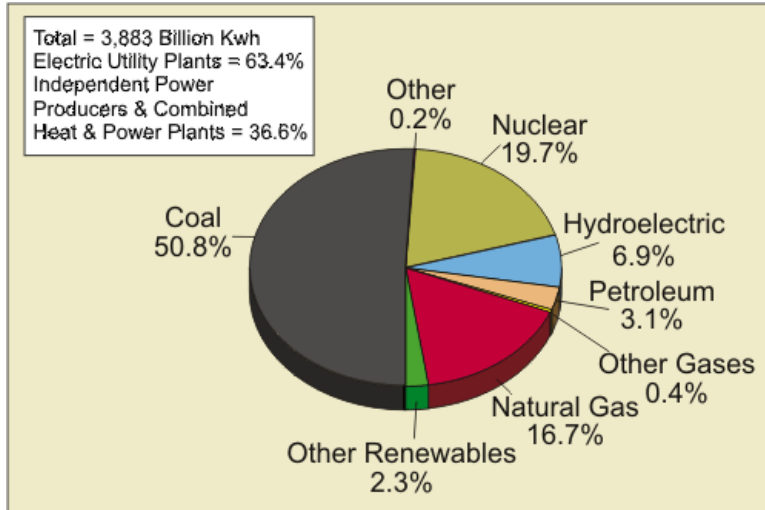
*Shield for Streetlight
Olympic Way NW (Olympia)*

Even though the streetlight on the left is a fully shielded “cobra” style light, the height of the pole and the small setback of the home create a light trespass problem. In some situations this can be remedied by the use of an additional shield on the back side of the light. Locally, Olympia, Thurston County, and Puget Sound Energy use shields to remedy situations such as this.

Environment:

Misdirected lighting is simply wasted energy. This waste artificially inflates the demand for energy. Emissions from fossil fuels used to generate electricity can have many negative effects on the environment. More than 70% of the power generation

in the U.S. is done with fossil fuels. Even with best available technologies and pollution controls the burning of fossil fuels to produce electricity still results in the emissions of green house gasses. Wasting light through the use of improperly designed or aimed or utilized lighting fixtures contributes to global warming.



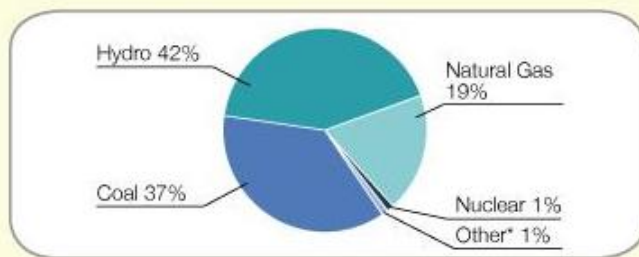
Source: Energy Information Administration (US Dept of Energy), Form EIA-906, "Power Plant Report" and EIA 920, "Combined Heat and Power Plant Report." Figure 2. U.S. Electric Power Industry Net Generation, 2003. <http://www.eia.doe.gov/neic/brochure/electricity/electricity.html>

Energy Supply - Electricity - Power Supply Profile

A diversified mix

The electricity that Puget Sound Energy (PSE) delivers to customers is generated using a number of different resources. The fuel mix resources used for generating electricity delivered in 2007 are shown in the following table and chart:

