



A Guide to Sea Turtle Lighting



Photo by Shirley Brown

December 2001

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2006**

**Compiled by:
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Dear User:

This guide is intended for a diverse audience. You may be a lighting retailer or wholesaler, beachfront homeowner or property manager, community leader, government regulator, tourism-oriented business owner, educator, or sea turtle enthusiast. As development of the coastline increases, habitat for sea turtle nesting diminishes. We are now confronted by the issue of beachfront lighting, and the best way to protect sea turtles while providing security and safety for residents and visitors of the seashore. We have known for some time that beachfront lighting causes problems for hatchling sea turtles as they emerge from the nest and crawl to the ocean. We have now learned that adult female turtles avoid well-lighted beaches too. The solution to these problems is "sea turtle friendly" lighting. However, conversion to this type of lighting has been relatively slow because lighting technology was new, and not always economical or feasible to use.

There are many options to install or convert to sea turtle friendly lighting along the beachfront. These options are now feasible to use, and in the long term, may also provide energy and cost savings to the user. This guide does not present any new invention or light fixture, but compiles existing information about sea turtles, the concerns with beachfront lighting, and the various solutions to implement sea turtle friendly lighting.

In addition, we have provided information about light "pollution"; that is, lighting that infringes on adjacent property owners. Because of the density of most coastal development, beachfront lighting is considered a type of light pollution and may affect the well-being and enjoyment of the beach experience for residents and visitors. Excessive ambient light has also been noted to affect astronomers viewing the sky, as well as migrating birds and nocturnal animals.

We appreciate your time in using this guide and hope you will find it useful. Please send us any suggestions or comments.

Sincerely yours,

Gail A. Carmody
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How to Best Use this Guide

First, we need to understand why sea turtle friendly lighting is needed. We are trying to decrease the amount of ambient beachfront lighting and use lights that sea turtles “do not see.” In short, sea turtles see differently than we do, which makes sense because they spend the majority of their lives in a “blue” ocean that filters out “reds and yellows.” In technical terms, sea turtles see light in the short wavelengths (blues and greens) and do not see light in the longer wavelengths (reds).

Determine if your property is sea turtle “unfriendly.” Stand on the beach along the water’s edge at night. If you can see any light illumination from a fixture or if a fixture directly illuminates the beach, the light is “unfriendly.” In addition, does the lighting create a glow that can be seen from the beach or dunes?

This guide is divided by tabs.

- Front side pocket: *Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches.* This is the primer on sea turtle lighting. The authors have compiled existing data (much of it their own) and describes in layman terms, about sea turtles and beachfront lighting, how to assess lighting, convert the lighting, and obtain lighting. FMRI Tech. Report TR-2. Revised 2000.
- State Guidelines: This is information provided as part of the FDEP, Beaches and Coastal Systems Coastal Construction Control Line (CCCL) permit package, entitled *CCCL Project Guidelines to Reduce Impacts to Marine Turtles.*
- Model Lighting Ordinance: This is a template provided by the State of Florida to help local governments design a lighting ordinance for their beachfront communities.
- Existing Ordinances: This is a map of Florida that shows the communities that have implemented lighting ordinances.
- Disorientation Forms: These are the forms that sea turtle permit holders in the State of Florida complete for official documentation of a lighting problem. They are sent into FWC, Office of Protected Species, Tequesta, FL. Also included in this tab is information on sea turtle lighting disorientations. This is information provided by the State of Florida, FWC that summarizes sea turtle lighting disorientations that were documented for the 2000 season.
- International Dark Sky: IDS was started because of the light pollution that reduced the astronomers ability to see the sky at night. The information in this tab provides useful information to compare light types, energy use,

and cost comparisons. It also provides examples of communities that have converted their lights.

Safety and Security:

This tab provides results of studies on lighting and crime prevention and observations by law enforcement.

NW FL Vendor List:

This is a list of vendors that can provide sea turtle friendly, lights, light fixtures, window glass and film. Provision of this list should not be considered as endorsement by the FWS. If you are in wholesale or retail sales and would like to have your business added to the list, please contact us.

Balcony and Patios:

Lighting fixtures for balconies, patios, door openings, etc.

Walkways:

Lighting fixtures for boardwalks, pedestrian paths, and other walkways.

Roadway:

Lighting used for highways and street lighting.

Utility:

Lighting used for parking garages, parking lots, etc.

Common Areas:

Lighting for multi-family developments such as pools, shuffle board courts, etc.

Windows

This includes information on turtle glass or film that meets the State's criteria for sea turtle friendly (45 % transmission from inside to outside), window treatment, window coverings, etc.

Bulb Vendors:

Contacts for purchasing various kinds of light bulbs.

Miscellaneous:

This includes information sea turtle compatible filter material that you can use on flashlights, headlights, or other "temporary" lights used on the beach. This tab includes other information that does not fit into above lighting categories.

Outreach & Education:

This is mostly educational material or examples of how other communities or sea turtle groups are informing beachfront users about sea turtles. Please feel free to use any of the material, call or write other groups for information. However, if any of the material has a copyright, please obtain permission before using it.

Acknowledgments

The compilation of the guide could not have been possible without the primer of sea turtle lighting, "*Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches.*" written by Blair Witherington and Erik Martin in 1996, and revised in 2000. In addition, Meghan Conti, Florida Fish and Wildlife Conservation Commission, Office of Protected Species Management, provided the majority of the product availability information and technical advice, including spending time on the beach with us. Also, many thanks to Sandy MacPherson, U.S. Fish and Wildlife Service, National Sea Turtle Coordinator, Robbin Trindell and Karen Moody, Florida Fish and Wildlife Conservation Commission, Office of Protected Species Management, who have both spent countless hours providing technical advice.

FLORIDA MARINE RESEARCH INSTITUTE TECHNICAL REPORTS

Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches

Blair E. Witherington and R. Erik Martin



Florida Fish and Wildlife
Conservation Commission





Jeb Bush
Governor of Florida

Florida Fish and Wildlife Conservation Commission

Allen L. Egbert
Executive Director



The Florida Marine Research Institute (FMRI) is a division of the Florida Fish and Wildlife Conservation Commission (FWC). The FWC is "managing fish and wildlife resources for their long-term well-being and the benefit of people." The FMRI conducts applied research pertinent to managing marine-fishery resources and marine species of special concern in Florida.

Programs at the FMRI focus on resource-management topics such as managing gamefish and shellfish populations, restoring depleted fish stocks and the habitats that support them, protecting coral reefs, preventing and mitigating oil-spill damage, protecting endangered and threatened species, and managing coastal-resource information.

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Blair E. Witherington and R. Erik Martin

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WITHERINGTON, B. E. 1997. The problem of photopollution for sea turtles and other nocturnal animals. Pp. 303–328 in J. R. Clemmons and R. Buchholz, eds. *Behavioral Approaches to Conservation in the Wild*. Cambridge University Press, Cambridge, England.

FMRI Web site:

The Florida Marine Research Institute Web site is located at www.floridamarine.org

Appendices D and G:

Vendors ERS and Westek are no longer available. Thomas Industries, Benjamin Division, is now Genlyte Thomas.

Appendix D, page 42, table body line 3, column 2: For “sound bollard” read “round bollard”

Appendix D, page 46, first table, table body line 17, column 4: For “18, 35,” read “18, 35, 55”

Appendix I:

The following is a list of conservation organizations, government agencies, and other groups that may be able to assist in resolving light-pollution problems on sea turtle nesting beaches.

ARCHELON—Sea Turtle Protection Society of Greece⁴

3rd Marina, GR-166 75 Glyfada
Athens, GREECE
TEL: +30-1-898-2600
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WEBSITE: <http://www.archelon.gr>
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FAX: 850-922-4338
WEBSITE: floridaconservation.org

Ecological Associates, Inc.¹

1458 Sunview Terrace
Jensen Beach, Florida 34957 USA
TEL: 772-334-3729
FAX: 772-334-4929

Caribbean Conservation Corporation¹

4424 NW 13th Street, Suite A-1
Gainesville, Florida 32609 USA
TEL: 800-678-7853
FAX: 352-375-2449
WEBSITE: www.cccturtle.org
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(continued on page 2)

* Available through the FMRI Web site, www.floridamarine.org

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Florida Fish & Wildlife Conservation Commission
Resource Recovery, Marine Turtles
100 Eighth Avenue SE
St. Petersburg, Florida 33701 USA
TEL: 727-896-8626
FAX: 727-893-9176
WEBSITE: www.floridamarine.org

Florida Power and Light Company²

Environmental Services Department
P.O. Box 14000
Juno Beach, Florida 33408 USA
TEL: 800-342-5375
FAX: 561-691-7049
WEBSITE: www.fpl.com

International Dark-Sky Association⁵

3225 North First Avenue
Tucson, Arizona 85719 USA
TEL: 520-293-3198 (voice)
FAX: 520-293-3192
WEBSITE: www.darksky.org
E-MAIL: ida@darksky.org

IUCN—The World Conservation Union³

Marine Turtle Specialist Group, Chair
Archie Carr Center for Sea Turtle Research
University of Florida
P.O. Box 118525
Gainesville, Florida 32611 USA
TEL: 352-392-5194
FAX: 352-392-9166
WEBSITE: accstr.ufl.edu
E-MAIL: kab@zoo.ufl.edu

Ogasawara Marine Center⁴

Byobudani, Chichijima
Ogasawara-mura, Tokyo, JAPAN 100-21
E-MAIL: BXL02325@niftyserve.or.jp

Programa Restauración de Tortugas Marinas⁴

Apdo. 1203-1100 Tibas
COSTA RICA
TEL: 506-241-5227
FAX: 506-236-6017
WEBSITE: www.tortugamarina.org
E-MAIL: rarauz@tortugamarina.org
pretoma@racsa.co.cr

PRONATURA—Yucatán⁴

Calle 17 # 188-A x 10
Colonia García Ginerés
Mérida, Yucatán—97070 MEXICO
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Queensland National Parks and Wildlife Service⁴

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TEL: (71) 676-1045
FAX: (71) 676-1067
WEBSITE: www.tamar.com.br
or in English: www.tamar.com.br/ingles

United States Fish and Wildlife Service⁴

National Sea Turtle Coordinator
6620 Southpoint Drive South, Suite 310
Jacksonville, Florida 32216
WEBSITE: northflorida.fws.gov/SeaTurtles/seaturtle-info.htm
E-MAIL: northflorida@fws.gov

WIDECAST¹

17218 Libertad Drive
San Diego, California 92127 USA
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FAX: (858) 451-6986
WEBSITE: www.widecast.org
E-MAIL: widecast@ix.netcom.com

World Wildlife Fund¹

1250 24th Street NW
Washington, DC 20037 USA
TEL: 1-800-225-5993
WEBSITE: www.worldwildlife.org

¹May be able to assist in education and legislation efforts.

²Offers a pamphlet for distribution entitled "Sea Turtles and Lights" and a booklet on general sea turtle biology (Van Meter, 1992).

³Maintains worldwide contacts with sea turtle researchers and conservationists.

⁴Compiles national or regional data gathered at sea turtle nesting beaches.

⁵Compiles and distributes information on the causes and effects of light pollution.

Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches

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2000

Cover Photograph

Tracks of disoriented loggerhead (*Caretta caretta*) hatchlings,
Melbourne Beach, Florida. Photograph by Blair E. Witherington.

Copies of this document may be obtained from

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100 Eighth Ave. SE
St. Petersburg, FL 33701-5095
Attn: Librarian

U.S. Fish and Wildlife Service
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Jacksonville, FL 32216
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Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches

Executive Summary

Sea turtle populations have suffered worldwide declines, and their recovery largely depends upon our managing the effects of expanding human populations. One of these effects is light pollution—the presence of detrimental artificial light in the environment. Of the many ecological disturbances caused by human beings, light pollution may be among the most manageable. Light pollution on nesting beaches is detrimental to sea turtles because it alters critical nocturnal behaviors, namely, how sea turtles choose nesting sites, how they return to the sea after nesting, and how hatchlings find the sea after emerging from their nests.

Both circumstantial observations and experimental evidence show that artificial lighting on beaches tends to deter sea turtles from emerging from the sea to nest. Because of this, effects from artificial lighting are not likely to be revealed by a ratio of nests to false crawls (tracks showing abandoned nesting attempts on the beach).

Although there is a tendency for turtles to prefer dark beaches, many do nest on lighted shores, but in doing so, the lives of their hatchlings are jeopardized. This threat comes from the way that artificial lighting disrupts a critical nocturnal behavior of hatchlings—crawling from their nest to the sea. On naturally lighted beaches, hatchlings escaping from nests show an immediate and well-directed orientation toward the water. This robust sea-finding behavior is innate and is guided by light cues that include brightness, shape, and in some species, color. On artificially lighted beaches, hatchlings become misdirected by light sources, leaving them unable to find the water and likely to incur high mortality from dehydration and predators. Hatchlings become misdirected because of their tendency to move in the brightest direction, especially when the brightness of one direction is overwhelmingly greater than the brightness of other directions, conditions that are commonly created by artificial light sources. Artificial lighting on beaches is strongly attractive to hatchlings and can cause hatchlings to move in the

wrong direction (misorientation) as well as interfere with their ability to orient in a constant direction (disorientation).

Understanding how sea turtles interpret light cues to choose nesting sites and to locate the sea in a variably lighted world has helped conservationists develop ways to identify and minimize problems caused by light pollution. Part of this understanding is of the complexity of lighting conditions on nesting beaches and of the difficulty of measuring light pollution with instrumentation. Thankfully, accurately quantifying light pollution is not necessary to diagnose a potential problem. We offer this simple rule: if light from an artificial source is visible to a person standing anywhere on a beach, then that light is likely to cause problems for the sea turtles that nest there.

Because there is no single, measurable level of artificial brightness on nesting beaches that is acceptable for sea turtle conservation, the most effective conservation strategy is simply to use “best available technology” (BAT: a common strategy for reducing other forms of pollution by using the best of the pollution-reduction technologies available) to reduce effects from lighting as much as practicable. Best available technology includes many light-management options that have been used by lighting engineers for decades and others that are unique to protecting sea turtles. To protect sea turtles, light sources can simply be turned off or they can be minimized in number and wattage, repositioned behind structures, shielded, redirected, lowered, or recessed so that their light does not reach the beach. To ensure that lights are on only when needed, timers and motion-detector switches can be installed. Interior lighting can be reduced by moving lamps away from windows, drawing blinds after dark, and tinting windows. To protect sea turtles, artificial lighting need not be prohibited if it can be properly managed. Light is properly managed if it cannot be seen from the beach.

Best available technology also includes light

sources that emit a color of light that has minimal effects on sea turtles. Light sources emitting low levels of short-wavelength light—sources that appear deep red or yellow—affect both hatchlings and nesting adults less than do sources emitting higher levels of short-wavelength light—sources that appear whitish or any color other than deep red or yellow. Low-pressure sodium-vapor luminaires are pure yellow sources that make good substitutes for more disruptive lighting near sea turtle nesting beaches. Yellow-tinted incandescent “bug-light” bulbs are not as pure a yellow source but can be an acceptable substitute.

Making the public aware of light-pollution problems on sea turtle nesting beaches is a fundamental step towards darkening beaches for sea turtles. Many of those responsible for errant lighting are unaware of its detrimental effects and are generally willing to correct the problem voluntarily once they become

aware. Nonetheless, legislation requiring light management is often needed, and on many nesting beaches, it may be the only means to completely resolve light-pollution problems. An outline for initiating, promoting, and implementing beach-lighting legislation is presented in this manual along with a model ordinance that can be used to help produce legislative drafts.

Appendices in the manual detail the appropriateness of lamp types, lamp colors, fixture designs, and fixture mounting for various lighting applications near sea turtle nesting beaches; give information for contacting lighting companies that offer appropriate lighting and for contacting governmental and nongovernmental organizations that can help with sea turtle conservation efforts; and present a list of responses to commonly encountered questions and comments regarding sea turtles and artificial lighting.

TRUST

*The sea produced an ancient form
with aquatic wings for soaring
that gouged the sand away from tide
above the ocean's pouring.*

*She abandoned hope to trust the past,
heaved forth the future and at last,
buried it and left.*

*Now, two moons hence, little turtles pip,
with soft struggling bodies hatching.
The sands ensconce as eggs are ripped
by contorted masses scratching.*

*The siblings toil at a common chore
to whittle ceiling into floor,
until at sand's surface just short of sky,
the unsettled lie, becalmed.*

*The tangled turtles wait
as heat of day abates
and cool of night prods
their reluctance away.*

*At dusk the fits and starts begin
and then through claw and strain,
above their heads sand rains again,
and yields to sky of night.*

*This army boiling in the night gains might,
and in waves, pours forth to see the sight.
Soft flippers patter and wipe sand from view
that eyes might seize upon the cue that betrays the sea.*

*And then, eyes do, they catch the glow
and every hatchling keen
rushes on to the goal they know
but they have never seen.*

*As if clockwork toys tightly wound
they keep pace and bearing tight,
for unless the sea is quickly found,
they will not survive the night.*

*They choose their erring paths
with neither doubt nor anticipation,
and their consistency deals them life or death
with quiet resignation.*

*Thus, night wanes and sights of light remaining
scatter throngs persistent
and about the dune abundant obstacles restraining,
divide the dying from the spent.*

*Weakened few reach the sight they sought,
a deceptive brightness reassuring
where trusting forms are caught
by the sight of lights alluring.*

*Dawn now dries their searching eyes
and death now rests the weary.
Might fate have been more kind
to travelers more leery?*

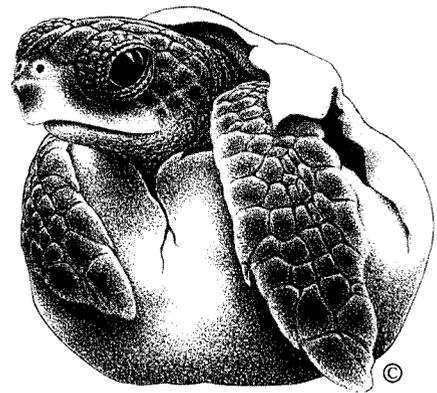
*Were these turtles to awaken,
could they sense their mother's plight
having left her young forsaken
owing confidence in light?*

*Past's light offered not such bitter seas
nor played such deadly roles
to guide hatchlings on to sights like these
electric lights on poles.*

*Might we masters of the light adapt,
forgo complete control,
and lessen obsolescence
lest our presence take its toll?*

*To tread on earth with darkness soft
leaves not the night asunder
and preserves the stars and moon aloft,
and obsoleted wonders.*

—BEW



Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches

Introduction

In the sliver of time since Europeans began migrating throughout the tropical oceans of the world, sea turtle populations have declined and many have been extirpated. As a group, sea turtles are considered dangerously close to extinction. Because of their precarious status, sea turtles have been afforded protection by local, state, provincial, and national laws and by international treaties. In the United States and its territories, the Endangered Species Act of 1973 prohibits all killing, harming, and harassment of six species of sea turtles: the green turtle (*Chelonia mydas*), the loggerhead (*Caretta caretta*), the hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), the olive ridley (*Lepidochelys olivacea*), and the leatherback (*Dermochelys coriacea*).

It is perhaps on ocean beaches where the activities of people and sea turtles are most conspicuously intertwined. On these narrow strips of sand, people live, recreate, and conduct commerce—and sea turtles come to reproduce. Although sea turtles spend very little of their lives on beaches, their activities there are critical to the creation of the next generation. Sea turtles leave little more disturbance on the beach than a mound of sand and are likely to make no more of an impression on human inhabitants than to awaken a sense of wonder. Humans, however, can cause profound environmental changes in the places they visit. The consequences of such changes for sea turtles can be severe and are of great concern to those working for sea turtle conservation. An integral goal of sea turtle conservation efforts is to reduce deleterious human effects such as habitat alteration. In this manual, we will examine a distinctive and particularly damaging type of habitat alteration that affects sea turtles at the nesting beach, namely, light

pollution—the introduction of artificially produced detrimental light into the environment.

Light from artificial sources differs markedly from other pollutants both in its form—light is energy rather than substance—and in its effect on sea turtles. Whereas heavy metal, petroleum, and other chemical pollutants produce predominately physical or physiological effects, the effect that light pollution has on sea turtles is essentially psychological. For sea turtles, artificial light is best described not as a toxic material but as misinformation. With its great potential to disrupt behaviors that rely on correct information, artificial lighting can have profound effects on sea turtle survival. Critical sea turtle behaviors affected by light pollution include the selection of nesting sites by adult turtles and the movement off the beach by hatchlings and adults.

Raymond (1984a) presented the first summary of the effects of light pollution on hatchling sea turtles and some potential solutions to this problem. The present manual can be considered an expanded update of the material presented by Raymond. Our goals here are to offer new perspectives on the problem of light pollution at sea turtle nesting beaches and to present recently acquired information both on the problem itself and on the strategies and mechanics by which the problem can be solved. Our presentation is geared for biologists, conservationists, and managers who may be consulted about or charged with solving problems caused by artificial lighting on sea turtle nesting beaches. However, this manual is also meant to inform the lay person who may work or live near a nesting beach and is concerned about sea turtle conservation.

Problems: The Effects of Artificial Lighting on Sea Turtles

Sea Turtle Nesting

THE NESTING PROCESS

Sea turtles are marine reptiles that deposit their eggs above the high-tide line on sand beaches. Sea turtle nesting is seasonal and for most populations begins in late spring and concludes in late summer. Although more than one sea turtle species may nest on the same beach, their nesting seasons are often slightly offset. In Florida (USA), for instance, leatherbacks begin nesting in mid-March and conclude in mid-July, loggerheads begin nesting in early May and conclude in late August, and green turtles begin nesting in early June and conclude by mid-September (Meylan *et al.*, 1995).

Except for the flatback turtle (*Natator depressus*; B. Prince, personal communication), Kemp's ridley (Pritchard and Marquez, 1973), and some populations of hawksbills (Brooke and Garnett, 1983), sea turtle nesting occurs almost exclusively at night. All sea turtle species have in common a series of stereotyped nesting behaviors (descriptions given by Carr and Ogren, 1959; Carr *et al.*, 1966; Bustard, 1972; Ehrenfeld, 1979; Hirth and Samson, 1987; Hailman and Elowson, 1992; Hays and Speakman, 1993), although there are subtle differences between species and some elements of this behavior may vary between individuals and between nesting attempts. For example, nesting behavior may vary in where turtles emerge onto land, in where on the beach they begin to construct their nests, in whether they abandon their nesting attempts and at what nesting stage they abandon the attempts, and in the directness of their paths as they return to the sea. These variations in nesting behavior can affect the success of egg deposition and hatchling production and can affect the well-being of the nesting turtle.

During the process of nesting, an adult female sea turtle 1) emerges from the surf zone, 2) crawls up the beach to a point typically between the high-tide line and the primary dune, 3) prepares the nest site by pushing or digging surface sand away to form a "body pit," 4) digs an "egg cavity" within the body pit using the rear flippers, 5) deposits eggs within the egg cavity, 6) covers the eggs with sand, 7) camouflages the nest site by casting sand, principally with front-flipper strokes, 8) turns toward the sea, and 9) crawls into the surf (Hailman and Elowson, 1992,

include an additional "wandering" phase). For the most part, the pattern of each of these behaviors (how they are performed) is not affected as greatly by external stimuli (such as the presence of humans or lights) as are the "decisions" that determine the timing, duration, and accuracy of these behaviors. Functionally, these decisions affect the selection of a nest site, the abandonment or abbreviation of nesting behaviors, and the accuracy of sea-finding.

DISRUPTION OF NEST-SITE SELECTION

Sea turtles select a nest site by deciding where to emerge from the surf and where on the beach to put their eggs. The most clearly demonstrated effect of artificial lighting on nesting is to deter turtles from emerging from the water. Evidence for this has been given by Raymond (1984b), who reported on a dramatic reduction in nesting attempts by loggerheads at a brightly lighted beach site in Florida. Elsewhere in Florida, Mattison *et al.* (1993) showed that there were reductions in loggerhead nesting emergences where lighted piers and roadways were close to beaches. Mortimer (1982) described nesting green turtles at Ascension Island as shunning artificially lighted beaches. Additional authors have noted a relationship between lighted beach development and reduced sea turtle nesting: Worth and Smith (1976), Williams-Walls *et al.* (1983), Proffitt *et al.* (1986), and Martin *et al.* (1989) for loggerheads in Florida; Witherington (1986), Worth and Smith (1976), and Ehrhart (1979) for green turtles in Florida; and Dodd (1988), Witham (1982), and Coston-Clements and Hoss (1983) in reviews of human impacts on sea turtle nesting. Salmon *et al.* (1995a) found that loggerheads that do nest on beaches where the glow of urban lighting is visible behind the dune tend to prefer the darker areas where buildings are silhouetted against the artificial glow. Other authors have mentioned reduced nesting activity at lighted and developed beaches (Talbert *et al.*, 1980) or nesting in spite of lighted development (Mann, 1977) but have reserved judgment on the effects of lighting because of other contributing factors such as increased human activity near developed areas.

In addition to evidence pointing to a correlation between lighted beaches and reduced nesting, there is evidence from experimental field work that directly implicates artificial lighting in deterring sea turtles

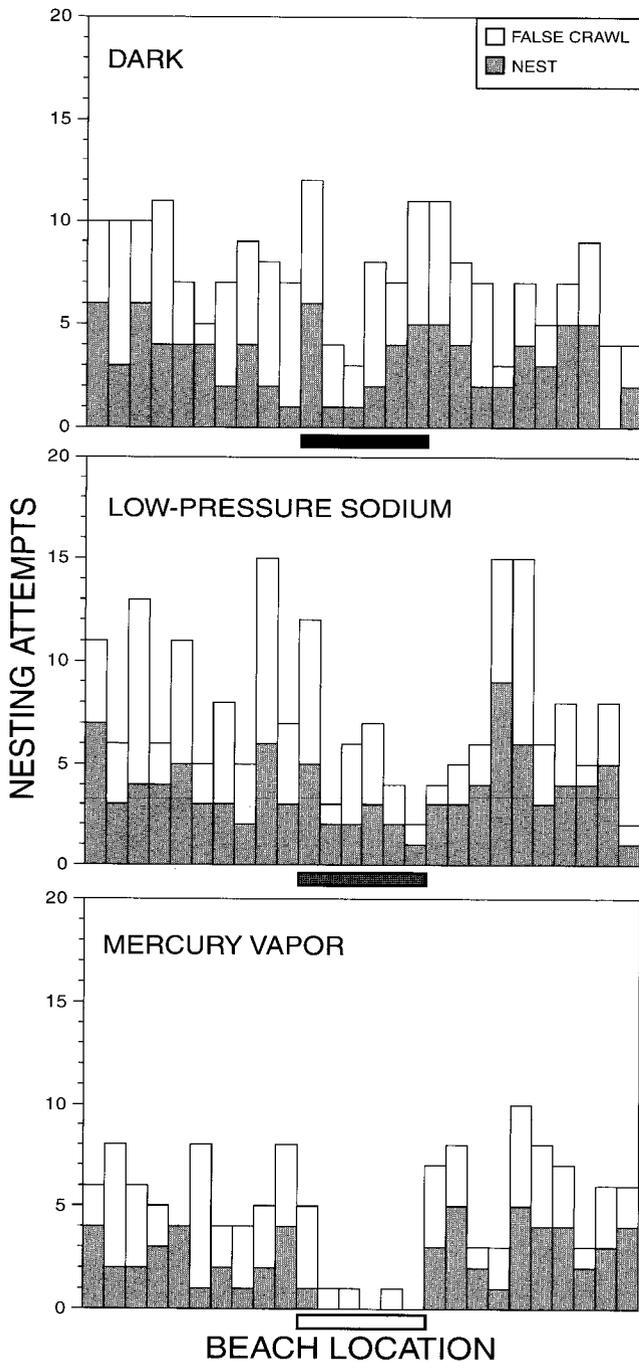


Figure 1. The distribution of loggerhead nesting attempts on a 1,300-m stretch of beach at Melbourne Beach, Florida. The beach locations were divided into 50-m sections. The horizontal bars show the section of beach where luminaires were set up—either lighted mercury-vapor luminaires (open bar), lighted low-pressure sodium-vapor luminaires (shaded bar), or luminaires that were not lighted (dark bars). Data are from Witherington (1992a).

from nesting (Witherington, 1992a). In these experiments, undeveloped nesting beaches were left dark or were lighted with one of two types of commercial

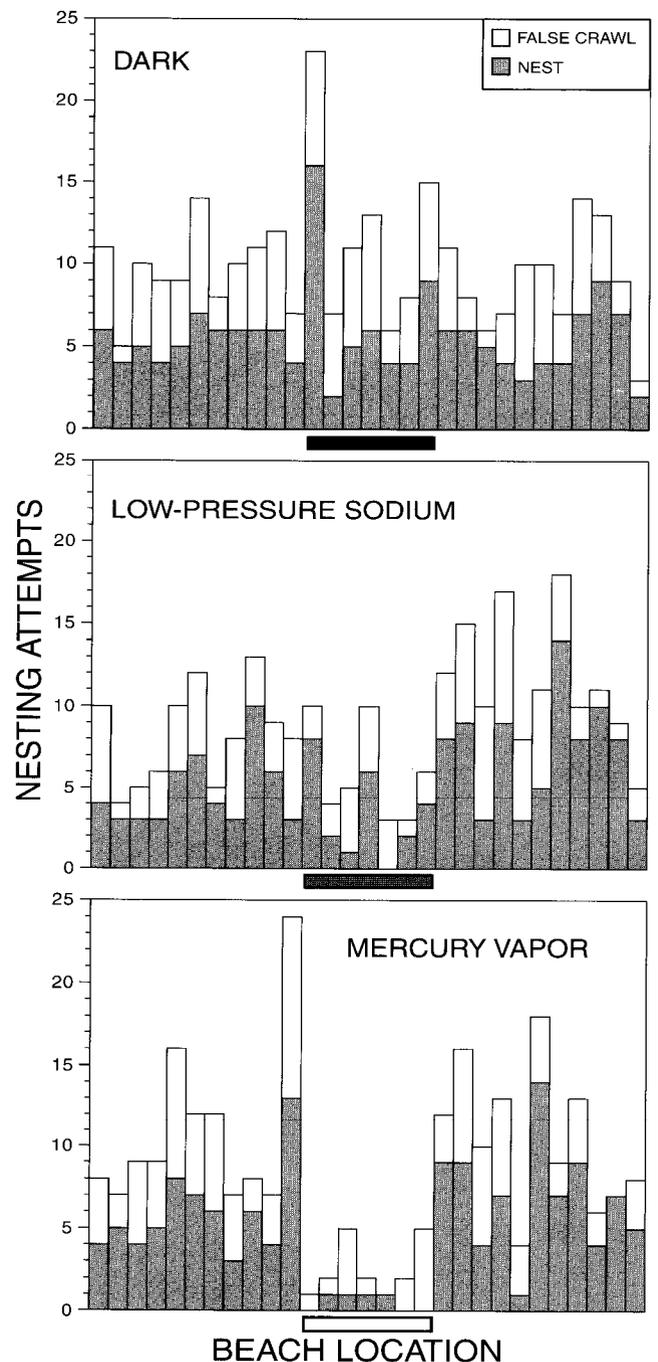


Figure 2. The distribution of green turtle nesting attempts on a 1,450-m stretch of beach at Tortuguero, Costa Rica. Identifications are as in Figure 1.

light sources. Both green turtles and loggerheads showed a significant tendency to avoid stretches of beach lighted with white mercury-vapor luminaires (Figures 1 and 2). However, any effect of yellow low-pressure sodium-vapor luminaires on loggerhead or green turtle nesting could not be detected. Because the mercury-vapor lighting reduced both nesting

and nonnesting emergences, it seems that the principal effect of artificial lighting on nesting is to deter turtles from exiting the water. This means that one cannot rely on a ratio of nesting and nonnesting tracks to reveal effects from artificial lighting. The reason why artificial lighting deters nesting emergences is not known. It may be that artificial lighting on a beach is perceived by the turtles as daylight, which may suppress behavior that is usually nocturnal.

Once on the beach, sea turtles select a place to make a nest. In the field experiments by Witherington (1992a), artificial lighting had no effect on how far from the dune sea turtles placed their nests. Nest placement on the beach may depend most heavily on nonvisual cues such as temperature gradients (Stoneburner and Richardson, 1981).

The artificial lighting of sea turtle nesting beaches can be considered a form of habitat loss. When lighting deters sea turtles from nesting beaches, nesting turtles may be forced to select less appropriate nesting sites. Worth and Smith (1976) reported that loggerheads deterred from nesting re-emerged onto beaches outside their typical range. Murphy (1985) found that loggerheads that were repeatedly turned away as they made nesting attempts chose increasingly distant and inappropriate nesting sites in subsequent nesting attempts. If we assume that sea turtles choose nesting sites based upon favorable conditions for safe nesting and the production of fit offspring, then light pollution can be said to force some turtles into suboptimal nesting habitat. At suboptimal nesting beaches, the number of hatchlings produced and their survivorship may be compromised, and hatchling sex ratios may be affected. There is also the potential that turtles deterred from nesting may shed their eggs at sea. In the Caribbean, adult female turtles held in pens during the nesting season often drop their eggs without nesting (A. Meylan, personal communication).

NESTING BEHAVIOR ABANDONMENT AND ABBREVIATION

Sea turtles that emerge onto beaches often abandon their nesting attempts before putting their clutches of eggs into the sand. Nesting success (the number of nests divided by attempts) varies between beaches and between species. Among 28 Florida nesting beaches surveyed in 1994, nesting success for loggerheads was 53% ($n = 52,275$ nests), 52% for green turtles ($n = 2,804$ nests), and 83% for leatherbacks ($n = 81$ nests) (Florida Department of Environmental Protection, Index Nesting Beach Survey Program). Nesting success for Florida loggerheads in 1994 was 61% ($n =$

3,704 nests) at the undeveloped beaches of the Canaveral National Seashore and 45% ($n = 6,026$ nests) at the residential and heavily armored beaches of Jupiter Island. Sea turtles will abandon nesting attempts when they encounter digging impediments, large structures, unsatisfactory thermal cues, or human disturbance; when there are injuries to the rear flippers; or when other influences recognized thus far only by the turtles deter them (BEW and REM, unpublished data; Stoneburner and Richardson, 1981; Fangman and Rittmaster, 1993).

Sea turtles are most prone to human disturbance during the initial phases of nesting (emergence from the sea through egg-cavity excavation; Hirth and Samson, 1987), and during this period, green turtles are reported to be deterred by people with flashlights (Carr and Giovannoli, 1957; Carr and Ogren, 1960). Our experiences with nesting loggerheads and green turtles have been that the presence of people moving within the field of view of a turtle may cause abandonment just as often as—and perhaps more often than—hand-held lighting, but this has yet to be studied experimentally.

In one study (Witherington, 1992a), stationary lighting could not be shown to cause loggerheads and green turtles to abandon their nesting attempts on the beach. In that study, however, so few turtles emerged onto the mercury-vapor-lighted portion of the beach that recorded nesting attempts were insufficient for a proper test of nesting success.

Although sea turtles are less prone to abandon nesting attempts once oviposition has begun, the normal post-oviposition behavior of covering the eggs and camouflaging the nest site can be abbreviated if a turtle is disturbed. Johnson *et al.* (1996) measured the behavior of loggerhead turtles observed by turtle-watch ecotourism groups and found that the “watched” nesting turtles had shorter-than-average bouts of nest covering and camouflaging. We have made similar observations of turtles “watched” by unorganized groups of people with flashlights. In one instance, BEW observed that a green turtle illuminated by a bright flashlight covered its eggs, cast sand, and began a return to the sea in less than five minutes following oviposition (green turtles normally take approximately 50 minutes for these behaviors; Hirth and Samson, 1987). We know of no studies that attribute an abbreviation of nesting behavior to the effects of stationary lighting near nesting beaches.

DISRUPTION OF SEA-FINDING

After a sea turtle has camouflaged her nest, she must orient toward the sea and return there. Experiments with blindfolded green turtles that had finished nest-

ing (Ehrenfeld and Carr, 1967; Ehrenfeld, 1968), experiments with blindfolded immature green turtles (Caldwell and Caldwell, 1962), and observations of orientation in nesting leatherbacks (Mrosovsky and Shettleworth, 1975) all indicate that these turtles rely on vision to find the sea. The blindfolding experiments allowed Ehrenfeld (1968) to determine how the light reaching each eye of an adult turtle influenced the direction it would turn and which way it would travel relative to the sea. The mechanism for this phototropotaxis—literally, turning and movement with respect to light—seemed to match the way that other, much simpler, organisms orient toward light. In essence, the turtles appeared to turn so that perceived light intensity was balanced between their eyes, a balance that seemed to guarantee orientation in the brightest direction.

Given an adult turtle's reliance on brightness for correct seaward orientation, it is not surprising that this sea-finding behavior is disrupted by artificial lighting. However, it is surprising how rarely this occurs. Turtles attempting to return to the sea after nesting are not misdirected nearly as often as are hatchlings emerging on the same beaches. In the lighted-beach experiments described by Witherington (1992a), few nesting turtles returning to the sea were misdirected by lighting; however, those that were (four green turtles and one loggerhead) apparently spent a large portion of the night wandering in search of the ocean.

Because misdirected nesting turtles may not be able to re-enter the ocean because of topography and obstacles, disruption of sea-finding may mean much more to nesting turtles than simple delay. At Jumby Bay, Antigua, a hawksbill that had nested was found far from the beach and crawling toward distant security lighting (C. Ryder, personal communication). At Hutchinson Island, Florida, adult loggerheads have left the beach and been found crawling toward parking-lot lighting near a busy highway or floundering in shallow ponds near condominium lighting (REM, personal observation). At Melbourne Beach, Florida, a green turtle wandered off the beach in the direction of mercury-vapor lighting and was found in a roadside parking lot (BEW, personal observation). Observers believed that none of these turtles would have been able to return to the sea without assistance. At Patrick Air Force Base, Florida, assistance came too late for a nesting loggerhead that had wandered toward a high-pressure sodium-vapor floodlight and onto a nearby highway, where it was struck and killed by a passing car (S. Johnson, personal communication).

LOW-PRESSURE SODIUM-VAPOR (LPS) LUMINAIRES

Low-pressure sodium-vapor (LPS) lighting emits a pure (single-wavelength or monochromatic) yellow light that seems to affect nesting turtles less than light from other sources, at least in loggerheads and green turtles (Witherington, 1992a). Light from LPS sources may appear dim or as an innocuous color to nesting sea turtles. If light levels do in fact determine the timing of nesting, then the yellow light from LPS may not provide the same stimulus that daylight does in deterring nesting behavior.

Although no direct effect of LPS lighting on nesting is apparent, indirect effects cannot be ruled out. For instance, even if LPS lighting were ignored by turtles, its light could indirectly increase human activity on the beach, which could interfere with nesting. Turtles nesting in lighted areas may be more conspicuous and therefore may be more likely to be approached by people visiting the beach. This lighting, in turn, may make people more conspicuous to turtles. People moving on the beach within sight of a loggerhead or green turtle that has not yet deposited her eggs will cause her to abandon the nesting attempt in most instances (BEW, unpublished data).

Hatchling Sea Turtle Orientation

THE ACT OF SEA-FINDING

One of the most critical acts a sea turtle must perform takes place immediately after it views the world for the first time as a hatchling. Approximately one to seven days after hatching from eggs beneath the sand (Demmer, 1981; Christens, 1990), hatchlings emerge from their nest *en masse* and orient toward the sea without delay. This emergence of hatchlings and subsequent sea-finding takes place principally at night (Hendrickson, 1958; Carr and Hirth, 1961; Bustard, 1967; Neville *et al.*, 1988; Witherington *et al.*, 1990), although some early-morning (Chavez *et al.*, 1968) and late-afternoon (Witzell and Banner, 1980) emergences have been reported. Loggerhead hatchlings in Florida emerge between dusk and dawn, with a peak emergence time near midnight (Witherington *et al.*, 1990; Figure 3).

Under natural conditions, hatchling sea turtles that have just emerged from the sand crawl in a frenzy directly from nest to sea. The zeal characterizing this seaward crawl is justified given the consequences of delay—death. Hatchlings that are physically kept from the sea or that have their sea-finding disrupted by unnatural stimuli often die from exhaustion, dehydration, predation, and other causes

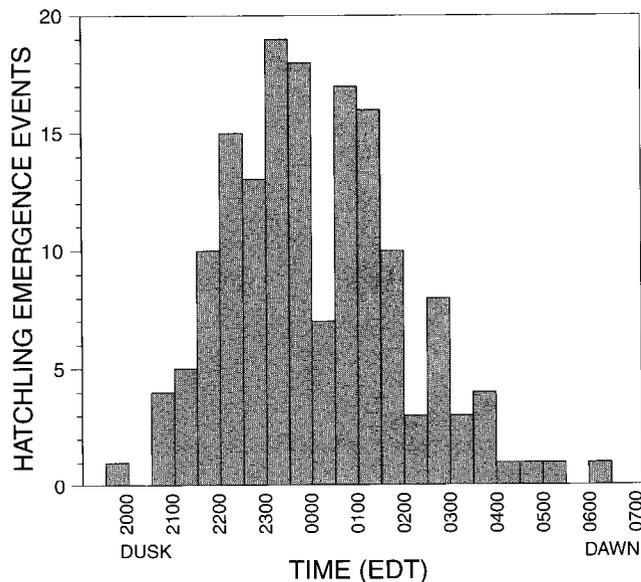


Figure 3. The timing of 157 loggerhead hatchling emergence events from natural nests at Melbourne Beach, Florida, between 29 July and 1 September 1988. An emergence event was defined as the movement of 10 or more hatchlings from nest to sea. Data are from Witherington et al. (1990).

(McFarlane, 1963; Philibosian, 1976; Hayes and Ireland, 1978; Mann, 1978).

HOW HATCHLINGS RECOGNIZE THE OCEAN

The first authors to study the sea-finding behavior of sea turtle hatchlings focused on associations between observed behavior and potential environmental cues (Hooker, 1907, 1908a, b) and later verified which of a hatchling's senses were necessary for sea-finding (Hooker, 1911; Parker, 1922; Daniel and Smith, 1947a, b; Carr and Ogren, 1960). A major conclusion of these early studies was that hatchlings rely almost exclusively on vision to recognize the sea. There are a number of supporting observations:

1. Hatchlings with both eyes blindfolded circle or remain inactive and seem to be unable to orient directly to the sea (Daniel and Smith, 1947a; Carr and Ogren, 1960; Mrosovsky and Shettleworth, 1968, 1974; Mrosovsky, 1977; Rhijn, 1979).
2. Visual stimuli such as light shields (Hooker, 1911; Parker, 1922; Carr and Ogren, 1959, 1960; Mrosovsky and Shettleworth, 1968, 1975) and artificial lighting (Daniel and Smith, 1947a; Hendrickson, 1958; McFarlane, 1963; Mann, 1978) greatly interfere with hatchling sea-finding performance.
3. Placing hatchlings where the ocean horizon cannot be seen but where other, nonvisual, cues should be detectable typically prevents seaward orientation

(Hooker, 1908b; Daniel and Smith, 1947a; Carr and Ogren, 1960; Carr et al., 1966; Mrosovsky, 1970).

Although studies suggest that hatchlings may be able to respond to beach slope, nonvisual cues such as this appear to have a small influence on directional movement and probably do not come into play when light cues are available (Rhijn, 1979; Salmon et al., 1992).

BRIGHTNESS CUES

A great deal of evidence suggests that brightness is an important cue used by hatchlings in search of the ocean. Hatchlings move toward bright artificial light sources in both laboratory and field settings (Daniel and Smith, 1947a; Hendrickson, 1958; Mrosovsky and Shettleworth, 1968) and toward reflective objects on the beach (Carr, 1962).

The role of brightness in sea-finding has two basic issues. The first issue is the mechanism by which hatchlings use their eyes and brain to point themselves in the brightest direction—how they turn toward brightness. The second issue is a model that describes the properties of brightness that are important to a hatchling—how we might predict where a hatchling will go.

TURNING TOWARD BRIGHTNESS

Two mechanisms have been proposed to explain how hatchling sea turtles turn toward the brightest direction. Evidence for the first mechanism comes from experiments that have capitalized on the odd turning or "circus movements" made by hatchlings that are partially blindfolded (Mrosovsky and Shettleworth, 1968). In this mechanism, hatchlings are described as having many light-intensity comparators within each eye that would give hatchlings a way to compare the light intensity reaching them from different directions. Thus, if the comparator aimed posteriorly within the left eye of a hatchling (a comparator that would be near the nasal margin of the curved retina of the left eye) detects the brightest input of light, the hatchling would "know" to turn left in order to orient in the brightest direction. Similarly, after turning toward the brightness until the light-intensity inputs between the eyes are balanced, the hatchling would "know" that it has reached an orientation in the brightest direction. This mechanism has been called a complex phototropotaxis system (Mrosovsky and Kingsmill, 1985)—complex refers to the many comparators involved and phototropotaxis (*photos* = light, *tropos* = a turning, *tasso* = to arrange) refers to a turning and movement toward light.

In a second mechanism that has been proposed,

hatchlings are described as having an integrated array or "raster system" of light sensors within both eyes that would allow a hatchling to instantaneously interpret the brightest direction. Rather than sensing detail, this hypothesized raster system would integrate a measure of brightness over a broad area. This mechanism is referred to as a telotaxis system (Verheijen and Wildschut, 1973; Mrosovsky and Shettleworth, 1974; Mrosovsky *et al.*, 1979)—telotaxis (*telopos* = seen from afar, *tasso* = to arrange) refers to a fixation on and movement toward a target stimulus.

Unfortunately, the differences in these proposed mechanisms are too subtle to allow them to be separated by the experimental evidence at hand. The more "complex" a phototropotaxis mechanism becomes, the more it functionally resembles a telotaxis mechanism (Schöne, 1984). The actual visual-neural system that hatchlings use to turn toward the brightest direction and maintain that orientation may incorporate aspects of each of the proposed mechanisms.

A MODEL FOR MEASURING BRIGHTNESS

To determine the brightest direction, hatchlings must be able to "measure" brightness. Knowing the properties of the "brightness detector" used in this measurement is essential to our understanding a hatchling's response to its world. Although simplistic, modeling hatchlings as biological brightness-detectors is a useful way to introduce the properties of light that most affect hatchling orientation.

Spectral properties of the brightness detector.—The spectral properties of a detector—or an eye—reveal its sensitivity to different wavelengths of light. In bright light, we see different wavelengths and combinations of wavelengths as color. However, independent of color, some wavelengths appear brighter to us than others, just as there are some wavelengths we cannot see.

The term "brightness" is often used in the sea turtle orientation literature and generally refers to the intensity and wavelength(s) of light relative to the spectral sensitivity of an individual (Ehrenfeld and Carr, 1967; Mrosovsky, 1972; Rhijn, 1979; Mrosovsky and Kingsmill, 1985). Brightness is undoubtedly in the eye of the beholder. The different-colored photopigments and oil droplets within the retina of a sea turtle's eye (Granda and Haden, 1970; Liebman and Granda, 1971; Granda and Dvorak, 1977) provide a unique set of conditions that influence how sea turtles make their determination of brightness.

Researchers have learned much about sea turtles' perception of brightness by using a procedure

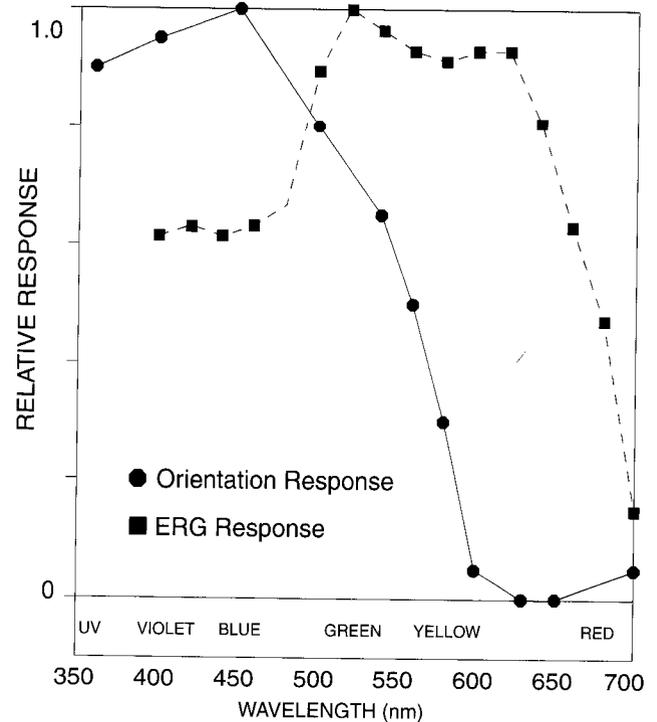


Figure 4. A comparison of the orientation and physiological (ERG) responses of green turtle hatchlings to colored light. The orientation response curve shows how attractive the light is to green turtle hatchlings, and the ERG response curve gives an approximation of how bright the light appears to them. Orientation data are from Witherington (1992b), and ERG data are adapted from Granda and O'Shea (1972). Figure adapted from Witherington (in press); used with permission.

called electroretinography (ERG) to measure the relative electrical potential across retinas of turtles exposed to different potential wavelengths of light. ERG data show that green turtles are most sensitive to light in the violet to orange region of the visible spectrum, from 400 to 640 nm (Figure 4; Granda and O'Shea, 1972). In daylight, green turtles show a greater spectral sensitivity within the shorter-wavelength (blue) region of the spectrum than humans do.

Although ERG data provide important physiological information, the most direct way to determine the effects of spectral light on orientation is to conduct behavioral experiments. The earliest studies on hatchlings' responses to light wavelength employed broad-band (multiple-wavelength-transmission) filters to vary the wavelengths that reached orienting hatchlings (Mrosovsky and Carr, 1967; Mrosovsky and Shettleworth, 1968). Although reactions to specific wavelengths could not be determined, it was clear that the green turtle hatchlings studied were more attracted to blue light than to red light.

In later experiments, researchers used narrow-

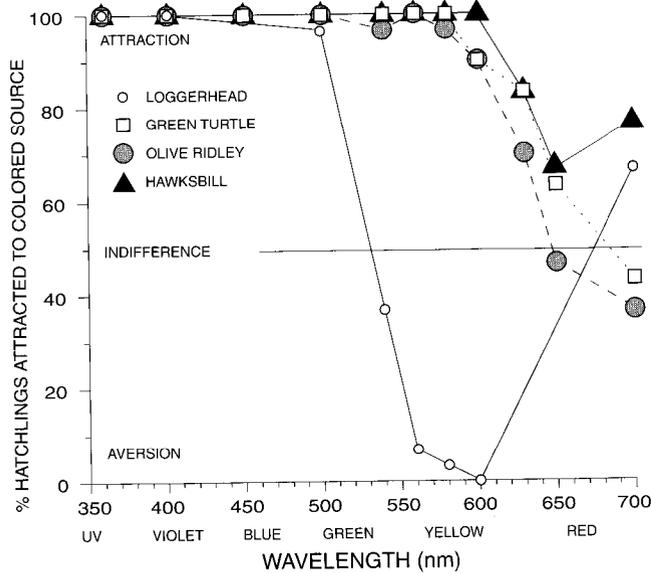


Figure 5. Orientation responses of four species of sea turtle hatchlings to colored light sources. Responses were measured as the proportion of hatchlings that chose a window lighted with a colored light source over a similar but darkened window (Witherington, 1992b). The loggerhead differed from the other species in that it showed an aversion to light in the yellow region of the spectrum. Figure adapted from Witherington (in press) and Lohmann et al. (in press); used with permission.

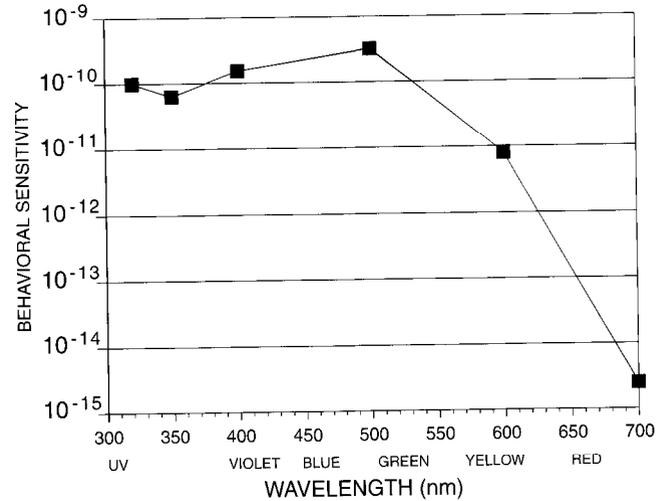


Figure 6. Behavioral sensitivity of loggerhead hatchlings to low-intensity colored light, represented as the inverse of the light-source radiance required to evoke significantly directed orientation in groups of hatchlings ($n = 30$ per wavelength). At the low light levels represented here (approximately the radiance of the sky on a full-moon night, and dimmer), there was orientation toward the light source at all wavelengths. The ordinate is a log scale of the units (photons/s/m²/sr)⁻¹. Data are from Witherington (1992b). Figure adapted from Witherington (in press) and Lohmann et al. (in press); used with permission.

band (monochromatic) filters to vary the wavelengths reaching loggerhead, green turtle, hawksbill, and olive ridley hatchlings (Witherington and Bjornstad, 1991a; Witherington, 1992b). The use of monochromatic filters allowed a simple measure of light intensity so that researchers could determine the responses of hatchlings to a set number of photons at each of several wavelengths. As in previous experiments, hatchlings showed a preference for short-wavelength light. Green turtles, hawksbills, and olive ridleys were most strongly attracted to light in the near-ultraviolet to yellow region of the spectrum and were weakly attracted to or indifferent to orange and red light (Figure 5). Loggerheads were most strongly attracted to light in the near-ultraviolet to green region and showed an unexpected response to light in the yellow region of the spectrum. At intensities of yellow light comparable to a full moon or a dawn sky, loggerhead hatchlings showed an aversion response to yellow light sources (Figure 5), but at low, nighttime intensities, loggerheads were weakly attracted to yellow light (Figure 6). It may be that the hatchlings cannot discriminate color at low light levels. This is common for animals (such as turtles) that have rod-and-cone retinas (Granda and Dvorak, 1977).

It should come as no surprise that humans and

sea turtle hatchlings see the world differently. For most of their lives, sea turtles see the world through a blue ocean filter (water selectively absorbs reddish, long-wavelength light), so it makes sense that sea turtles would be most sensitive to short-wavelength light.

Because sea turtle hatchlings respond to light that we cannot see (ultraviolet light) and are only weakly sensitive to light that we see well (red light), instruments that quantify light from a human perspective (such as most light meters) cannot accurately gauge brightness from the perspective of a sea turtle. Humans also cannot assess color exactly as a sea turtle would. Although we can see colors, we cannot tell what assortment of wavelengths may make up those colors. For example, a light source emitting both 525-nm (green) and 645-nm (red) light, a source highly attractive to hatchlings, appears to a human observer to emit yellow light comparable to a 588-nm monochromatic source, which would be only weakly attractive to hatchlings (Rossotti, 1983).

Directional properties of the brightness detector.—Just as a hatchling's detector has a sensitivity to specific light wavelengths, it is also sensitive to light direction. The directional properties of a detector determine how much of the world the detector measures

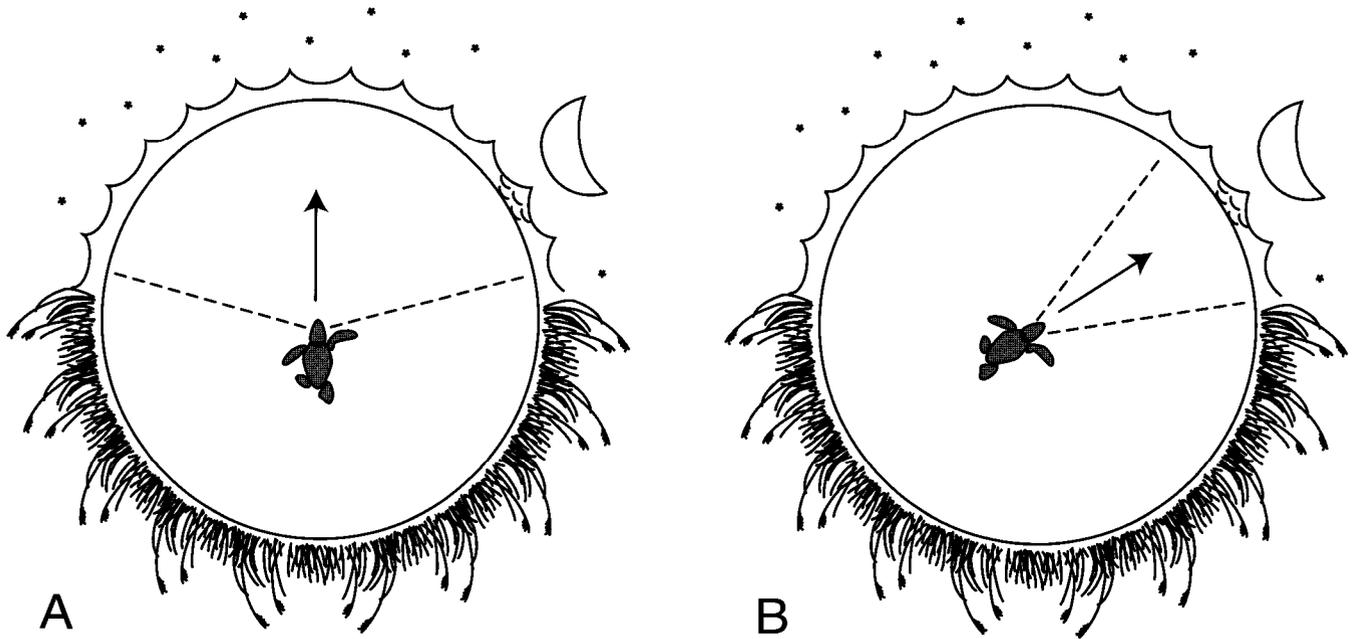


Figure 7. The consequences of measuring the brightest direction with a wide (A) or a narrow (B) angle of acceptance. Hatchlings A and B both orient toward the center of the brightest portion of the horizon within their angle of acceptance (shown by dotted lines). Hatchling B's path to the water would be considerably longer. Figure adapted from Witherington (in press); used with permission.

at any one instant. These properties are described by a specific "cone of acceptance" or by bidimensional (horizontal and vertical) "angles of acceptance." The height and breadth of a detector's acceptance cone critically influences brightness measurements and the determination of brightest direction (Figure 7). This conceptual acceptance cone may be only a portion of a turtle's complete field of view.

The horizontal component of the acceptance cone for green turtle and olive ridley hatchlings (Verheijen and Wildschut, 1973) and for loggerhead hatchlings (Witherington, 1992b) has been deduced from the way that hatchlings orient in controlled light fields. In these studies, light fields were artificially controlled so that detectors with different acceptance-cone widths measured different brightest directions. Hatchlings of each species typically oriented in the brightest direction as it would be measured with a wide acceptance cone, approximately 180° horizontally.

To determine the vertical component of the acceptance cone, the researchers cited above measured the orientation of hatchlings presented light sources that were positioned at various vertical angles. The angular height of this vertical component was approximated to be "a few degrees" for green turtles and olive ridleys (Verheijen and Wildschut, 1973) and between 10° below and 30° above the horizon for loggerheads (Salmon and Wyneken, 1990;

Witherington, 1992b). Although the measures are approximate, it is clear that light closest to the horizon plays the greatest role in determining orientation direction.

The detector model for hatchling orientation predicts that hatchlings measure brightest direction by integrating the light they detect over a broad and flat acceptance cone (Figure 8). Again, we see that the attributes of this hypothetical detector differ from those of most light meters. The most commonly found light meters, illuminance meters, measure light with an acceptance cone that is less flattened and not as wide as the acceptance cone that hatchlings use. Another type of light meter, a luminance or "spot" meter, measures light with a very narrow acceptance cone. Careful consideration should be given to the directional attributes of a light-measuring instrument if its measurements are to be used in predicting hatchling behavior.

COLOR CUES

In addition to brightness cues, color may also influence the direction that a hatchling orients. Color discrimination (the ability to identify colored light) is different from spectral sensitivity. An animal may be able to detect many light wavelengths that it cannot tell apart. The fact that sea turtles have cones in their retinas is not sufficient evidence that sea turtles see color; however, some behavioral evidence can be

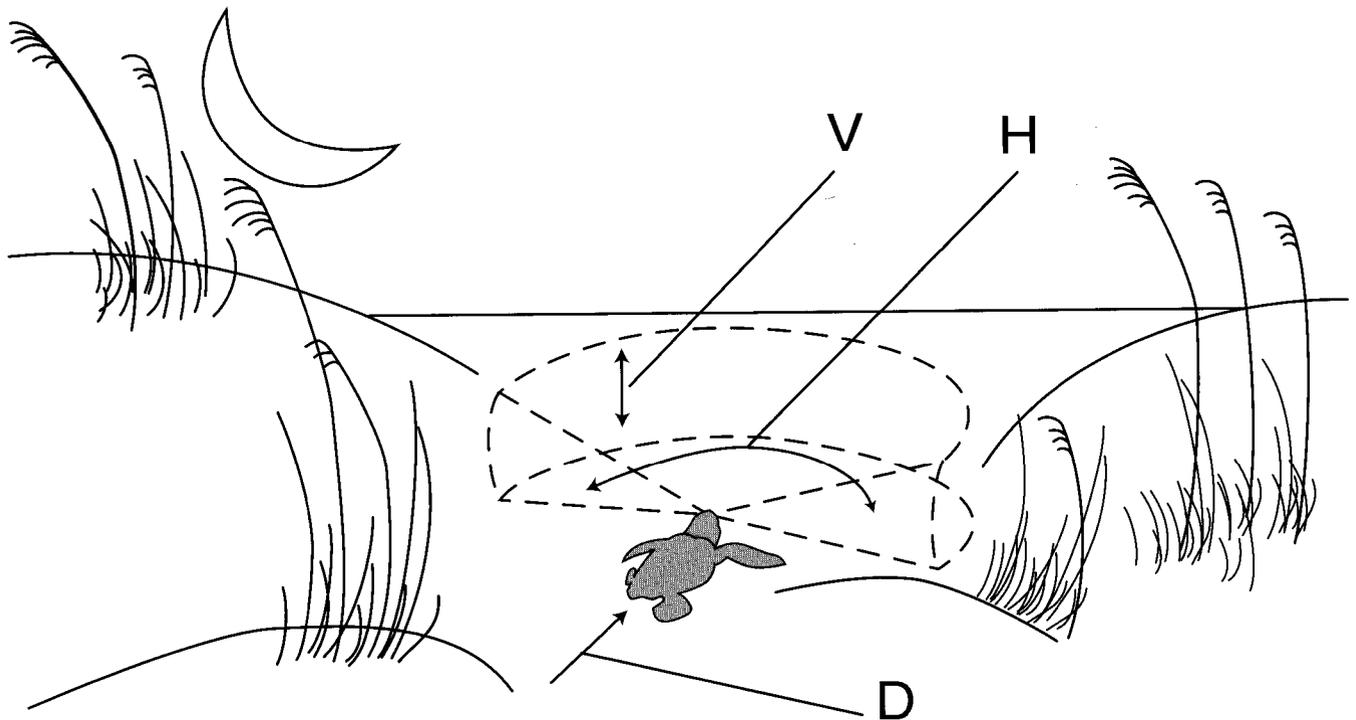


Figure 8. A hypothetical cone of acceptance that describes how a sea turtle hatchling measures the brightest direction. The vertical component of the cone (V) is approximately 10° – 30° from the horizon, and the horizontal component of the cone (H) is approximately 180° . Light within this cone of acceptance is integrated into an assessment of brightness for the direction D. This description is based on data from studies of green turtles, olive ridleys, and loggerheads (Verheijen and Wildschut, 1973; Witherington, 1992b). Figure adapted from Witherington (in press); used with permission.

convincing. Currently, there is some behavioral evidence that sea turtles can see color and that color may play some limited role in sea-finding.

In one of the first published discussions of sea-finding cues in hatchlings, Hooker (1911) suggested that the blue of the ocean itself may provide an attraction. The evidence used to test this hypothesis should be weighed carefully. Green turtle hatchlings do tend to prefer directions illuminated with blue light over directions illuminated with red light (Mrosovsky, 1972), but is this truly a color choice? Do hatchlings prefer the color blue, or are they simply selecting the brightest direction as determined by a detector that is most sensitive to blue wavelengths? The answer may be that both are true.

Conditioning experiments have shown that loggerheads do have some ability to discriminate among colors (Fehring, 1972). Whether loggerheads can and do use this ability in sea-finding, however, can best be determined by comparing the wavelengths a hatchling can detect best (as might be measured with ERG) with the wavelengths a hatchling prefers in orientation experiments. ERG data for the green turtle show that red light must be approxi-

mately 100 times more intense than blue light for the two colors to elicit a similar magnitude of response at the retina (Granda and O'Shea, 1972). Yet in a series of behavioral experiments using broad-band colors, Mrosovsky (1972) found that red light had to be approximately 600 times more intense than blue light in order for green turtle hatchlings to show an equal preference for the two colors. Such a bias against long-wavelength light was also demonstrated by behavioral studies in which monochromatic light was used (Figure 4; Witherington and Bjorndal, 1991a). In this study, the greatest disparity between ERG response and color preference was found in the yellow-orange region of the spectrum, near 600 nm. Although it is apparent that green turtles see yellow light well, light of this color is relatively unattractive to orienting hatchlings.

Although no ERG data currently exist for the loggerhead, the way that loggerhead hatchlings behave toward some colored light sources indicates that they too may use color cues in sea-finding. The aversion to yellow light, or xanthophobia, that loggerhead hatchlings show sets them apart from other sea turtle species. Loggerhead hatchlings are weakly attracted

to low-intensity yellow light sources but show an aversion to higher-intensity yellow light. Similar increases in the light intensity of near-ultraviolet, violet, and green light sources do not elicit a change in response from attraction to aversion, which indicates that the aversion to yellow light is related to color rather than brightness. Additional experiments with loggerheads have shown an interesting relationship between attraction to short-wavelength light and aversion to yellow light: the two responses appear to be additive. In evidence of this, Witherington (1992b) showed that adding high-intensity yellow light to an otherwise attractive light source (thereby making the light source brighter) will decrease its attractiveness to loggerhead hatchlings.

There is no empirical evidence to suggest why both loggerhead and green turtle hatchlings show little or no attraction to sources that are rich in yellow light. One hypothesis is that by reducing their attraction to yellow-rich light sources, hatchlings can avoid being misdirected by the sun or the moon. Because the rising or setting sun or moon lies within a hatchling's vertically flat acceptance cone, these celestial sources have the potential to affect hatchling orientation to some degree. However, a universal characteristic of celestial light sources is that they become yellower and redder when they are near the horizon (a sunset appears yellowish red because the blue light from the sun at dusk is attenuated by the thickness of the atmosphere that the light must pass through to reach an observer). Actually, some controversy exists as to whether the rising sun does affect sea-finding in hatchlings. Whereas Parker (1922), Ehrenfeld and Carr (1967), and Rhijn (1979) reported that loggerheads, green turtles, and hawksbill turtles are affected insignificantly by the sun on the horizon, Mrosovsky (1970), Mrosovsky and Kingsmill (1985), and Witherington (1992b) reported that loggerhead, green, and hawksbill turtles are affected. By all accounts, given its brightness, the effects of the sun on hatchling orientation seem small.

SHAPE CUES

Many authors have suggested that the patterns of light and shadow associated with visible shapes help sea turtle hatchlings find the sea. On beaches, hatchlings tend to orient toward "open areas" and "open horizons" and away from "silhouetted horizons," "dune profile," and "vegetation" (Hooker, 1911; Parker, 1922; Mrosovsky and Shettleworth, 1968; Limpus, 1971; Salmon *et al.*, 1992, 1995b).

Hatchling sea turtles' response to shape cues has been studied less extensively than their response to brightness has. To be sure, there is some debate as to

how well hatchlings on a beach can discriminate shape. Based upon the optical characteristics of a sea turtle's eye, one would expect them to see most clearly in sea water and to be relatively myopic on land (Ehrenfeld and Koch, 1967). But because hatchling eyes are small and their depth-of-focus is large, hatchlings may be able to distinguish shape well (Northmore and Granda, 1982). The most recent evidence from laboratory studies suggests that sea turtle eyes may be able to distinguish shape well enough to resolve individual stars in the sky (Northmore and Granda, 1991).

Both Limpus (1971) and Salmon *et al.* (1992) have presented convincing evidence that loggerhead and green turtle hatchlings tend to orient away from silhouettes. On most beaches this tendency would direct hatchlings away from the profile of the dune and toward the ocean. But do hatchlings respond to the shape of the dune itself or to the way the dune influences the brightest direction? By their nature, dune silhouettes darken the horizon and would be expected to influence brightest direction as hatchlings measure it. Although some effects of shape and silhouette may be independent of brightness, isolating these effects is not a straightforward process. In fact, our confidence in distinguishing shape-cue orientation from brightness-cue orientation should be only as great as our confidence in our ability to measure brightness as hatchlings do.

Determining the specific roles of shape and brightness in hatchling orientation has been attempted in cue-conflict studies. In these studies, both green turtle (Rhijn and Gorkom, 1983) and loggerhead (Witherington, 1992b, c) hatchlings tended to orient away from sets of alternating black and white stripes and toward a uniformly illuminated direction, even when the striped direction was brightest. Orientation away from a horizon that has spatial patterns of light and shadow (*i.e.*, shapes) could assist sea-finding by directing hatchlings away from the structure associated with the dune (*e.g.*, vegetation) and toward the comparatively flat and featureless ocean. However, the demonstration that hatchlings can orient with respect to shape cues does not necessarily mean that hatchlings require them for sea-finding.

The necessity of shape cues for sea-finding has been studied by depriving hatchlings of form vision (*i.e.*, the ability to discern shape). Mrosovsky and Kingsmill (1985) disrupted the form vision of loggerhead hatchlings by fitting them with waxpaper goggles and concluded that because the animals still oriented seaward, shape was not a primary cue in sea-finding. In a similar test, Witherington (1992b) placed

loggerhead hatchlings within transparent cylinders that were covered with either waxpaper or nothing at all. These hatchlings were observed as they attempted sea-finding under what might be considered "challenging" conditions—at moonset on an east-facing beach. Under these conditions, hatchlings with a clear view of their surroundings oriented seaward, whereas hatchlings having their form vision disrupted by waxpaper oriented in the general direction of the setting moon.

OTHER LIGHT CUES

In addition to intensity, wavelength, shape, and direction, light can also vary in time (have a certain periodicity) and in both space and time (display motion) and can have a unique composition of polarized light. Motion has not yet been explored as a potential sea-finding cue. Periodicity has been examined and has been found to have some influence on hatchling orientation, but only as it relates to a brightness measure. Evidence for this comes from a study in which green turtle hatchlings preferred a constant light source over a flashing one only when the off-time of the flashing source was very long (Mrosovsky, 1978). This implies that hatchlings may integrate their measures of brightness over time.

Because water tends to polarize the light reflected from it, richness of polarized light has the potential to indicate the ocean direction. However, the experiments in which hatchlings viewed their world through waxpaper but maintained a seaward orientation showed that hatchlings depend little, if at all, on polarity cues (Mrosovsky and Kingsmill, 1985). Waxpaper, in addition to obliterating form, would have also depolarized the light that hatchlings saw. Additional laboratory evidence shows that at least among loggerhead hatchlings, there is no orientation preference between sources that are polarized or unpolarized or that have different directions of polarity (e-vector direction; Witherington, 1992b).

WHEN CUES CONFLICT

Brightness cues, shape cues, and color cues (under high-illumination only) all provide information to orienting sea turtle hatchlings. Because a hatchling's environment is complex and variable, having a compound set of cues to guide even the simplest of tasks makes sense. Any single cue by itself could, under some conditions, be misleading. But do conflicting cues present a real problem in nature, and if so, how do hatchlings balance the information from these cues in order to make a correct orientation decision?

In nature, cues do conflict. Brightness measurements made on nesting beaches where hatchlings

orient to the sea show that the seaward direction is often brightest, but sometimes it is not (Rhijn, 1979; Wibbles, 1984; Witherington, 1992b). Measurements made under various conditions show that although the ocean is brightest on clear, moonless nights, the direction of the moon is brightest near moonrise and moonset (Witherington, 1992b).

Although it is not completely clear how hatchlings balance the information from conflicting orientation cues, experimental evidence indicates that this balance may be based upon the comparative strengths of the cues. In the cue-conflict experiments discussed earlier, influences of both brightest direction and shape were seen in some cases (Witherington, 1992b). Hatchlings tended to orient away from contrasting stripes even when the striped direction was twice the brightness of the uniformly lighted direction. But, when the striped direction was made three times brighter than the opposing direction, hatchling orientation became undirected, and when the striped direction was five times brighter, most hatchlings oriented toward the stripes. It seems then that orientation either away from contrasting shapes, irrespective of brightest direction, or toward the brightest direction, irrespective of contrasting shapes, depends on how strong the brightest direction happens to be. This strength of the brightest direction is known as "directivity." As the directivity of the light field a hatchling sees increases, the brightest direction becomes more pronounced, less ambiguous perhaps, and seemingly a greater orientation stimulus.

Are shape cues more important than brightness cues to orienting hatchlings? To answer this question, researchers will need to measure and compare the strengths of the two types of cues. At present, there is no common unit of measurement that can be used in making a comparison. For now, we can say that both shape cues and brightness cues are important for correct seaward orientation in a variably lighted world.

DISRUPTION OF SEA-FINDING

OBSERVATIONS OF SEA-FINDING DISRUPTION
Accounts of sea-finding disruption presented in the literature do not properly represent the vast extent of the problem. Only the most conspicuous cases are observed and reported, such as when hatchlings have been crushed on roadways (McFarlane, 1963; Philibosian, 1976; Peters and Verhoeven, 1994; REM and BEW, personal observations), burned to death in the flames of an abandoned fire (Mortimer, 1979), or led onto the playing field of a baseball game in progress (Philibosian, 1976). More often than not,

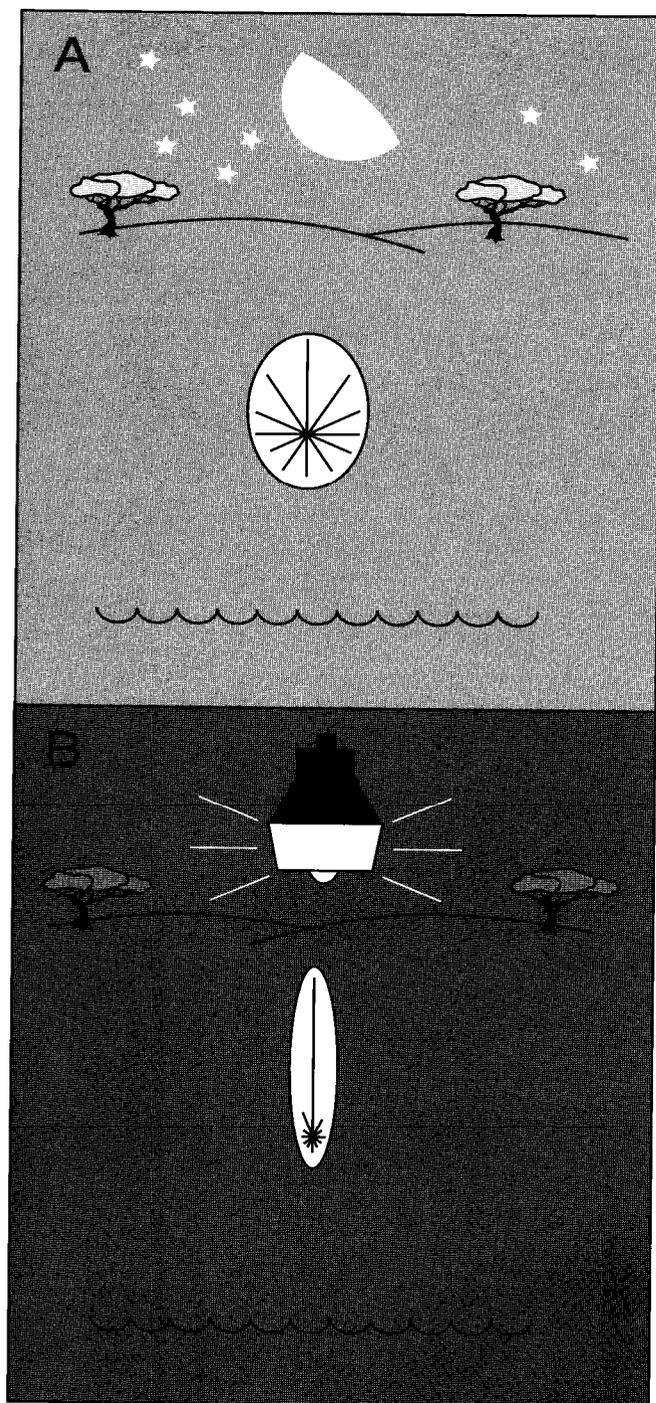


Figure 9. The directional brightness of a natural light field (A, one dominated by celestial sources) and an artificial light field (B, one dominated by a lighted luminaire) from the perspective of an observer on a beach. The length of each radiating line is proportional to the brightness of the direction. In the natural light field, the moon is conspicuous as a bright source, but it also illuminates the sky, water, and other objects. In the artificial light field, a glaring luminaire appears bright because of its closeness to the observer but does not provide enough light to illuminate other features. The luminaire produces a highly directed light field that has an overwhelming brightness in one direction.

“lost” hatchlings are preyed upon by beach crabs or shorebirds or become exhausted and dehydrated deep in nearby dune vegetation (REM and BEW, personal observations). The discovery of hundreds of dead loggerhead hatchlings beneath a mercury-vapor light at Melbourne Beach, Florida, serves as one example that indicates the cryptic nature of the problem (L. M. Ehrhart, personal communication). The number of hatchlings found in this case indicated that the light had been left on and had attracted hatchlings over many nights. As is often the case, the discovery of the pile of dried hatchlings came as a complete surprise to the caretaker of the property.

MISORIENTATION AND DISORIENTATION

Newly emerged sea turtle hatchlings crawl almost incessantly. For the most part, the effect of artificial lighting on hatchling behavior is not to alter latency, frequency, duration, or intensity of crawling, but rather to alter its efficacy—hatchlings on artificially lighted beaches tend to crawl in the wrong direction.

Hatchlings that are oriented away from the most direct ocean path are said to be “misoriented.” Hatchlings on lighted beaches are frequently misoriented, sometimes as entire groups. These groups of hatchlings leave relatively straight tracks that often stream across the beach parallel to the surf line toward an artificial light source.

Hatchlings that are “unsure” about orientation direction demonstrate their uncertainty by frequently changing direction and circling. Hatchlings lacking directed orientation are said to be “disoriented.” Similar “orientation circles” are also seen in hatchlings that have been blindfolded (Mrosovsky and Shettleworth, 1968) or placed in complete darkness (except for an infrared observation source; BEW, personal observation). Hatchlings often become disoriented by overhead light sources. Frequently, hatchlings that are misoriented toward an artificial light source become disoriented as they reach the source. Hatchlings also appear to become disoriented when they reach boundaries between artificially lighted areas and shadows on the beach. Turtles in this predicament exit the shadows toward the lighted beach sand, become exposed to the light from the artificial source itself, move toward the light source into the shadow, and may repeat this cycle until they become exhausted. This often explains the curious circling tracks that observers find in the center of the beach berm, away from any overhead light source.

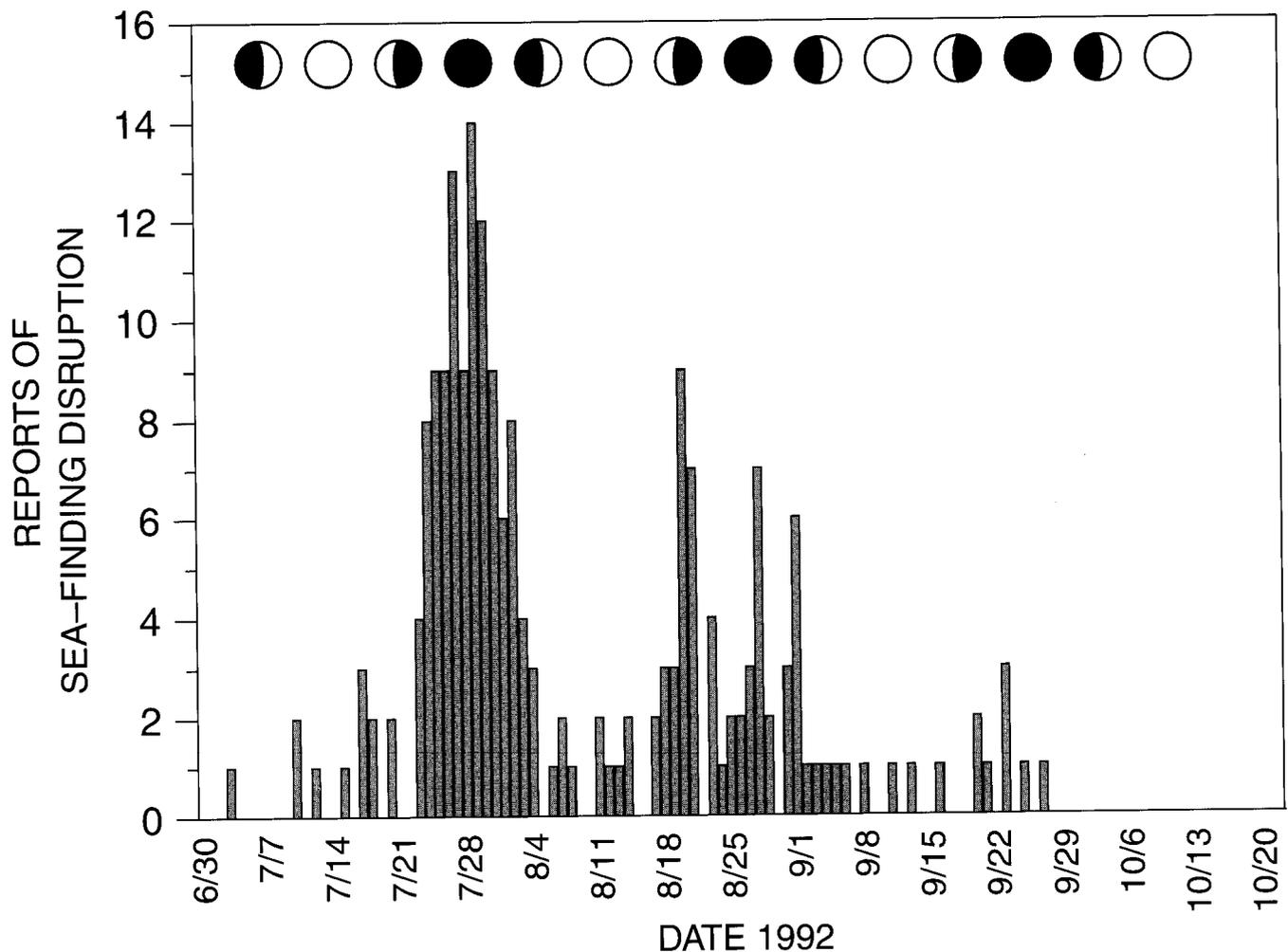


Figure 10. The timing of 201 reported cases of hatchling disorientation on Florida beaches in 1992. The circles above histogram bars show moon phase. Most cases occurred on nights on or near the new moon. The decrease in cases in September and October probably represent reduced survey efforts at the end of the nesting season. Data are from Salmon and Witherington (1995).

DIFFERENCES BETWEEN NATURAL AND ARTIFICIAL LIGHTING

Why are sea turtle hatchlings misdirected to such an extent by artificial lighting? Given the importance of light cues to hatchlings, the intuitive answer to this question is that light from artificial sources interferes with the "natural" light cues that hatchlings depend upon to orient seaward. Although hatchlings may possess a marvelous sea-finding mechanism that functions under almost any set of natural lighting conditions, this mechanism is rendered ineffective on an artificially lighted beach. But why does artificial lighting have a far greater effect on orientation than bright celestial light sources like the sun or moon do? Much of the answer to this can be found in the differences between artificial light fields and celestial light fields.

A light field is produced by a light source (or

sources) but is measured from the perspective of an observer. In essence, it is a directional picture of all the light an observer can detect. An important characteristic of light fields produced by celestial sources is that they are only moderately directed (Figure 9), which means that although there may be only one brightest direction, this direction is not tremendously brighter than other, competing, directions. These natural light fields are moderated because both the observer and the illuminated features that the observer can see are a similar distance from the light source(s). Celestial light has a distant origin and reaches an observer not only directly but also indirectly as it is scattered in the atmosphere and reflected from the features on the Earth's surface (other competing directions). As a result, an observer experiencing a celestial light field can see brightness from many directions.

Artificial light fields are produced by sources that are less intense than celestial sources, although they can appear very bright to an observer close to the light source (Verheijen, 1958, 1978). Other features that could contribute to the brightness of the light field (sky, clouds, landscapes, *etc.*) are relatively distant and the light reflected from them is dim when compared to the brightness of the source. Consequently, an observer near an artificial light source experiences a highly directed light field that is overwhelmingly dominated by the light source. For a hatchling near a lighted luminaire on a beach, the overwhelming brightness of the light source provides a "supernormal stimulus" that overrides tendencies to orient to other visual cues.

EFFECTS OF MOON PHASE AND MOONLIGHT

Some of the myths regarding the moon's effect on hatchling emergence and sea-finding can be dispelled here. For the most part, hatchling sea turtles do not emerge from nests according to a lunar cycle. The date of emergence is determined by the date eggs were deposited in the nest and the length of the incubation period. Although nesting cycles correlated with specific moon phases have been detected in olive ridleys (Cornelius, 1986) and to a lesser extent in loggerheads (Burney *et al.*, 1991), the timing of these cycles allows for hatchling emergence during all phases of the moon. Because hatchlings may emerge when no moon is visible, they must not depend on the moon to lead them seaward. Perceptions that hatchlings emerge only during the full moon and are led seaward by its light probably originated because hatchlings are most readily observed on bright, full-moon nights.

The light of the moon does, however, have an apparent effect on the degree of sea-finding disruption caused by artificial lighting. Reports of hatchling disorientation events (including misorientation and disorientation) in Florida are most common on nights surrounding the new moon (Figure 10; Salmon and Witherington, 1995). Compared to darker nights, moonlit nights have higher levels of ambient light that may lessen the relative contribution of artificial light sources to the light fields that hatch-

lings perceive. By reducing light-field directivity, moonlight may allow hatchlings to rely on shape cues that correctly reveal the seaward direction.

SWIMMING ORIENTATION

A hatchling's best chance to survive its first few hours is to escape from the beach and swim directly out to sea, away from the predator-rich waters near the shore (Frick, 1976; Ireland *et al.*, 1978; Salmon and Wyneken, 1987; Witherington and Salmon, 1992). In the open ocean, hatchlings can conserve energy by remaining inactive, and because of their distance from shore, their risk of being swept back onto land is small.

How artificial lighting affects swimming hatchlings is not well known. Hatchling sea turtles have been observed to exit the surf onto land where lighting is nearby (Daniel and Smith, 1947a; Carr and Ogren, 1960; Witherington, 1986); however, it is not clear how long these hatchlings were in the water. Limpus (1991) reported that "thousands" of green turtle hatchlings were seen swimming in circles next to a brightly lighted boat anchored off the nesting beach at Raine Island, Australia. Hatchlings affected by such lighting may linger in the lighted water and be preyed upon by fish that are also attracted to the lighted area. These incidents may leave little or no evidence.

In laboratory settings with other cues absent, loggerhead hatchlings will swim toward an artificial light source (O'Hara, 1980; Salmon and Wyneken, 1990). However, it is apparent from other laboratory work that hatchlings depend less on light cues and more on sea-wave and magnetic cues once they enter the water (Salmon and Lohmann, 1989; Lohmann *et al.*, 1990; Salmon and Wyneken, 1990; Wyneken *et al.*, 1990). Witherington (1991) observed that loggerhead hatchlings swimming from a lighted beach had a wider pattern of dispersal than did hatchlings from unlighted beaches, but he did not see evidence of disrupted orientation comparable to that seen on land. Further work is needed to determine how lighted ships and platforms may affect the survivorship of hatchlings and their dispersal from beaches.

Assessments: Discerning Problems Caused by Artificial Lighting

Lighting Inspections

WHAT ARE LIGHTING INSPECTIONS?

During a lighting inspection, a complete census is made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. The goal of lighting inspections is to locate lighting problems and to identify the property owner, manager, caretaker, or tenant who can modify the lighting or turn it off.

WHICH LIGHTS CAUSE PROBLEMS?

Although the attributes that can make a light source harmful to sea turtles are complex, a simple rule has proven to be useful in identifying problem lighting under a variety of conditions:

An artificial light source is likely to cause problems for sea turtles if light from the source can be seen by an observer standing anywhere on the nesting beach.

If light can be seen by an observer on the beach, then the light is reaching the beach and can affect sea turtles. If any glowing portion of a luminaire (including the lamp, globe, or reflector) is directly visible from the beach, then this source is likely to be a problem for sea turtles. But light may also reach the beach indirectly by reflecting off buildings or trees that are visible from the beach. Bright or numerous sources, especially those directed upward, will illuminate sea mist and low clouds, creating a distinct glow visible from the beach. This "urban skyglow" is common over brightly lighted areas. Although some indirect lighting may be perceived as nonpoint-source light pollution, contributing light sources can be readily identified and include sources that are poorly directed or are directed upward. Indirect lighting can originate far from the beach.

Although most of the light that sea turtles can detect can also be seen by humans, observers should realize that some sources, particularly those emitting near-ultraviolet and violet light (e.g., bug-zapper lights, white electric-discharge lighting) will appear brighter to sea turtles than to humans. A human is also considerably taller than a hatchling; however, an observer on the dry beach who crouches to the level of a hatchling may miss some lighting that will affect turtles. Because of the way that some lights are par-

tially hidden by the dune, a standing observer is more likely to see light that is visible to hatchlings and nesting turtles in the swash zone.

HOW SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Lighting inspections to identify problem light sources may be conducted either under the purview of a lighting ordinance (see Appendix H and the section below on sea turtle lighting ordinances) or independently. In either case, goals and methods should be similar.

GATHER BACKGROUND INFORMATION

Before walking the beach in search of lighting, it is important to identify the boundaries of the area to be inspected. For inspections that are part of lighting-ordinance enforcement efforts, the jurisdictional boundaries of the sponsoring local government should be determined. It will help to have a list that includes the name, owner, and address of each property within inspection area so that custodians of problem lighting can be identified. Plat maps or aerial photographs will help surveyors orient themselves on heavily developed beaches.

PRELIMINARY DAYTIME INSPECTIONS

An advantage to conducting lighting inspections during the day is that surveyors will be better able to judge their exact location than they would be able to at night. Preliminary daytime inspections are especially important on beaches that have restricted access at night. Property owners are also more likely to be available during the day than at night to discuss strategies for dealing with problem lighting at their sites.

A disadvantage to daytime inspections is that fixtures that are not directly visible from the beach will be difficult to identify as problems. Moreover, some light sources that can be seen from the beach in daylight may be kept off at night and thus present no problems. For these reasons, daytime inspections are not a substitute for nighttime inspections.

Descriptions of light sources identified during daytime inspections should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of

the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (*e.g.*, needs turning off; should be redirected 90° to the east). These detailed descriptions will show property owners exactly which luminaires need what remedy.

NIGHTTIME INSPECTIONS

Surveyors orienting themselves on the beach at night will benefit from notes made during daytime surveys. During nighttime lighting inspections, a surveyor walks the length of the nesting beach looking for light from artificial sources. There are two general categories of artificial lighting that observers are likely to detect:

1. Direct lighting. A luminaire is considered to be direct lighting if some glowing element of the luminaire (*e.g.*, the globe, lamp [bulb], reflector) is visible to an observer on the beach. A source not visible from one location may be visible from another farther down the beach. When direct lighting is observed, notes should be made of the number, lamp type (discernable by color; Appendix A), style of fixture (Appendix E), mounting (pole, porch, *etc.*), and location (street address, apartment number, or pole identification number) of the luminaire(s). If exact locations of problem sources were not determined during preliminary daytime surveys, this should be done during daylight soon after the nighttime survey. Photographing light sources (using long exposure times) is often helpful.
2. Indirect lighting. A luminaire is considered to be indirect lighting if it is not visible from the beach but illuminates an object (*e.g.*, building, wall, tree) that is visible from the beach. Any object on the dune that appears to glow is probably being lighted by an indirect source. When possible, notes should be made of the number, lamp type, fixture style, and mounting of an indirect-lighting source. Minimally, notes should be taken that would allow a surveyor to find the lighting during a follow-up daytime inspection (for instance, which building wall is illuminated and from what angle?).

WHEN SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Because problem lighting will be most visible on the darkest nights, lighting inspections are ideally conducted when there is no moon visible. Except for a few nights near the time of the full moon, each night

of the month has periods when there is no moon visible. Early-evening lighting inspections (probably the time of night most convenient for inspectors) are best conducted during the period of 2–14 days following the full moon. Although most lighting problems will be visible on moonlit nights, some problems, especially those involving indirect lighting, will be difficult to detect on bright nights.

A set of daytime and nighttime lighting inspections before the nesting season and a minimum of three additional nighttime inspections during the nesting-hatching season are recommended. The first set of day and night inspections should take place just before nesting begins. The hope is that managers, tenants, and owners made aware of lighting problems will alter or replace lights before they can affect sea turtles. A follow-up nighttime lighting inspection should be made approximately two weeks after the first inspection so that remaining problems can be identified. During the nesting-hatching season, lighting problems that seemed to have been remedied may reappear because owners have been forgetful or because ownership has changed. For this reason, two midseason lighting inspections are recommended. The first of these should take place approximately two months after the beginning of the nesting season, which is about when hatchlings begin to emerge from nests. To verify that lighting problems have been resolved, another follow-up inspection should be conducted approximately one week after the first midseason inspection.

WHO SHOULD CONDUCT LIGHTING INSPECTIONS?

Although no specific authority is required to conduct lighting inspections, property managers, tenants, and owners are more likely to be receptive if the individual making recommendations represents a recognized conservation group, research consultant, or government agency. When local ordinances regulate beach lighting, local government code-enforcement agents should conduct lighting inspections and contact the public about resolving problems.

WHAT SHOULD BE DONE WITH INFORMATION FROM LIGHTING INSPECTIONS?

Although lighting surveys serve as a way for conservationists to assess the extent of lighting problems on a particular nesting beach, the principal goal of those conducting lighting inspections should be to ensure that lighting problems are resolved. To resolve lighting problems, property managers, tenants, and owners should be given the information they need to make proper alterations to light sources. This information

should include details on the location and description of problem lights, as well as on how the lighting problem can be solved. One should also be prepared to discuss the details of how lighting affects sea turtles. Understanding the nature of the problem will motivate people more than simply being told what to do.

Monitoring Sea Turtle Behavior

In part, the behavior of nesting sea turtles and their hatchlings on the beach can be monitored by studying the tracks they leave in the sand. This evidence can reveal how much and where nesting occurs and how well oriented hatchlings are as they attempt to find the sea from their nest. Monitoring this behavior is one way to assess problems caused by artificial lighting, but it is no substitute for a lighting inspection program as described above. Many lighting problems may affect sea turtles and cause mortality without their leaving conspicuous track evidence on the beach.

SEA TURTLE NESTING

On many beaches, sea turtle biologists make early-morning surveys of tracks made the previous night in order to gather information on nesting. With training, one can determine the species of sea turtles nesting, the success of their nesting attempts, and where these attempts have occurred. These nesting surveys are one of the most common assessments made of sea turtle populations.

Because many factors affect nest-site choice in sea turtles, monitoring nesting is not a very sensitive way to assess lighting problems. However, changes that are observed in the distribution or species composition of nesting can indicate serious lighting problems and should be followed with a program of lighting inspections if one is not already in place.

HATCHLING ORIENTATION

Although hatchlings are more sensitive to artificial lighting than are nesting turtles, the evidence they leave behind on the beach is less conspicuous. Evidence of disrupted sea-finding in hatchlings (hatchling disorientation) can vastly underrepresent the extent of a lighting problem; however, this evidence can be useful in locating specific problems between lighting inspections. There are two ways one can use hatchling-orientation evidence to help assess lighting problems:

HATCHLING-ORIENTATION SURVEYS

Of the two methods, hatchling-orientation surveys, which involve measuring the orientation of hatchling tracks at a sample of sites where hatchlings have emerged, provide the most accurate assessment. Because the jumble of hatchling tracks at most emergence sites is often too confused to allow individual tracks to be measured, simple measures of angular range (the width that the tracks disperse) and modal direction (the direction that most hatchlings seem to have gone) are substituted. If the sampling of hatchling emergence sites does not favor a specific stretch of beach or a particular time of the lunar cycle, data from these samples can be an accurate index of how well hatchlings are oriented (Witherington *et al.*, 1996).

HATCHLING DISORIENTATION REPORTS

Although many cases of hatchling disorientation go unnoticed, some are observed and reported. The evidence of such events includes numerous circling tracks, tracks that are directed away from the ocean, or the carcasses of hatchlings that have succumbed to dehydration and exhaustion. Because reporters often discover this evidence while conducting other activities, such as nesting surveys, the events reported often include only the most conspicuous cases. Although these reports have a distinct coverage bias, they can still yield valuable information.

Hatchling-disorientation reports can help researchers immediately identify light-pollution problems. Although not every hatchling that is misled by lighting may be observed and reported, each report constitutes a documented event. When reports are received by management agencies or conservation groups, action can be taken to correct the light-pollution problem at the specific site recorded in the report. To facilitate the gathering of this information, standardized report forms should be distributed to workers on the beach who may discover evidence of hatchling disorientation. The following is a list of information that should be included on a standardized hatchling-disorientation report form:

1. Date and time (night or morning) that evidence was discovered.
2. Observer's name, address, telephone number, and affiliation (if any). The reporter may need to be contacted so that information about the event can be verified and the site can be located.
3. Location of the event and the possible light sources

responsible. Written directions to the locations should be detailed enough to guide a person unfamiliar with the site. The reporter should judge which lighting may have caused the sea-finding disruption, a decision that may involve knowledge about lighting that was on during the previous night and the direction(s) of the tracks on the beach. If possible, the type of lighting responsible

should be identified (*e.g.*, a high-pressure-sodium street light).

4. The number of hatchlings of each species involved in the event. Unless carcasses or live hatchlings are found, the species and numbers involved will be an estimate.
5. Additional notes about the event.

Solutions: Solving Problems Caused by Artificial Lighting

Light as a Pollutant

Light pollution has widespread effects. The terms “light pollution” and “photopollution” were originally used by astronomers (Dawson, 1984; Eakin, 1986) to describe the light that obliterates our scientific and recreational view of the night sky. Many of the same light sources that interfere with our enjoyment of the heavens on nightly beach walks also deter nesting and disrupt orientation in sea turtles. The biological effects of light pollution are just beginning to be realized and are not limited to sea turtles. Many animals—such as migrating birds and night-flying insects—depend on natural light for cues that guide orientation and are well-known victims of artificial lighting (Verheijen, 1985; Witherington, in press).

Solving problems caused by light pollution can be very different from solving problems caused by other pollutants. For instance, in theory, harmful light can be eliminated instantaneously by flipping a switch at the source. Light does not linger in the environment as do many polluting substances. However, some difficulty lies in recognizing light pollution and in agreeing upon which artificial lighting constitutes problem lighting. One person’s environmental threat may be another person’s safety and security.

It may help to think of light pollution as being artificial light that is out of place. More often than not, light that is located in the area it was meant to illuminate causes little harm. This is certainly true for sea turtle nesting beaches: artificial light that illuminates dune properties without reaching the nesting beach itself is not a threat to sea turtles.

The most readily accepted strategy for solving light-pollution problems is to manage light rather than prohibit it. In most cases, light that causes problems for sea turtles has “spilled over” from sites it was intended to illuminate; this light “spillage” does not serve a useful purpose and should be managed. A program of light management can make it possible to solve light-pollution problems without resorting to “just say no” policies that may be intimidating to the public.

USING BEST AVAILABLE TECHNOLOGY

Light management for conserving sea turtles must have an identifiable goal; that is, light must be managed to some level that conservationists can recog-

nize. Unfortunately, there is no level of light intensity that one may use as this criterion. The level of artificial brightness necessary to deter nesting or misorient hatchlings varies greatly with the level of ambient light (moonlight) and with the availability of other visual cues (e.g., the amount of dune). Consequently, there is no one acceptable level of light for every sea turtle nesting beach under every set of lighting conditions.

Given the uncertainty over how to measure acceptable light, it is most productive to simply minimize light pollution as best we can. This is the concept behind the use of best available technology (BAT: a common strategy for reducing other forms of pollution by using the best of the pollution-reduction technologies available). Best available technology forms the basis of light management methods that reduce the effects of artificial lighting to the greatest extent practicable. Although there is no single “turtle-friendly” luminaire that would be best for all applications, there are methods one can use, and a set of characteristics that light sources should have, in order to minimize the threat of light pollution for sea turtles. As presented below, these light-management tactics include selecting some lights to be turned off, controlling light so that the level reaching the beach is minimized, and ensuring that the light that does reach the beach is the least disruptive color.

Effective Methods for Managing Light

TURN OFF PROBLEM LIGHTS

Any strategy to reduce light pollution should begin with identifying those problem light sources (as defined previously in “Assessments”) that can be switched off or eliminated. Many light sources illuminate areas that do not need to be lighted. These unnecessary light sources include the following:

1. Light sources illuminating areas that require no security. This includes the beach itself in most cases. Ocean beaches are often in public, not private, ownership and are not areas where property is normally stored.
2. Light sources that illuminate areas that are vacant or where there is no foot traffic.
3. Decorative lighting. This category of lighting usually has limited use for any purpose other than aes-

thetic enhancement. Decorative lighting near nesting beaches may be much more harmful to sea turtles than it is useful to people.

4. Light sources that provide more than adequate illumination for a particular function. Light illuminance levels necessary for safety and security are rather low (0.2–1.0 footcandles or 2–11 lux, recommended for fence security and parking areas) compared with the illuminance necessary for detailed work, comfortable reading, or outdoor entertainment (100–300 footcandles or 110–320 lux) (Kaufman and Christensen, 1987).

Unnecessary light sources near sea turtle nesting beaches should be eliminated, and the number of light sources that provide more than adequate illumination should be reduced. Lighting that is necessary for safety or security can be used when needed during early-evening hours and switched off the remainder of the night (see notes on timers and motion detectors below). Items valuable enough to require security lighting should be moved away from the beach.

Switching lights off can be the simplest, cheapest, and most straightforward way to solve lighting problems. Turning out the lights will result in energy, as well as sea turtle, conservation. Usually, property owners are able to switch lighting off on their own; however, large outdoor luminaires and the poles they are mounted on are sometimes leased from a power company and must be switched off by authorized company personnel at the request of the customer paying the electricity bill.

MINIMIZE BEACH LIGHTING FROM OUTDOOR SOURCES

Beach lighting from outdoor sources can be minimized in a number of ways that allow the function of the lighting to be retained or even enhanced:

1. Turn the lighting off, or better yet, remove the luminaire. Sometimes this is the only solution to the problem, and it is almost always the simplest and least expensive solution. Lighting does not need to be extinguished year-round, only during the nesting-hatching season.
2. Reduce the wattage of problem lighting. For a given lamp type (*e.g.*, high-pressure sodium vapor) and style of fixture (*e.g.*, floodlight), reducing the wattage of the luminaire (or lamp) will reduce the amount of light emitted. When changing lamp types or fixture styles, the manufacturer's data on luminance (typically given in lumens) should be consulted. A table outlining efficiency (lumens/watt) of various light sources is given in Appendix B.
3. Substitute luminaires that are better focused so that light can be concentrated where it is most needed. Lower-wattage directional luminaires can replace higher-wattage multidirectional luminaires. Luminaires should not be directed onto the nesting beach or onto any object visible from the beach (see Appendices D–F).
4. Shield light sources from the nesting beach. To be effective, light shields should be completely opaque, sufficiently large, and positioned so that light from the shielded source does not reach the beach. In most cases, light shields can be fashioned from materials that are inexpensive and easily obtained. Aluminum and galvanized-steel flashing, plywood, and some opaque plastics make excellent light shields. An effective, simple, and inexpensive way to shield luminaires with hemispherical globes (*e.g.*, cobrahead fixtures) is to line the inside of the seaward half of the globe with household aluminum foil (the foil is not likely to remain on the outside of the globe). Attempts to shield light by fastening tinted acrylic or acetate to luminaires or painting their globes are generally not effective because these materials are not sufficiently opaque. Tar-paper shields are effective only for a short time because they do not weather well. Good shielding should provide a cutoff angle of 90° or more. Although commercial light shields are available for some common outdoor fixtures (Luminaire Technologies, Inc., Hubbell Lighting, Inc.; Appendix G), customized light shields are often needed because luminaires come in so many different designs. Changing a light fixture to a more directional style is almost always a more efficient and permanent solution than shielding is.
5. Recess luminaires into roof soffits. Recessed sources will be more directional and, if directed downward, will be less visible from the beach than multidirectional lighting is (see Appendices D, E).
6. Lower pole-mounted luminaires or use low-mounted luminaires with louvered, bollard-type fixtures as a substitute for pole-mounted lighting. The lower a light source is mounted, the smaller the area it will illuminate. In addition, sources mounted lower will tend to have a greater degree of shielding from the beach by objects on the dune (vegetation, buildings, *etc.*). Sources mounted high on poles near the beach can be very difficult to shield from the beach. The post-like stature of bollard luminaires and the light-directing louvers with which they can be fitted make them ideal for keeping light close to the ground and off the beach.

7. Redirect luminaires away from the nesting beach. Even sources that are poorly directional can be redirected so that most of their brightness is pointed away from the beach.
8. Reposition luminaires to take advantage of natural light screens. Necessary luminaires should be positioned on the landward side of any buildings or vegetation.
9. Install timers to switch off lighting when it is no longer needed in the evening. This tactic by itself is only minimally effective in solving lighting problems because both nesting and hatchling emergence can occur throughout the night. To be most effective, timers should be set to turn lights off in the early evening, no more than one hour after dusk. People tend to function poorly as "timers" because of forgetfulness, procrastination, and other human foibles.
10. Install motion-detector switches. Lighting connected to a motion-detector switch comes on when the fixture itself is approached and then switches off after a set time following the last detected motion. Thus, the light source is on only when it is needed for safety or security. If possible, the length of time that lighting remains on should be set at no more than 30 seconds. This type of lighting should not be used in high-traffic areas visible from the beach. Motion-detector switches are generally a better solution to lighting problems than timers are, are relatively inexpensive, and are widely available (Appendix D). However, motion detectors can be used only with incandescent lighting (yellow bug-light bulbs work well with motion detectors).
11. Install visors or louvers to stadium lighting. Stadium lighting—intense broad-spectrum lighting that is typically mounted as multiple units on tall poles—can pose lighting problems that are particularly difficult to solve. This type of lighting should not be used near sea turtle nesting beaches during the nesting-hatching season. Because stadium lighting tends to be both outwardly directed and intense, it can produce a glow that affects nesting beaches many kilometers away. This glow can be reduced by fitting individual luminaires with louvers or visors that reduce the amount of light shining upward and laterally (Hubbell Lighting, Inc.; Appendix G).
12. Replace conspicuous lighting on beach-access ramps with hidden, walkway-only lighting. Because lighting meant to illuminate beach-access ramps is often conspicuously located out on the beach itself, it can be difficult to shield properly. Other than turning this lighting off, the

best solution to the problems caused by this lighting is to use hidden light sources that light only the walking surface of the ramp. A good way to hide ramp lighting is to use small light sources (e.g., light-emitting diodes) within strips that are sunken within grooves along the edges of the ramp's walking surface (Appendix E).

13. Plant native dune vegetation as a light screen. Planting light-blocking vegetation on the primary dune can help alleviate problems caused by light that is not managed by the techniques outlined above. To be most effective, vegetation should be near the crest of the dune closest to the beach, which is where woody, well-established vegetation normally grows. Salt-tolerant, bushy, densely leaved native plants are the most suitable. See the discussion on light screens below.

MINIMIZE BEACH LIGHTING FROM INDOOR SOURCES

Light from indoor sources can also cause problems for sea turtles. The criteria for identifying problems caused by indoor lighting are the same as those for identifying problems caused by outdoor lighting. Indoor light is a problem if it is visible from the beach.

Indoor lighting from buildings that are close to the beach, are very tall, or have large sea-side windows causes the greatest problem for sea turtles. Because indoor lighting is usually not meant to light the outdoors, the unwanted effects of indoor lighting can easily be eliminated without compromising the intended function of the lighting by doing the following:

1. Turning off lighting in rooms that are not in use. Reminder notices placed on switches in oceanfront rooms can help in this effort.
2. Relocating moveable lamps away from windows that are visible from the beach.
3. Tinting or applying window treatments to windows visible from the beach so that light passing from inside to outside is substantially reduced. A good tinted glass or window-tinting treatment will reduce visible light from the inside to 45% or less (transmittance $\leq 45\%$). Window glass may be either tinted during its manufacture or tinted later with an applied film. Window treatments (shading materials) are less permanent and can reduce light transmittance more than tints and films can. A complete blocking of light is ideal. See Appendix G for companies offering tinted glass and window treatments.
4. Closing opaque curtains or blinds after dark to

completely cover windows visible from the beach. This is an inexpensive solution because most home windows have curtains or blinds to provide privacy to the occupants.

USE ALTERNATIVE, LONG-WAVELENGTH LIGHT SOURCES

Where efforts to dim, redirect, or block light have not been entirely effective, some errant light may reach the beach. An additional strategy to reduce the effects of artificial lighting is to ensure that any light reaching the beach has spectral properties that make it minimally disruptive to sea turtles. Minimally disruptive light sources have a spectral distribution that excludes short-wavelength (ultraviolet, violet, blue, and green) light. These long-wavelength light sources will have a minimal effect on sea turtles, but because they are not completely harmless, they should not be used without light-management techniques.

LOW-PRESSURE SODIUM VAPOR

The spectral properties of low-pressure sodium-vapor (LPS) lighting make this type of lamp the least disruptive to sea turtles among commonly used, commercially available light sources. This assessment comes from studies of nesting and hatchling loggerheads and green turtles, along with limited evidence from studies of hatchling hawksbills and olive ridleys. Because light from LPS sources is not completely ignored by sea turtles, LPS should be considered as a substitute for more disruptive light sources rather than as a replacement for beach-darkening efforts.

LPS light has greater effects on some species than on others. Loggerhead hatchlings have not been observed to have sea-finding substantially disrupted by LPS lighting in the field, whereas green turtle hatchlings are substantially affected under some conditions. Although LPS lighting is predicted to have a minimal effect on loggerhead hatchlings, it is not true that LPS—because of the loggerhead hatchlings' aversion to yellow light—will reduce the attraction of other, adjacent, lights on the nesting beach. To improve loggerhead sea-finding on a lighted beach, illuminance from additional LPS lighting would need to be considerably higher than what is typical for outside lighting.

YELLOW FILTERS, BUG LIGHTS, AND RED LED'S
Lamps that are tinted yellow to reduce the emission of insect-attracting short-wavelength light (bug lights) can also be minimally disruptive to sea turtles. Bug lights are poorer alternatives than LPS lighting

but are less expensive (initially) and more widely available than LPS lighting. True bug lights are incandescent lamps, but some yellow-tinted fluorescent tubes are available (Appendix C) and should be used in place of white fluorescent tubes.

Amber or yellow filters installed in light fixtures vary greatly in effectiveness and can fade, increasing the transmission of short-wavelength light over time. Yellow, dichroic "long-pass" filters are an exception to this rule—they exclude short wavelengths well and generally do not degrade with time (but can degrade with high heat). To affect sea turtles the least, dichroic filters should exclude all wavelengths (have a stop-band) below 520 nm.

Red light-emitting diodes (LEDs) are too small to light large areas but can be used for walkways and steps. The red light of LEDs remains a true, narrow-band red for the life of the lamp and is probably one of the light sources least visible to sea turtles. The red light from LEDs has the added benefit of not degrading the night vision of people visiting the beach. As people walk to the beach along a pathway lighted with red LED lamps, their eyes can adjust to the darkness, leaving them better able to see by moonlight and starlight once they reach the unlighted beach.

HOW TO CHOOSE AN ALTERNATIVE LIGHT SOURCE

Selecting appropriate alternative lighting may seem to be a complex task. For example, which would be least harmful to sea turtles, a 15-watt white bulb or a 35-watt LPS luminaire? Unfortunately, we have no reliable formula that can be used to calculate how much each light source will affect sea turtles. We do know, however, that if spectral emissions are equivalent, reducing intensity will reduce effects, and if intensities are similar, substituting less attractive sources (like LPS) will also reduce effects. A sound strategy, therefore, would be to reduce effects on sea turtles by manipulating both intensity and color. As few lights as practicable should be used, and for lighting applications that are deemed essential, long-wavelength light sources (LPS, bug lights, etc.) should replace more disruptive light sources and intensity should be reduced by using lamps of minimal wattage that are housed within well-directed fixtures aimed down and away from the beach. Rather than attempt to answer the example question posed above, one should explore additional available technology that will best suit one's lighting needs. If a 15-watt white bulb is truly sufficient for the lighting requirement, then a 15- to 25-watt bug-light bulb may be a more appropriate choice than a 35-watt LPS

luminaire, which would emit approximately 20 times the light of the white bulb.

USE LIGHT SCREENS AND ENHANCE DUNE PROFILE

Both laboratory and field experiments have suggested that the silhouette of the dune can influence sea-finding in hatchlings (Limpus, 1971; Salmon *et al.*, 1992), and it is clear that sea-finding problems are exacerbated where the dune profile is low or the dune is sparsely vegetated (Ferris, 1986; Witherington, 1990; Reiners *et al.*, 1993). Whether by providing visual cues, blocking light, or both, enhancing the silhouette of the dune can reduce lighting problems. Methods include the following:

1. Planting native vegetation on the dune. Unlike artificial light screens, vegetation will grow, enhance the dune habitat for other animals, and may provide more natural orientation cues for hatchlings.
2. Erecting artificial light screens on the dune where immediate, short-term light blocking is needed. Artificial screens should be positioned so that they do not impede nesting. Sturdy "shade cloth" and "privacy fencing" can make effective light screens. Artificial light screens can be used to block light until planted vegetation thickens to fill in gaps.
3. Filling in and replanting dune cuts, pathways, and washout areas. Misoriented hatchlings and adult turtles often exit the beach through these lighted gaps in the dune.
4. Providing emerging hatchlings shielded pathways from nest to surf. On the loggerhead nesting beach at Cape Canaveral Air Force Station, Florida, workers have been able to correct hatchling orientation in lighted areas by shading the dune side of nests and laying 10-cm-high walls of lumber from nest to high-tide line (Leach, 1992). These tactics should be used only as stop-gap measures to reduce hatchling mortality while other light-management efforts are made.

A COMPREHENSIVE STRATEGY FOR MINIMIZING EFFECTS OF ARTIFICIAL LIGHTING

There are many options for lessening the effects of artificial lighting on sea turtles, but in order to have them employed, a comprehensive strategy is needed to educate stakeholders, pass legislation, enforce laws, and monitor the nesting beach.

1. Education. Efforts should begin with making those

able to solve lighting problems (individuals, corporations, or governments) aware of the problems and possible solutions. Public awareness is a prerequisite for legislative action and can foster results that extend beyond what can be mandated by government. Many of the organizations listed in Appendix I are authorities on educating the public on conservation issues. Stories in the news media, distribution of pamphlets and fliers (see Appendix I for sources), presentations at community gatherings, and door-to-door campaigns can make the public aware of the need for darker nesting beaches (Limpus *et al.*, 1981; Witherington, 1986).

Well-rounded and long-term educational efforts should include the next generation of sea turtle conservationists. Nurturing in school-age children an appreciation of sea turtles and other features of the natural world is a vital conservation investment.

2. Legislation. While public awareness is important for fostering beach-darkening efforts, light-management legislation is often necessary to complete the task. Light-management laws represent serious commitment to protecting sea turtles from artificial lighting and ensure that this conservation effort will be community-wide. See Appendix H and the discussion on legislation below.
3. Prevention and enforcement efforts. It is far easier to solve light-pollution problems during preliminary planning, before projects are constructed and before lighting is installed. Legislation should require that a central, knowledgeable authority review development plans so that any new lighting near a nesting beach does not become a problem for sea turtles. Solutions to existing lighting problems should also be enforced. Where existing lighting problems are complex or difficult to solve, grace periods can be granted; however, flagrant lighting problems caused by easily identifiable sources should be remedied quickly. Issuing warnings and levying fines can ensure that lighting problems are solved promptly. Ideally, warnings should be issued prior to the nesting and hatchling seasons so that problems can be solved before nesting is deterred and hatchlings are killed.
4. Know your nesting beach. Lighting problems can be detected more quickly if observers are familiar with the activities of sea turtles and humans on the beach. Lighting problems can be cryptic. Results of lighting inspections, nesting surveys, and hatchling disorientation reports should be assessed regularly.

Lighting Ordinances: How an Idea Becomes a Law

Acts of local, state, and national governments are often essential to ensure that light management on nesting beaches, justified by scientific information and supported by the public, becomes a reality. By adopting light-management legislation, government makes a long-term commitment to protect sea turtles from the harmful effects of artificial lighting. Light-management laws are necessary because some individuals will not correct lighting problems unless they are required to do so. Legislation can force action when needed and, on many nesting beaches, may be the only means to completely resolve light-pollution problems.

In addition to providing a public mandate, legislation can establish specific criteria for determining which artificial light sources constitute a problem and how this lighting should be modified to resolve the problem. Legislation ensures that lighting problems are handled in a fair and even-handed manner throughout coastal areas.

What follows is a step-by-step guide to initiating, passing, and implementing legislation to protect sea turtles from light pollution. The strategy presented is largely based upon successful efforts in Florida, USA, but it provides a framework that can be generally applied elsewhere.

1. BECOME FAMILIAR WITH THE ISSUES

Those accepting responsibility for promoting lighting legislation should become familiar with all related issues: specific effects of artificial lighting on sea turtles, recommended methods of correcting problem lights, local nesting patterns of sea turtles, observed and/or potential lighting problems on local beaches, and details of existing lighting legislation that can be used as a model.

Van Meter (1992) provides a good general overview of sea turtle biology for nonbiologists, and the National Research Council (1990) offers a detailed account of sea turtle conservation issues. For some beaches, specific information on sea turtle nesting, hatchling orientation, and existing lighting can be obtained from local researchers and conservationists or from published reports. For poorly known beaches, much of this information will need to be gathered. General information on lighting and its effect on sea turtles can be found within this manual. Various environmental groups, biologists, and resource managers (see Appendix I) may be contacted for information concerning legislation adopted in other areas. "Florida's Model Standards for Beach-

front Lighting" are included in this manual (Appendix H) as an example of minimum guidelines for protecting sea turtles from the effects of lighting.

2. DEVELOP A SUMMARY DOCUMENT OF RELEVANT LOCAL ISSUES

It is helpful to summarize relevant information in a single document that can be used to develop presentations to the public and to educate government officials. Ask a person or group familiar with lighting issues to review the summary to ensure that all of the pertinent information is covered.

3. DEVELOP A PRESENTATION

A presentation developed from the summary document should be directed toward those unfamiliar with the subject. Remember that many in the audience will know little about sea turtles, how threatened they are, and why they need to be protected. Have succinct answers ready for the most basic questions, as well as for the most difficult ones (see Appendix J).

A good presentation should include a brief description of sea turtles and their plight. Be sure to distribute materials with photographs or to project slides that show what sea turtles look like. Supportive materials (*e.g.*, slides, pamphlets, booklets) may be available from environmental groups or government agencies (see Appendix I). The presentation should clearly justify the need for legislation. Use the presentation as an opportunity to allay fears. Point out that light-management legislation is not meant to prohibit lighting near the beach; the goal of light management is to preserve useful light and reduce harmful light. Address the misconceptions that lighting modifications will cause beaches to become less safe and will cost large sums of money (see Appendix J). Lastly, review in the presentation some practical methods for assessing and correcting problem lighting. Because it may take years to pass effective legislation, the education provided by these public presentations may be the only impetus for improving local lighting conditions while legislation is pending.

4. WRITE A PRELIMINARY DRAFT OF THE LEGISLATION

A preliminary draft of legislation should address all of the relevant issues heretofore discussed. The "Florida Model Standards for Beachfront Lighting" (Appendix H) and legislation from other areas may be used as guides for writing the draft legislation. A person or group familiar with lighting issues should review the draft to make sure that all important points are covered.

5. SOLICIT SUPPORT FOR LEGISLATION

Public support for lighting legislation is essential. In small communities, support can be garnered at town meetings and from individual contacts with coastal residents and business owners. In larger communities, one should begin public-awareness campaigns on a broad scale by making presentations to local environmental groups, civic organizations, homeowners associations, and other groups, especially those with members who may be affected by the legislation. Pamphlets or fliers distributed by hand or by mail will reach many of those not attending meetings and presentations.

Be patient and diplomatic when interacting with an audience. Concerns of those who may be skeptical, whether justified or imagined, should be thoroughly addressed. Responses to many common questions and concerns about beach-darkening efforts are listed in Appendix J.

Presentations should be reevaluated regularly based on audience reaction. If a particular concept is obviously not clear to the audience at the end of the presentation, then the explanation of that concept probably needs to be modified.

The internet, radio, television, and the press can be quite valuable in getting the message out. As in other presentations to the public, it is helpful to give a short, standardized message that includes the basic elements discussed above. It is also valuable to distribute written news releases to the electronic and print media.

6. EDUCATE GOVERNMENTAL STAFF

Whether the need for lighting legislation is originally identified by government planning or environmental staff or it has been introduced by an outside group, the knowledgeable support of local government staff is critical. If staff are not well versed in the relevant issues, they should be provided with the pertinent background information (the summary document discussed above, a copy of this manual, names and addresses of sea turtle biologists familiar with lighting issues, *etc.*).

Local government staff can be extremely helpful by providing guidance on how to properly format legislation and how to best approach government officials in order to pass legislation. Unfortunately, government environmental and planning departments may be greatly understaffed and may be overwhelmed by new issues. For this reason, assist the staff whenever possible, avoid unnecessary demands on their time, and by all means, demonstrate an appreciation for their efforts.

7. EDUCATE ELECTED OFFICIALS

Personal meetings with elected officials may be very effective in gaining support for legislation, but certain guidelines should be followed. First and foremost, be well prepared. Before meeting with elected officials, make sure that each of the six tasks above has been completed and be able to answer some difficult questions concerning the proposed legislation. Additionally, be ready to demonstrate that there is public support for the legislation; it will be an important factor in convincing an elected official to vote in favor of the legislation. A representative of a large group or coalition will often have more influence than an individual acting alone.

When discussing issues with elected officials, be cordial, factual, and succinct. Most officials have to meet with many people during the course of a day and will appreciate amiable brevity. Cover the major points and be prepared to expound on them when asked. Bring along support material that can be left with the official. This will allow the official, at his or her convenience, to become more familiar with the finer details of the proposed legislation. Lastly, offer to answer any questions the official may have in the future and be sure to leave your name, address, and telephone and fax numbers.

8. MAKE A FORMAL RECOMMENDATION TO ADOPT THE LEGISLATION

A formal recommendation usually involves placing the proposed legislation on the agenda of the commission, board, or council that advises elected officials on new legislation. For example, in Florida, before a lighting ordinance is considered by a county commission, it is usually reviewed by a county planning and zoning board, a development review board, or other appointed board. That board then makes recommendations to the county commission concerning the proposed ordinance. Local government planning and environmental staff should be consulted on how to arrange to place the proposed legislation on the appropriate agenda.

If the legislation must be reviewed by an appointed board (as described above), it would be helpful to arrange personal meetings with board members prior to the public meeting at which the proposed legislation will be considered. In these personal meetings, follow the same guidelines as those for meeting with elected officials.

Prior to the public meeting, contact supporters of the legislation (especially those representing large local organizations) and encourage them to meet with, write to, or call local officials. It is also critical

that they attend the meeting to voice their support. Experts on sea turtle biology and conservation may be particularly well received. Supporters should discuss issues and coordinate their comments before the meeting so that their presentations will not be contradictory and so that different speakers can emphasize different points.

At the public meeting, follow the guidelines for meeting with elected officials (*i.e.*, be prepared, factual, concise, cooperative, cordial, and diplomatic). Also, be aware of and adhere to the proper protocol for public comment. Individual board members should have been provided with background materials and the justification for the proposed legislation; therefore, presentations at the public meeting should be principally a concise review of the main points. Because it is important for board members to be made aware of strong public support for the proposed legislation, supporters should attend in force and many should be prepared to speak. If board members have technical questions about any aspect of the legislation, the individual most qualified to answer the question should do so.

It is of tremendous help to have the support of local environmental and planning staff. Board members will be familiar with staff and will usually place considerable weight on their judgment (hence the importance of working with staff from the beginning).

If controversy over the legislation develops, the board may require one or more public workshops in order to resolve the controversial aspects of the legislation. The legislation then may be given a final review by the board and forwarded to the elected body (*e.g.*, county commission) along with specific recommendations. The process comes to a climax with a vote by the elected body during a public meeting. Because the legislation can be modified at any one of these public workshops or meetings, supporters should participate in each of these steps.

With a concerted effort by supporters, the chances of seeing light-management legislation through to official promulgation are good. Although the arguments for lighting regulations on sea turtle nesting beaches are themselves compelling, a resolute show of public support counts most heavily. The importance of this support cannot be overstated. Even if initial efforts to pass legislation fail, the support fostered during the attempt will convince many to begin addressing the problem themselves and will provide a strong base for future legislative efforts.

9. AFTER THE LEGISLATION IS ADOPTED

GET THE WORD OUT

After lighting legislation is adopted, it will be necessary for the local government to send notice of the new legislation to owners of coastal property, informing them of the associated regulations and the time period (often until the next nesting season) during which they must comply. The notice should also inform property owners of the criteria that will be used to determine compliance, the name and address of a contact person within local government, and some general suggestions for bringing lighting into compliance.

CONDUCT LIGHTING INSPECTIONS AND ENFORCE REGULATIONS

For light-management legislation to be effective, comprehensive lighting inspections are needed (see the previous section on lighting inspections). At least one inspection should be made prior to the deadline for compliance stated in the ordinance. Lighting that is not in compliance should be identified so that property owners can be notified in sufficient time to correct the problem. After the deadline for compliance, follow-up lighting inspections should be conducted. Owners of problem lighting identified during the follow-up inspection should be sent a second notice. Reference should be made to the first notice, and a final deadline for compliance should be explicitly stated. Generally, this final deadline would be the end of the aforementioned grace period. Noncompliance beyond the deadline should result in enforcement action (*e.g.*, a fine) unless there are extenuating circumstances.

STAY INVOLVED

After legislation has been adopted and problem lighting has been identified and brought into compliance, it will pay to remain vigilant. As problems with lighting are generally ongoing, so too should be the solution. Vigilance will reduce forgetfulness and apathy and will uncover changes that may make the original legislation less effective, such as amendments that weaken the legislation and discontinuation of lighting inspections or enforcement.

It is important to stay aware of the activities of local government because legislation may be amended at any time; be prepared to address the issues of lighting legislation as they arise. Attending public meetings and preserving contacts with local government staff are key ways to keep abreast of the actions and inactions that may affect light-management efforts.

Literature Cited

- ANONYMOUS. 1983. Guide to High Intensity Discharge Lamps. North American Philips Lighting Corporation, Bloomfield, New Jersey. 23 p.
- ANONYMOUS. 1989. Light Sources, Monochromators, Detection Systems. Oriel Corporation, Stratford, Connecticut. 335 p.
- BROOKE, M. DE L., and M. C. GARNETT. 1983. Survival and reproductive performance of hawksbill turtles *Eretmochelys imbricata* L. on Cousin Island, Seychelles. *Biological Conservation* 25:161-170.
- BURNEY, C. M., C. MATTISON, and L. FISHER. 1991. The relationship of loggerhead nesting patterns and moon phase in Broward County, Florida. Pp. 161-164 in T. H. Richardson, J. I. Richardson, and M. Donnelly, eds. Proceedings of the Tenth Annual Workshop on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFC-278.
- BUSTARD, H. R. 1967. Mechanism of nocturnal emergence from the nest in green turtle hatchlings. *Nature* 214:317.
- BUSTARD, H. R. 1972. Sea Turtles. Natural History and Conservation. Taplinger, New York. 220 p.
- CALDWELL, M. C., and D. C. CALDWELL. 1962. Factors in the ability of the northeastern Pacific green turtle to orient toward the sea from the land, a possible coordinate in long-range navigation. *Contributions in Science* 60:5-27.
- CARR, A. 1962. Orientation problems in the high seas travel and terrestrial movements of marine turtles. *American Scientist* 50:358-374.
- CARR, A., and L. GIOVANNOLI. 1957. The ecology and migrations of sea turtles. 2. Results of field work in Costa Rica, 1955. *American Museum Novitates* 1835:1-32.
- CARR, A., and H. HIRTH. 1961. Social facilitation in green turtle siblings. *Animal Behaviour* 9:68-70.
- CARR, A., and L. OGREN. 1959. The ecology and migrations of sea turtles. 3. *Dermochelys* in Costa Rica. *American Museum Novitates* 1958:1-29.
- CARR, A., and L. OGREN. 1960. The ecology and migrations of sea turtles. 4. The green turtle in the Caribbean Sea. *Bulletin of the American Museum of Natural History* 121:1-48.
- CARR, A., H. HIRTH, and L. OGREN. 1966. The ecology and migrations of sea turtles. 6. The hawksbill turtle in the Caribbean Sea. *American Museum Novitates* 2248:1-29.
- CHRISTENS, E. 1990. Nest emergence lag in loggerhead sea turtles. *Journal of Herpetology* 24:400-402.
- CHAVEZ, H., M. CONTRERAS G., and T. P. E. HERNANDEZ D. 1968. On the coast of Tamaulipas, part two. *International Turtle and Tortoise Society Journal* 2:16-19, 27-34.
- CORNELIUS, S. E. 1986. The Sea Turtles of Santa Rosa National Park. Fundación de Parques Nacionales, Costa Rica. 64 p.
- COSTON-CLEMENTS, L., and D. E. HOSS. 1983. Synopsis of data on the impact of habitat alteration on sea turtles around the southeastern United States. NOAA Technical Memorandum NMFS-SEFC-117. 57 p.
- DANIEL, R. S., and K. U. SMITH. 1947a. The sea-approach behavior of the neonate loggerhead turtle (*Caretta caretta*). *Journal of Comparative Physiology and Psychology* 40:413-420.
- DANIEL, R. S., and K. U. SMITH. 1947b. The migration of newly-hatched loggerhead turtles toward the sea. *Science* 106:398-399.
- DAWSON, D. W. 1984. Light pollution and its measurement. Pp. 30-53 in R. C. Wolpert, R. M. Genet, and J. Wolpert, eds. *Advances in Photoelectric Photometry*. Vol. 2. Published by the Fairborn Observatory, Patagonia, Arizona.
- DEMMER, R. J. 1981. The hatching and emergence of loggerhead turtle (*Caretta caretta*) hatchlings. Unpublished Master's Thesis, University of Central Florida, Orlando. 40 p.
- DICKERSON, D. D., and D. A. NELSON. 1988. Use of long wavelength lights to prevent disorientation of

- hatchling sea turtles. Pp. 19–21 in B. A. Schroeder, ed. Proceedings of the Eighth Annual Workshop on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS–SEFC–214.
- DICKERSON, D. D., and D. A. NELSON. 1989. Recent results on hatchling orientation responses to light wavelengths and intensities. Pp. 41–43 in S. Eckert, K. Eckert, and T. Richardson, eds. Proceedings of the Ninth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS–SEFC–232.
- DODD, C. K. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). FAO Synopsis NMFS–149, Biological Report 88(14). 110 p.
- EAKIN, J. S. 1986. Tucson tackles sky glow: how one city is helping to protect astronomy. Light Magazine 1(2):10–12.
- EHRENFELD, D. W. 1968. The role of vision in the sea-finding orientation of the green turtle (*Chelonia mydas*). II. Orientation mechanism and range of spectral sensitivity. Animal Behaviour 16:281–287.
- EHRENFELD, D. W. 1979. Behavior associated with nesting. Pp. 417–434 in M. Harless and H. Morlock, eds. Turtles: Perspectives and Research. Wiley and Sons, New York.
- EHRENFELD, D. W., and A. CARR. 1967. The role of vision in the sea-finding orientation of the green turtle (*Chelonia mydas*). Animal Behaviour 15:25–36.
- EHRENFELD, D. W., and A. L. KOCH. 1967. Visual accommodation in the green turtle. Science 155: 827–828.
- EHRHART, L. M. 1979. Threatened and Endangered Species of the Kennedy Space Center. Part 1. Marine Turtle Studies. Final report to NASA/KSC: A Continuation of Baseline Studies for Environmentally Monitoring STS at JFK Space Center. 301 p.
- FANGMAN, M. S., and K. A. RITTMASER. 1993. Effects of human beach usage on the temporal distribution of loggerhead nesting activities. Pp. 222–227 in B. Schroeder and B. Witherington, eds. Proceedings of the Thirteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS–SEFC–341.
- FEHRING, W. K. 1972. Hue discrimination in hatchling loggerhead turtles (*Caretta caretta caretta*). Animal Behaviour 20:632–636.
- FERREIRA, S. N. M., G. C. M. FILHO, and V. J. PATIRI. 1992. The influence of artificial lighting on the reproduction of sea turtles. Unpublished report from the Eleventh National Seminar of Electrical Power Distribution, Bahia, Brazil. 20 p.
- FERRIS, J. S. 1986. Nest success and the survival and movement of hatchlings of the loggerhead sea turtle (*Caretta caretta*) on Cape Lookout National Seashore. NPS–CPSU Technical Report 19. 40 p.
- FRICK, J. 1976. Orientation and behavior of hatchling green sea turtles (*Chelonia mydas*) in the sea. Animal Behaviour 24:849–857.
- GRANDA, A. M., and C. A. DVORAK. 1977. Vision in turtles. Pp. 451–495 in F. Crescitelli, ed. Handbook of Sensory Physiology. Vol. VII/5. The Visual System in Vertebrates. Springer-Verlag, Berlin.
- GRANDA, A. M., and K. W. HADEN. 1970. Retinal oil globule counts and distribution in two species of turtles: *Pseudemys scripta elegans* (Wied) and *Chelonia mydas mydas* (Linnaeus). Vision Research 10:79–84.
- GRANDA, A. M., and P. J. O'SHEA. 1972. Spectral sensitivity of the green turtle (*Chelonia mydas mydas*) determined by electrical responses to heterochromatic light. Brain Behavior and Evolution 5:143–154.
- HAILMAN, J. P., and A. M. ELOWSON. 1992. Ethogram of the nesting female loggerhead (*Caretta caretta*). Herpetologica 48:1–30.
- HAYES, W. N., and L. C. IRELAND. 1978. Visually guided behavior of turtles. Pp. 281–317 in D. I. Mostofsky, ed. The Behavior of Fish and Other Aquatic Organisms. Academic Press, New York.
- HAYS, G. C., and J. R. SPEAKMAN. 1993. Nest placement by loggerhead turtles, *Caretta caretta*. Animal Behaviour 45:47–53.
- HENDRICKSON, J. R. 1958. The green sea turtle, *Chelonia mydas* (Linn.) in Malaya and Sarawak. Proceedings of the Zoological Society of London 130:455–535.
- HIRTH, H. F., and D. A. SAMSON. 1987. Nesting behavior of green turtles (*Chelonia mydas*) at Tor-

- tuguero, Costa Rica. *Caribbean Journal of Science* 23:374–379.
- HOOKE, D. 1907. Preliminary observations on the behavior of some newly hatched loggerhead turtles. *Carnegie Institute Washington Yearbook* 6: 111–112.
- HOOKE, D. 1908a. The breeding habits of the loggerhead turtle and some early instincts of the young. *Science* 27:490–491.
- HOOKE, D. 1908b. Report on the instincts and habits of newly hatched loggerhead turtles. *Carnegie Institute Washington Yearbook* 7:124.
- HOOKE, D. 1911. Certain reactions to color in the young loggerhead turtle. *Papers from the Tortugas Laboratory, Carnegie Institute* 132:71–76.
- IRELAND, L. C., J. A. FRICK, and D. B. WINGATE. 1978. Nighttime orientation of hatchling green turtles (*Chelonia mydas*) in open ocean. Pp. 420–429 in K. Schmidt-Koenig and W. T. Keeton, eds. *Animal Migration, Navigation and Homing*. Springer-Verlag, New York.
- JOHNSON, S. A., K. A. BJORNDAL, and A. B. BOLTEN. 1996. Effects of organized turtle watches on loggerhead (*Caretta caretta*) nesting behavior and hatchling production in Florida. *Conservation Biology* 10:570–577.
- KAUFMAN, J. E., and J. F. CHRISTENSEN (eds.). 1987. Pp. 2–15, 2–16 in *IES Lighting Handbook*. Illuminating Engineering Society of North America, New York.
- LEACH, A. L. 1992. Sea turtle nesting summary report for Cape Canaveral Air Force Station, Florida. 1992. Unpublished report to Johnson Controls World Services Inc., Cape Canaveral Air Force Station, Florida. 19 p.
- LIEBMAN, P. A., and A. M. GRANDA. 1971. Microspectrophotometric measurements of visual pigments in two species of turtle, *Pseudemys scripta* and *Chelonia mydas*. *Vision Research* 11:105–114.
- LIMPUS, C. J. 1971. Sea turtle ocean-finding behaviour. *Search* 2:385–387.
- LIMPUS, C. J. 1991. Marine turtles of Raine Island, Australia. Unpublished paper presented at the Eleventh Annual Workshop on Sea Turtle Biology and Conservation, 26 February–2 March 1991, Jekyll Island, Georgia.
- LIMPUS, C., R. W. CARTER, and S. McLEAN. 1981. Lights and hatchling turtles: an education program. *Marine Turtle Newsletter* 19:11.
- LOHMANN, K. J., M. SALMON, and J. WYNEKEN. 1990. Functional autonomy of land and sea orientation systems in sea turtle hatchlings. *Biological Bulletin* 179:214–218.
- LOHMANN, K. J., B. E. WITHERINGTON, C. M. F. LOHMANN, and M. SALMON. In press. Orientation, navigation, and natal beach homing in sea turtles. In P. L. Lutz and J. A. Musick, eds. *The Biology of Sea Turtles*. CRC Press, Boca Raton, Florida.
- MANN, T. M. 1977. Impact of developed coastline on nesting and hatchling sea turtles in southeastern Florida. Unpublished Master's Thesis, Florida Atlantic University, Boca Raton. 100 p.
- MANN, T. M. 1978. Impact of developed coastline on nesting and hatchling sea turtles in Southeastern Florida. *Florida Marine Research Publications* 33: 53–55.
- MARTIN, R. E., R. G. ERNEST, N. WILLIAMS-WALLS, and J. R. WILCOX. 1989. Long-term trends in sea turtle nesting on Hutchinson Island, Florida. Pp. 111–113 in S. Eckert, K. Eckert, and T. Richardson, eds. *Proceedings of the Ninth Annual Workshop on Sea Turtle Conservation and Biology*. NOAA Technical Memorandum NMFS-SEFC-232.
- MATTISON, C., C. BURNEY, and L. FISHER. 1993. Trends in the spatial distribution of sea turtle activity on an urban beach (1981–1992). Pp. 102–104 in B. Schroeder and B. Witherington, eds. *Proceedings of the Thirteenth Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFC-341.
- McFARLANE, R. W. 1963. Disorientation of loggerhead hatchlings by artificial road lighting. *Copeia* 1963:153.
- MEYLAN, A., B. SCHROEDER, and A. MOSIER. 1995. Sea turtle nesting activity in the State of Florida 1979–1992. *Florida Marine Research Publications* No. 52. 51 p.

- MORTIMER, J. A. 1979. Ascension Island: British jeopardize 45 years of conservation. *Marine Turtle Newsletter* 10:7-8.
- MORTIMER, J. A. 1982. Factors affecting beach selection by nesting sea turtles. Pp. 45-51 in K. A. Bjorndal, ed. *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- MROSOVSKY, N. 1970. The influence of the sun's position and elevated cues on the orientation of hatchling sea turtles. *Animal Behaviour* 18:648-651.
- MROSOVSKY, N. 1972. The water-finding ability of sea turtles. *Brain Behavior and Evolution* 5:202-225.
- MROSOVSKY, N. 1977. Individual differences in the sea-finding mechanism of hatchling leatherback turtles. *Brain Behavior and Evolution* 14:261-273.
- MROSOVSKY, N. 1978. Effects of flashing lights on sea-finding behavior of green turtles. *Behavioral Biology* 22:85-91.
- MROSOVSKY, N., and A. CARR. 1967. Preference for light of short wavelengths in hatchling green sea turtles, *Chelonia mydas*, tested on their natural nesting beaches. *Behaviour* 28:217-231.
- MROSOVSKY, N., and S. F. KINGSMILL. 1985. How turtles find the sea. *Zeitschrift fur Tierpsychologie* 67:237-256.
- MROSOVSKY, N., and S. J. SHETTLEWORTH. 1968. Wavelength preferences and brightness cues in the water-finding behaviour of sea turtles. *Behaviour* 32:211-257.
- MROSOVSKY, N., and S. J. SHETTLEWORTH. 1974. Further studies on the sea-finding mechanism in green turtle hatchlings. *Behaviour* 51:195-208.
- MROSOVSKY, N., and S. J. SHETTLEWORTH. 1975. On the orientation circle of the leatherback turtle, *Dermochelys coriacea*. *Animal Behaviour* 23:568-591.
- MROSOVSKY, N., A. M. GRANDA, and T. HAY. 1979. Seaward orientation of hatchling turtles: turning systems in the optic tectum. *Brain Behavior and Evolution* 16:203-221.
- MURPHY, T. 1985. Telemetric monitoring of nesting loggerhead sea turtles subjected to disturbance on the beach. Unpublished paper presented at the Fifth Annual Workshop on Sea Turtle Biology and Conservation, 13-16 February 1985.
- NATIONAL RESEARCH COUNCIL. 1990. *Decline of the Sea Turtles: Causes and Prevention*. National Academy Press, