

Landscape Lighting: A Guide for the DIY Homeowner

Putting Your Vision into Action

Congratulations on starting your landscape lighting project. While you have many things to consider, the reward of seeing your home in the ideal light is substantial – not to mention the added benefits of security, safety, and increased home value. No doubt, you have many ideas. This guide will get you started and help you to make the choices that give your home and landscape the look you want.

We divided this guide into four parts:

1. Options
2. Planning
3. Installation
4. Troubleshooting

Additionally, when you gather your tools and select your fixtures, you will want to keep and refer to the instructions that come with them. We have additional guides and instructions in the eLightSpot.com learning center (<http://www.elightspot.com/learningcenter.aspx>). Of course, we are always ready to answer your questions, so feel free to contact us through our site or by calling toll-free (800) 309-4747.



Options and Considerations for Landscape Lighting

Stroll around the Grounds

Before you launch into planning, it helps to understand the benefits and tradeoffs of different locations, fixture types, and lighting effects, which we describe in the next few sections. Then grab a flashlight and walk through your landscape. Be sure to go at dusk as well as night to see the difference in conditions. You can even look during different moon phases. Use the flashlight to mimic the different lighting techniques described below. Keep in mind the following needs:

Security: Where would you like to clear the shadows?

Safety: Where do you need to increase visibility?

Beauty: What features of your landscape would you like to highlight?

Where to Install

The following areas commonly use outdoor lighting.

Steps

Illuminated steps not only add a nice visual effect, but also they increase safety. Adding lights to highlight stairs makes it easy to see them at night, especially as your eyes adjust from well-lit interiors. For staircases longer than three steps, place lights at the top and bottom, and possibly additional lights along the sides.

Walkways

Highlight walking paths on the property. This helps people safely navigate the path, and defines other elements bordering the walkway such as gardens and waterscape. Place lighting close to the ground and directed down to define the path without glare. Another option is to mount fixtures behind trees to filter the light softly onto paths.



Decks

At night, people tend to spend more time on decks than walking in the yard. You want to illuminate the deck while keeping the landscape visible. Like step lighting, you can illuminate decks with fixtures on columns, risers, and railings. You can also place fixtures beneath benches and other objects, or in recessed areas.

Walls

Enhance structural elements such as walls by placing lights low about six to eight inches away from the surface and focused upward. If you have textured surfaces such as stone, brick, or stucco, and even tree trunks, illuminating these accentuates them as a centerpiece of the landscape; and you can use the effect to distract from other elements such as bare trees in winter.

Porches

Mount porch fixtures a little bit above eye level, to make the light easier to see. Also, judge how the fixture will look from farther away. If you select a lantern-type fixture to illuminate your doorway, use a fixture that has a height one third that of the door. For a two-fixture design, use fixtures one-fourth the height of the door.

Landscape Lighting Techniques

Experiment with the following techniques for outdoor lighting to see what gives the best effect:

Spread lighting: also known as *diffused* lighting, offers soft illumination over wide areas. Use this for patios, driveways, and paths as well as shrubs. Bollards or pedestal lights are effective.

Crosslighting: uses two or more lights to illuminate a single object, such as a tree or statue, to create a three-dimensional effect

Uplighting: involves placing lights so that the illumination faces upward. It is good for lighting up trees, textured walls, or statues, and simulates a theater-like effect.

Downlighting: Mount the fixtures above an area, such as in trees or on the roof of a house to highlight a broad area. Use floodlights this way for safety and security purposes.

Moonlighting: is similar to downlighting, but the fixtures are positioned higher up. It can simulate natural effects such as moonlight coming through tree branches, and creates interesting shadows.

Shadowing: place a light below the front of something in the yard, and create shadows on vertical surfaces for interesting effects.

Grazing: highlight textured surfaces such as tree bark or stone walls. Place the light fixture close to the surface.

Floodlights: illuminate an entire wall or other large object. For security or safety, you can use this to illuminate features such as signage.

Pool and Fountain Lighting: enables the use of water to create intriguing effects with light.

Silhouetting: creates illumination from behind and below an object. This creates a shadow best seen at dusk, where the shadow of an object appears positioned against the sky.

Test and combine these techniques to create a unique garden lighting scheme. Take into account every object and space in the area when in the design stages.

Powering Outdoor Lights

You have many options for powering your landscaping design – you can deploy multiple systems in your design, depending on your needs. Your choices depend on what you need for reliability as well as your own skills for wiring and landscaping. Consider the following options:

Conventional: These systems use standard AC power and require extensive safety precautions. Conventional systems are highly reliable and not susceptible to voltage drop (a condition where power decreases over distance.). However, you must familiarize yourself with the building and municipal codes to ensure your safety and to make sure you have the proper permits. Conventional systems must be protected from water and moisture to prevent hazards, which also requires wires be buried six to eight inches deep.

Low Voltage: These systems employ a transformer that converts AC power to a 12-volt direct current. They do not carry the same degree of risk as conventional systems; therefore, you do not need to bury the wiring deeply, if at all, and you likely have fewer building code requirements. These systems are flexible and simple to install but are susceptible to voltage drop; so, you must plan for power demand and may need to deploy multiple transformers.

Solar: The main consideration for solar systems – a type of low-voltage system – is the availability and intensity of sunlight in your area. You also must consider the placement of the solar collectors in your design.

TIP: some States provide cash or tax incentives for the use of solar or low-voltage lighting systems. Check with your utility company to see if you qualify.

Security & Safety Considerations

One final but critical thing to think about in your landscape lighting needs is security. Security lights come in two main forms. There are lights controlled by motion sensors and those that activate according to the ambient light.

Motion-Sensor Lights

Motion-sensor lights are bright and serve to startle an intruder and even wake up people inside the home. These lights operate by infrared motion sensors. An object, such as a person has to cross the path of an infrared light beam for the light to turn on. The light remains on for a programmable length of time if the beam is not obstructed again.

Dusk-to-Dawn Lights

Dusk-to-Dawn lights are not as bright as motion sensor lights, but remain on all night long. This can provide a more constant supply of light, deterring intruders by taking away places to hide or by making them visible to residents. Dusk-to-Dawn lights also provide safety by illuminating paths when ambient light is low. Additionally, they save energy because they are only on when needed.

Planning Your Landscape Lighting

Planning Stages

By now, you have spent some time imagining how your landscape lighting will look, and you have some clear preferences. Now is time to put your decisions into a plan. The effort you put into the design and planning will save work and headaches during installation.

The following steps form your planning stage:

1. Sketch your design
2. Plot your fixtures
3. Determine your power needs
4. Gather your tools and equipment

Sketch Your Design

Draw an outline of the area you are using, with recognizable objects and locations visible, such as trees, gardens, and driveways. Perspective helps as well. Make the drawing as much to scale as possible, and include an outline of the house. To go the extra mile, you can use graph paper and map out the landscape to scale. This will help you estimate cable lengths later.

TIP: To save time and prevent errors, make copies of the landscape drawing and use these to plot your fixtures on the copies. .

Be sure to include existing fixtures such as porch lights and streetlights that will affect the design. Also, be sure to include any electrical outlets that you might need to access later.

Plot Your Fixtures

On your sketch, start marking your initial fixtures. Be sure to use simple symbols such as circles, lines, or cones to indicate the spread of the light. This will help you to see if any lights are interfering with another in unintended ways. Use colored pencils if color is part of your design.

Most landscape designs spread lights about six to ten feet from each other. Place the first fixture at least ten feet from the transformer.

TIP: Save yourself headaches and fines by checking whether you have pipes or wires running under your property. Call 811 free to see where it is safe to dig.

Motion Sensors

If you want motion sensors as part of your design, include the location of the sensor and mark the spread of detection of the sensor. Most sensors are effective at up to 100 feet from a target. The arc of detection will be between 90 and 270 degrees and some fixtures will allow you to set the arc. Be careful of any walls or other obstructions that could prevent your detector from working the way you intend. Review your diagram for areas where someone could hide. The following are common settings for the detection arc:

- Corners – 270 degree sensors
- Walls – 180 degree sensors
- Doors and Windows – 90 degree sensors

Determine Your Power and Control Needs

Once your design looks the way you want it, determine your needs for power and control. Which fixtures will be automated by timers, dusk-to-dawn sensors, or motion sensors? Which fixtures will you turn on manually? Where would you put that control? Are there any fixtures that require additional concerns, such as waterscape lighting?

Mark your controls on the design plot. Conventional systems will need a GFCI outlet and appropriate controller. Low-voltage systems will need a transformer that will plug into a GFCI outlet. Solar systems may have independent collectors or batteries. Add any of these items to your design.

GFCI: stands for ground-fault circuit interrupter – an outlet with a safety breaker that cuts power when it detects a shortage in the line. It prevents electrocution and damage to fixtures. It will have **Test** and **Reset** buttons.

Energy Consumption

For low-voltage systems, select the wattage of the transformer you need by adding up the wattage of the fixtures on the circuit. For example, ten 7-watt fixtures will draw a total of 70 watts. Therefore, you need a transformer that provides more than 70 watts, such as a 100-watt transformer. You can split those loads between more than one transformer. Leave some overhead in wattage in case you want to add fixtures later and to compensate for any voltage drop.

TIP: Keep the maximum wattage at 100 watts of lighting of any single line.

Voltage Drop

Electrical current loses voltage as it travels down a cable. In short runs, the voltage drop is not detectable, but long cable runs may have lights that get progressively dimmer the farther away they are from the transformer. Cable

gauge also affects voltage drop. The higher the cable gauge number, the lower the voltage drop. For systems requiring less than 200 watts, 14-gauge cable will suffice, but systems higher than 200 watts should include 12-gauge cable.

The best way to prevent voltage drop is to split your cables coming off the transformer and keep the lights on each run of cable at about the same distance from the transformer. For example, if you have two groups of lights and one group of lights is closer to the transformer, and the other is farther away, put the two groups on separate runs of cable. Then make sure the length of cable between each fixture on the run is about the same length, even if the fixtures themselves are not physically equidistant. This distributes the voltage drop equally among the fixtures, helping them appear to be the same brightness.

TIP: Take advantage of dimming from voltage drop by placing fixtures at the end of a cable for areas of low light.

Gather Your Tools and Supplies

By now, you have done the math, and drawn all the fixtures, transformers, controls, and cabling on your design plot. Now it is time to gather your tools and supplies, and shop for fixtures. The following list shows the common needs:

- Transformer
- Weatherproof Receptacle Cover
- GFCI Outlet
- Cable (wiring)
- Light Fixtures
- Connectors
- Rubber Gloves
- Graph Paper
- Pencil
- Hand Shovel
- Steel Punch
- Screwdriver
- Wire Stripper
- Voltage Tester

Installing Your Design

Steps for Installation

If you have done your design and planning homework well, you know exactly where to put everything. Now is the time to unpack the equipment and lay it out on the actual landscape. Be sure to refer to the instructions that came with your equipment. The following steps will guide you through installation.

1. Place Equipment
2. Test Fixtures in Place
3. Prepare Holes for Fixtures
4. Dig Trenches
5. Make Connections Permanent
6. Mount Fixtures
7. Cover Wires

Place Equipment

Place the transformer at a central location close to an outdoor GFCI outlet. If needed, replace the transformer's outlet cover with a weatherproof outlet cover.

The most common way to mount a transformer is to drive a wood stake into the ground. You can then screw the transformer to the wood post. You may also mount the transformer to the side of the house.

Many transformers have a timer and photocell. Mount them so that the photocell is toward the west by turning the mounting post. This will ensure that the lights do not activate sooner than you intend.

Test Equipment in Place

Initially, you want to connect the cables in the simplest way so you can test the fixtures. Later you will weatherproof the connections. Connect each run of fixtures to the transformer.

Most light fixtures have a connector or two components of a connector that actually pierce the cable insulation to make an electrical connection with the wire. Always look at the instructions that come with the fixtures to be sure of the correct way to link everything up. A clicking sound indicates that the connector has sealed properly.

Once you have connected every light to the transformer, plug in the transformer (for a low-voltage system), and turn on the system. If all of the lights come on at this point, then you know that you have installed everything correctly. If not, then

you need to check each fixture to make sure the proper connections have been made, or check the transformer to see if it is working as it was designed to.

Use a simple digital voltage meter to test each fixture. For example, when testing halogen lights, see to it that each one is getting 10 to 12 volts. If readings are low, there might be too many lights connecting on a single circuit, or a bad connection somewhere. Also, try adjusting the controls on the transformer. See the **Troubleshooting & Tips** section of this guide for more ideas.

Prepare Holes for Fixtures

Using the steel punch or screwdriver, make a hole in the ground where each fixture will go. Punching this pilot hole prevents damage to the fixture and the wire. You can also fully assemble each fixture by screwing the stakes to the bottom at this stage.

Dig Trenches

Use the hand shovel to dig small trenches along the path of the wire. It is only necessary to cut a slot wide enough to fit the wires. Three to six inches is a sufficient depth to avoid any damage during routine lawn maintenance. For sod, cut one side and fold it back to preserve the roots. Leave extra wire for each fixture so you have room to move things later on. Place the wire in the trenches.

Make Connections Permanent

If the connections work, then make them permanent. Use weatherproof wire connectors that have bottom shields and internal sealant, to connect all of the wires. Cut off any press-on connections that came with the lights, then strip half an inch of insulation to install the weatherproof connectors.

Mount Fixtures

Place the ground fixtures in holes deep enough to be level with the base of the pipe. With the light pole level, pack in the dirt and soil around its base. The top of the stake will be flush with the ground when the fixture is fully inserted. During this process, also make sure the fixture remains straight up. You will have to refit the hole if there is any tilting.

Cover Wires

Cover the wires with the dirt or sod. Begin replacing the sod by smoothing out the soil and grass around the light fixtures. If there is extra sod or soil around the fixtures, remove it with a shovel, but avoid hitting the fixture and damaging it.

The best method of folding back sod is to use your hands. Press down on it with a firm push and then water it with a garden hose along the length of the trench.

Final Test and Enjoy!

You have everything working, but at night is when your final vision comes to life. Take this time to adjust effects, redirect fixtures, and test components such as photo-sensors and timers.

TIP: Be sure to update any changes to your design as you go along. It will help later if you ever need to replace fixtures or need to know where your wires run.

Troubleshooting & Tips

The Lights Are Dim.

Check the transformer and connections of the light fixtures. Check that the cable connects tightly at all junction points, starting with the transformer. Disconnect at least one bulb. If the other lights become brighter, the line could be overloaded. Try removing one or more fixtures. You could also replace the transformer with a higher wattage unit, split the cable configuration, use higher-gauge cable, or add another transformer to the system.

One Lamp Will Not Light

Examine the connection of the cable. Even if it looks good, try removing it and reconnecting the cable securely. If the lamp still does not light up, try testing the socket by inserting a lamp you know is working properly. If this lamp fails to light, there could be a problem with the fixture and it may need to be replaced.

Nothing works

Check the transformer and examine the circuit breaker. Make sure the outlet is active and the power is on. Also, look at the connections on the transformer terminals. It is easy to misplace wires on the connections, so check if the positive and negative wires are correct. To test a photo-controlled transformer, block the photoelectric sensor with a piece of dark tape or other obstruction.

A Light Is Out

Test the connections with a lighting kit. Connections with pierce points can corrode where you have stuck the fixture connectors into the cable. A temporary fix involves using pliers to squeeze the connection. To correct the problem permanently, cut the connection, strip the wire, and use a new connector.

Additionally, fixture sockets may corrode, so try applying dielectric grease to the connector ends on the bulbs. Ideally, replace the fixture.

All Lights Are Out

This usually means there is a short at the transformer. Press the Reset button on the GFCI outlet. If the lights are still out, use a voltmeter to check the voltage going to the plug. If there is none, check the transformer fuse or circuit breaker.

Next, look at the amperage on the output side of the transformer. Even if the power going into the transformer is OK, high amperage means there is an issue somewhere else along the wire.

Check each fixture with the voltmeter. Now you can narrow down the problem to a single fixture or section of cable. Replace fixtures or cable sections accordingly.