State of Washington, CTED: Fuel Mix Disclosure



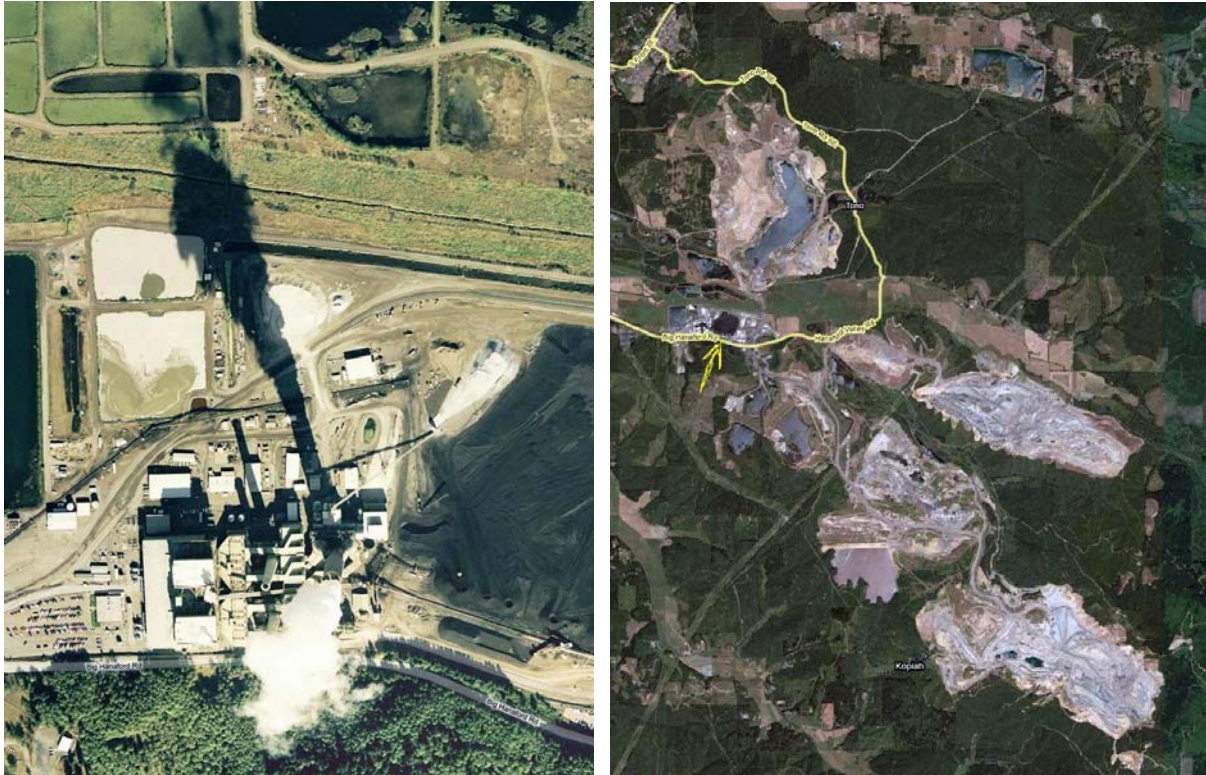
* Biomass, landfill gas, petroleum, waste, wind and solar.

In 2007, PSE sold renewable energy credits (RECs) associated with the power output of its two wind-power facilities, so this power is not included in the fuel-mix report.

Source of data: As reported by PSE to, and published by, the State of Washington Office of Community, Trade and Economic Development, Energy Policy Section, 2007.

56% of PSE's (Puget Sound Energy) electricity comes from burning fossil fuels such as coal and natural gas. This is a bit less than the national average due to the extensive use of hydroelectric power in the northwest.

The Centralia Power Plant and Mine (pictured below) is a coal fired electric generating plant located only 20 miles south of Tumwater. On clear cold days the steam plume can be seen from Tumwater.



The Centralia Power Plant (left) and Mine (right)

In the picture of the mine (right) the power plant location is denoted with a yellow arrow on the left side of the photo. The extent of the disturbances caused by the coal mining can be seen clearly in the aerial photo on the right.

Even dams, seemingly the most benign of the power generating facilities, can change natural river flows, degrade water quality and block fish migration, endangering fish. Small dams can also be high impact if they lack mitigation measures such as fish ladders. Approximately 42% of the electricity supplied by PSE comes from hydroelectric projects.

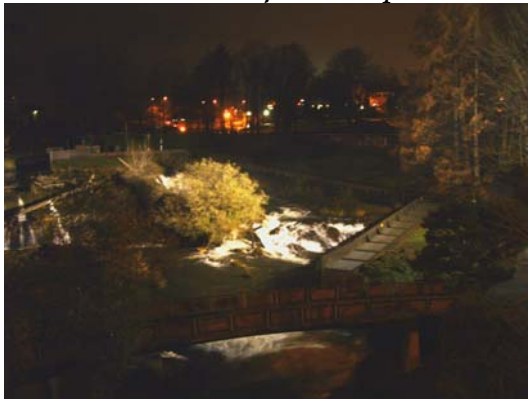
Sources: PSE chart on previous page and <https://renewablenw.org/>

Light pollution can also harm plants and animals. All earth's creatures have evolved over thousands of years by adapting to a world that is dark at night. The loss of true darkness can alter the growth cycle of trees, weakening them and making them more susceptible to disease and severe weather. Birds, fish, frogs, bats, moths, and plankton are just some of the animals whose behavior has been shown to be affected by increasing nighttime light, often with disastrous results.

Although it may not seem intuitive, fish such as salmon can be detrimentally affected by nighttime lighting and light trespass. It has recently been found that the eyes of young salmon take about half an hour to adjust to dramatic light changes. Two University of Washington researchers found that predators such as dogfish and sculpins wait in illuminated eddies to pick off temporarily blinded smolts.



Falls Terrace from Capitol Boulevard Bridge over Deschutes River



Upper Deschutes Falls and fish ladder



Falls Terrace lights

Another example of inadvertent detrimental effects of nighttime lighting on wildlife is the thousands of birds that are killed in large cities such as Toronto, Chicago, and New York due to light pollution. Many migratory birds migrate at night. Lights in and on large buildings disorient the birds, some of which collide with the buildings. The City of Chicago's Department of the Environment estimates that tens of thousands of birds are killed from nighttime lights each season in the City. In 2004, Chicago became the first US city to go dark during spring and fall bird migrations. Studies in Chicago have shown that migratory bird fatalities are reduced up to 80% when the lights are turned off. New York and Toronto both have similar programs aimed at reducing the effects of night time lighting on bird populations.

<https://www.darksky.org/>

<https://www.seattlemet.com/arts-and-culture/2008/12/0608-givebacknight>

<http://www.birdmonitors.net/>

<http://www.terrain.org/articles/15/kousky.htm>

<http://nycaudubon.org/NYCASBirdWatch/TabDefault.asp>

<http://www.illinoislighting.org/links.html>

Safety:

Glare from bad lighting that blinds a motorist, even momentarily, can result in a fatal situation. Older Americans are particularly at risk. As one ages the eyes take a longer time to adjust from excessive brightness to less bright areas. Consider the contrast between the excessive illumination common at gas stations and the darker roadway the next time you gas up your vehicle at night. Impaired driver vision during this transition poses an even greater hazard for pedestrians.

Lighting for safety is very important. People must be able to see clearly see where they are walking and driving. These amendments do not take away this important safety aspect of lighting, they simply require wasted lighting that is misdirected upwards or off premise or creating safety hazards such as glare to be directed in an appropriate manner to the area where the light is really needed.

Bad lighting

Unshielded and improperly installed lights produce large amounts of glare and misdirected light. Most of the light is wasted skywards and on adjacent properties and streets. Drivers and pedestrians both experience diminished vision due to the glare. This creates an unsafe situation, but at least it can easily be prevented.



Floodlight at entrance to Shell Pipeline Terminal Facility on Linderson Avenue



Floodlight and wall box at (former) WA State Parks and Rec Bldg-Cleanwater Lane

Bad lighting (cont.)



*Floodlight and wall box at WA State Patrol Facility
7219 Cleanwater Lane (adjacent to Tumwater Boulevard)*



Sign floodlights at Timberland Library Offices (Tumwater Boulevard)



Wall boxes at Washington State Department of Printing (76th Avenue)

Bad lighting (cont.)

Parking lot floodlight at the Tumwater Public Works shop. As can be seen in the picture (taken from New Market Street) it is not a fully shielded light but rather an outward oriented floodlight that produces glare and uplift.



*Flagpole light on other side of walkway
Point Plaza East (Israel Road)*



*Wall box and parking garage lights
Town Center East (Israel Road)*

Good lighting vs. bad lighting--wall boxes

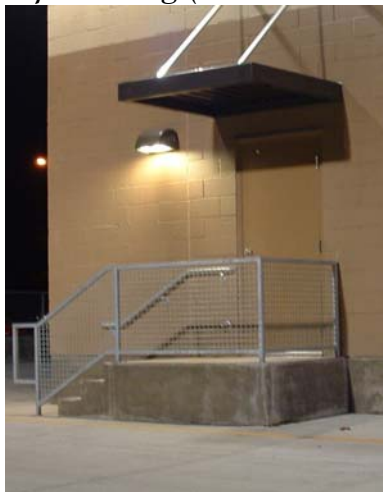
Well-designed fully shielded fixtures that direct all their light downward, onto the ground have far less glare. Without the glare you're able to see your surroundings clearly rather than being blinded by the lights' harsh brilliance.



*Good: Fully shielded wall box
WA Dept of Printing (New Market St.)*



*Bad: Unshielded wall box
Dept of Health (Town Center East)*

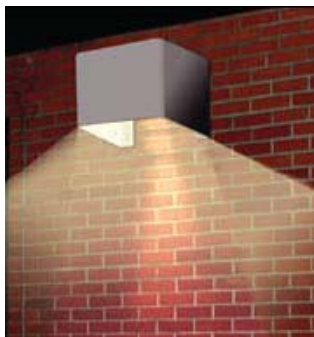


Good: Lowes (Yelm Highway)



Bad: Tumwater Facilities Bldg (Israel Rd)

The fully shielded wall boxes on the left side of the page emit no upward lighting. In contrast the unshielded wall boxes on the right side of the page emit light out and up causing glare and light trespass. Fortunately the entire unshielded light does not have to be replaced to correct the situation. Add on shields are available for unshielded wall boxes from a number of manufacturers.



Add on shield from RAB lighting



Unshielded wall box

Good lighting



City Hall parking lot light with a fully shielded fixture. This light emits no uplight as evidenced by the downward angle of light seen on the adjacent trees.



Fully shielded lights on City Hall back steps



*Fully shielded area lighting
Olympia Federal Savings (Custer Way)*



*Fully shielded flush mount
walkway lights at Tumwater City Hall*

Good lighting (cont.)



Fully shielded area light at gate to Schmidt House (off Custer)



Fully shielded sign light local restaurant (Tumwater Blvd)



Downward architectural/area lighting Starbucks (Tumwater Fred Meyer)



Downward fully shielded lighting Brewery City Pizza (Capitol Blvd)

Security:

Generally people tend to feel safer when areas are well lit. These amendments do not take away security lighting, they simply require wasted lighting that is misdirected upwards or off premise to be directed to the appropriate area where the light is really needed. In addition, lights with motion detectors are listed as an exemption in the proposed amendments.



This is a before (left) and after (right) picture of a Charter Bank that remodeled its lighting system with full cutoff fixtures. As is seen in the picture, the reduced glare has eliminated almost all the harsh shadows (hiding spots) on the exterior of the bank and makes the building and its sign more visible.

U.S. Justice Department:

While outdoor lighting may reduce the fear of crime, it can also attract criminals, illuminating their tasks and creating deep shadows in which to hide. In the late 1970s and again in 1997, investigations by the U.S. Justice Department concluded that there is no meaningful evidence that street lighting affects the level of crime.

Source: <http://www.ncjrs.gov/works/> (see chapter7)

“Lighting campaigns seek to enhance the ability of people to provide protection for each other. In 1979, the predecessor agency of NIJ, the National Institute of Law Enforcement and Criminal Justice, reported on a review of 60 lighting evaluations. The authors of this review concluded:

‘Is street lighting an effective approach in the reduction and deterrence of crime? The answer is inconclusive. The paucity of reliable and uniform data and the inadequacy of available evaluation studies preclude a definitive statement regarding the relationship between street lighting and crime.’ (Tien, et. al. 1979, page 93, emphasis in the original)

Security (cont.):

Almost twenty years later, we know little more about the effectiveness of lighting.[...] Lighting has received considerable attention. Yet, evaluation designs are weak and the results are mixed. We can have very little confidence that improved lighting prevents crime, particularly since we do not know if offenders use lighting to their advantage. In the absence of better theories about when and where lighting can be effective, and rigorous evaluations of plausible lighting interventions, we cannot make any scientific assertions regarding the effectiveness of lighting. In short, the effectiveness of lighting is unknown.”



If you look closely you may be able to spot the faint outline of a person standing directly to the left of the light pole. The light appears to illuminate the trees better than the ground.

Chicago Alley Lighting Project:

In 1998 the City of Chicago instituted a program aimed at increasing the illumination in alleys in order to decrease crime. The increased lighting effect on crime was inconclusive. The following is an excerpt from the Final Evaluation Report of the Chicago Alley Lighting Project (2000):

“These contradictory research results of evaluative studies are not surprising. Many factors influence the level of actual crime and perceived risk, of which lighting is only one. The relative importance of these multiple factors is likely to vary between areas so that while increased lighting is a major influence on crime in one location, its significance elsewhere may be minimal (Ramsay 1989). In fact, it has been suggested that in some circumstances, increased lighting may actually lead to an increase in the level of certain property offenses (Fleming and Burrows 1986).”

<http://www.icjia.state.il.us/public/pdf/ResearchReports/Chicago%20Alley%20Lighting%20Project.pdf>

Security (cont.):

Deschutes Way (looking south from Boston Street)

*The lower row of lights is unshielded wall boxes mounted on the I-5 retaining wall
(The top row of lights is the “streetlights” in the center of I-5)*

Like the picture on the previous page, these wall box lights along Deschutes Way create glare and deep shadows. The street appears to be somewhat illuminated; however, the deep shadows under the lights and behind the bushes creates hiding spots for lurkers. A person walking towards their parked car will be temporarily



*Deschutes Way wallbox light (across street
from Falls Terrace Restaurant)*

blinded by the light's harsh brilliance and they will not be able to discern any lurkers waiting in the shadows. In this situation brighter lights would make matters worse. Also, drivers on the roadway may find it difficult to see pedestrians against the backdrop of glare from the wall boxes. Fully shielded fixtures would eliminate most of the blinding glare and produce a more even and balanced illumination of the area.

SUMMARY OF AMENDMENTS: (O2009-001)

The draft amendments establish a new section within Chapter 18.40 *Environmental Performance Standards* of the Tumwater Municipal Code.

The draft standards have the following main provisions:

1. Existing lights are “grandfathered”. No need to change anything that is already in place, however, new lights and replacement lights need to comply with the regulations.
2. Almost all new light fixtures must be fully shielded so that light is directed downward (not upwards or outwards)
3. Light fixtures must be installed such that there is minimal light trespass beyond property lines.
4. Light fixtures on business zoned properties that are mounted to the underside of structures such as canopies, awnings, etc, (such as those found at gas stations, drive thru facilities, service stations, and parking structures) generally must be flush mounted to the canopy so that the lens does not protrude below the surface to which it is mounted.
5. Exempt lights include seasonal decorations, outdoor movie projection equipment, sports field lighting, navigation lights, lights on moving vehicles, traffic control signals and devices, temporary emergency lighting, lights on structures on historic registers, and low lying landscaping lighting such as rope lights. Security floodlights with motion detectors are exempt from the shielding requirements but still must meet the light trespass standards.
 - Outdoor lighting for temporary or periodic events lasting less than seven days in a calendar year is allowed to be unshielded.
6. The regulations will apply to new streetlights on both public and private streets. However, public streetlights are exempt from the light trespass standards.
7. Upward pointed flagpole lighting is allowed for government flags provided it is shielded and louvered (downlighting of flags is encouraged).
8. When any development includes the installation of new or replacement exterior lighting, a basic lighting plan is to be submitted to the Development Services Department. The requirements of this basic plan are simple enough that it can be done by any applicant, no engineering is required. The basic lighting plan includes descriptions of the lights to be installed, their

locations, and a description of how the lights and their mounting locations conform to the outdoor lighting regulations.

- An engineered photometric lighting plan may be required for non-residential development proposals that are 4,000 square feet or larger.

OTHER DARK SKY REGULATIONS:

Many cities, counties, and states have already adopted “dark sky” type outdoor lighting regulations. Mammoth Lakes, California had exterior lighting retrofit deadlines in 2005 for residential and 2006 for commercial and industrial. Sun Valley, Idaho, required all existing lights to come into compliance with the new regulations in 2005. Goleta, California adopted their regulations in 2003. Ames, Iowa adopted full cutoff regulations in 1999. Branford Connecticut approved regulations in 1997. New Mexico approved the Night Sky Protection Act in 1999. Tuscon, Arizona and Pima County, Arizona approved very similar ordinances in 1994. Staff reviewed numerous jurisdictions’ outdoor lighting regulations including the following: Boulder, CO; East Hampton, NY; Albany County, WY; Adelaide (Australia); Arcade, NY; Blount County, TN; Breckenridge, CO; Casselberry, FL; Champaign, IL; Cochise County, AZ; Douglas County, CO; Fairfax County, VA; Goodyear, AZ; Greenwood Village, CO; Jupiter, FL; Palm Springs, CA; Pitkin County, CO; Pueblo, CO; Scottsdale, AZ; Ketchum, ID; Surrey (British Columbia); Shorewood Hills, WI; Sierra-Vista, AZ; Kent, NY; Upper Dublin Township, PA; and West Whiteland Township, PA. Many others can be found at the following links:

<https://www.townofmammothlakes.ca.gov/>

<http://www.illinoislighting.org/links.html>

<https://www.darksky.org>

Closer to home, Enumclaw, Brier, Burlington, Goldendale, Kennewick, Kirkland, Lake Forest Park, Lynnwood, Mountlake Terrace, Oak Harbor, Pasco, Okanogan County and Island County are some of the jurisdictions in Washington State that have already adopted “dark sky” type outdoor lighting regulations. Bainbridge Island approved very strict lighting controls in 2003. Bellevue approved regulations in 1994. Sequim approved regulations in 2008 for full cutoff streetlights in new developments. In addition, a number of other jurisdictions as well as the Washington State Legislature are currently discussing adopting dark sky type regulations. Olympia placed this issue on **RESOURCES** schedule for 2009-2010.

1. Washington Municipal Research Services Center
<http://www.mrsc.org/Subjects/Legal/nuisances/nu-light.aspx>
2. Proposed Washington State lighting legislation 2009 (HB1069):
<http://apps.leg.wa.gov/billinfo/Summary.aspx?bill=1069&year=2009>
3. Illuminating Engineering Society (IES) <https://www.ies.org/>
4. Responsible outdoor lighting organizations
 - a. <http://www.illinoislighting.org/index.html>
 - b. <http://www.darksky.org>

- c. <http://www.darksky.org>
5. Article by Mr. Bob Crelin in Sky and Telescope magazine, “How I Beat Light Pollution in my Hometown”
 - a. <https://skyandtelescope.org/>
6. Lists of compliant lighting fixtures
<http://www.nextrionet.com/mc/page.do?sitePageId=56422&orgId=idsa>
<http://www.skykeepers.org/odlight.html>

ATTACHMENTS:

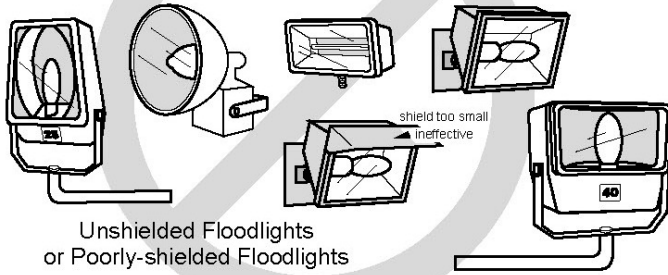
1. Flyer: *Examples of Acceptable/Unacceptable Lighting Fixtures*
 - a. The Public Works Committee requested a flyer showing acceptable and unacceptable lighting fixtures. The creator of the attached flyer, Mr. Bob Crelin, has given us permission to use it in our local lighting regulations. A couple of additional examples were added at the bottom of the page at the request of the Public Works Committee.
2. Example of a “*Basic Lighting Plan*” for a single family home (created on Microsoft Word).

Examples of Acceptable / Unacceptable Lighting Fixtures

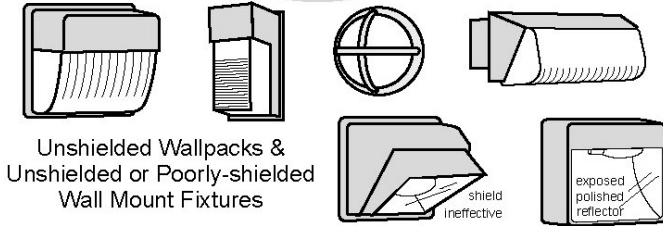
A1

Unacceptable / Discouraged

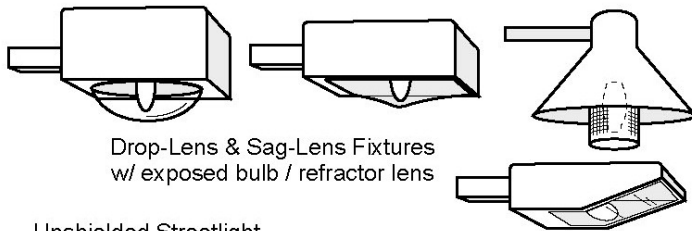
Fixtures that produce glare and light trespass



Unshielded Floodlights or Poorly-shielded Floodlights

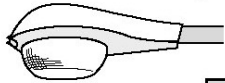


Unshielded Wallpacks & Unshielded or Poorly-shielded Wall Mount Fixtures

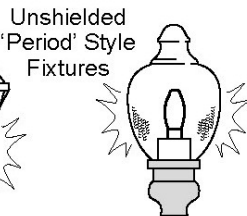
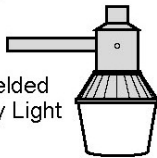


Drop-Lens & Sag-Lens Fixtures w/ exposed bulb / refractor lens

Unshielded Streetlight



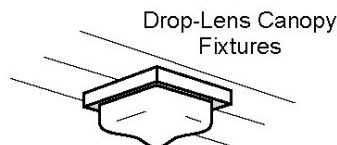
Unshielded Security Light



Unshielded 'Period' Style Fixtures



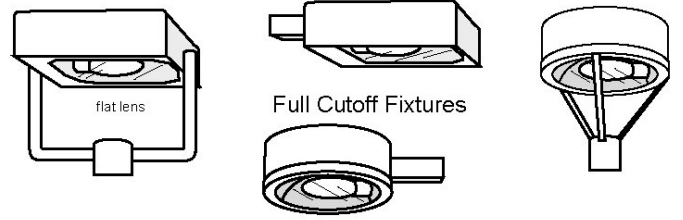
Unshielded PAR Floodlights



Drop-Lens Canopy Fixtures

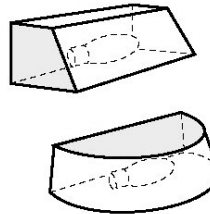
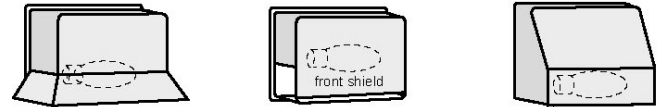
Acceptable

Fixtures that shield the light source to minimize glare and light trespass and to facilitate better vision at night



Full Cutoff Fixtures

Fully Shielded Wallpack & Wall Mount Fixtures

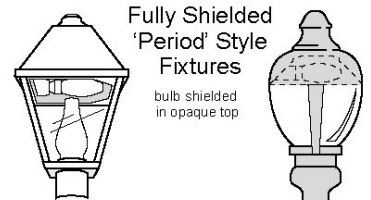
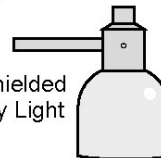


Fully Shielded Fixtures

Full Cutoff Streetlight

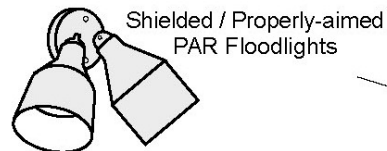


Fully Shielded Security Light

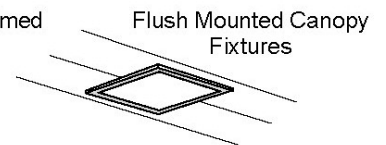


Fully Shielded 'Period' Style Fixtures

bulb shielded in opaque top



Shielded / Properly-aimed PAR Floodlights



Flush Mounted Canopy Fixtures

Copyright Bob Crelin BC 10.02

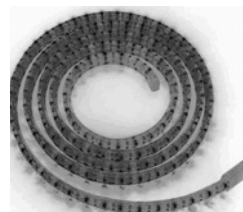
ADDITIONAL EXAMPLES

UNACCEPTABLE



Upward Oriented Landscaping Floodlight

ACCEPTABLE



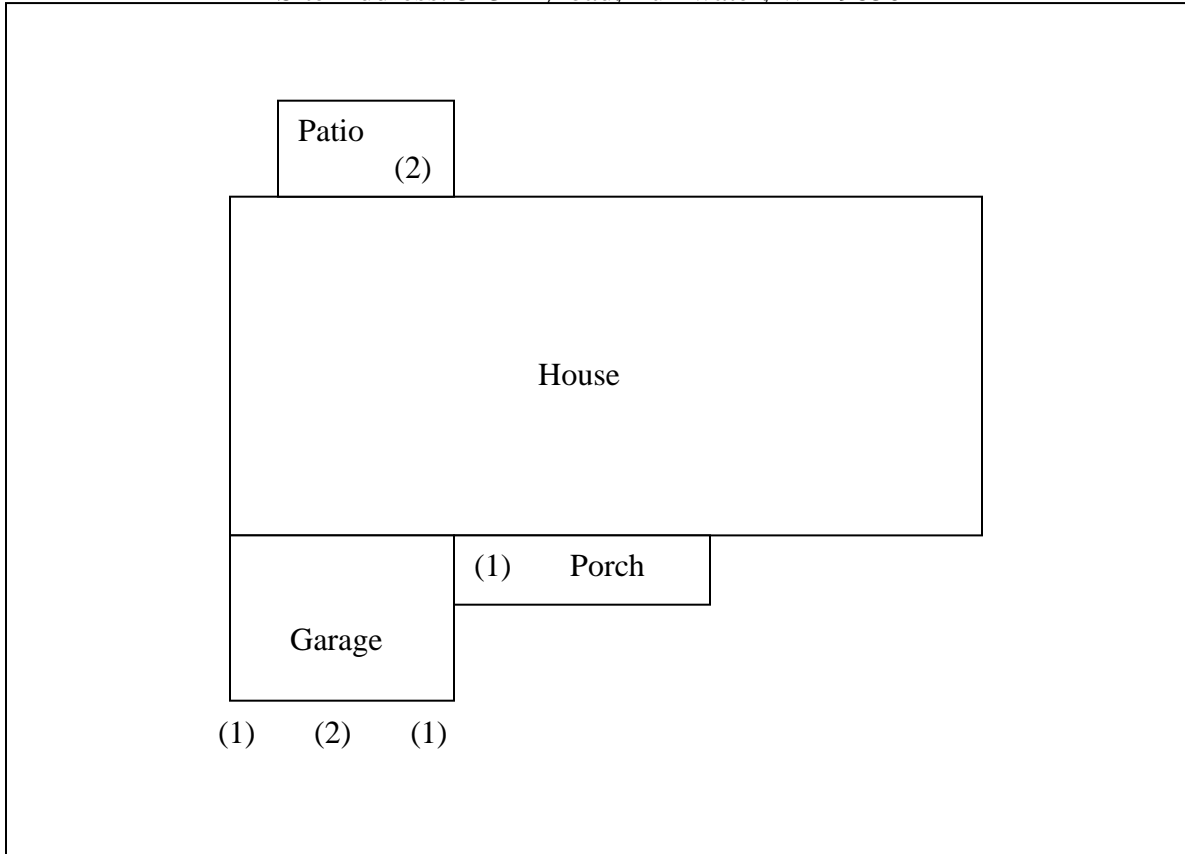
Rope Lighting



Partially Shielded Low Voltage Landscape light

EXAMPLE BASIC LIGHTING PLAN

Site Address: 323 Myroad, Tumwater, WA 98501



- (1) Three fully shielded light fixtures mounted at both sides of garage and by the front door at a height of 7ft. The fixtures are aimed downwards which prevents light trespass onto neighboring properties and are controlled by motion detectors set on 1 minute timers. No uplift is produced by these fixtures. See attachment for picture of light fixture.
- (2) Two fully shielded security floodlights. One mounted at peak of garage roof at a height of 15ft. The other is mounted at the entrance to the back door of the house at a height of 7ft. Both fixtures are shielded and have motion detectors with the timers set at 1 minute. Also, both fixtures are aimed downwards which prevents light trespass onto neighboring properties and prevents uplift. See attachment for picture of light fixture.

Statement of Compliance:

This lighting design (including the design, placement, and aiming of the lighting fixtures) complies with the Tumwater outdoor lighting regulations. If it is found that changes are necessary to come into compliance with the regulations the applicant will complete the changes in a timely manner and before an occupancy permit is issued.

Name: _____ Signature: _____

Contact information: _____

Example Basic Lighting Plan p.2 (attachments):

(1) Light fixtures to be used at both sides of garage and at front porch. Full cutoff, dark sky approved, motion detectors.



(2) Light fixtures to be used at the top center of the garage and on the back patio. Fully cutoff with motion detectors. The light will be aimed downwards to prevent glare, uplight, and light trespass.



Note: Both of these fixtures are available locally at Home Depot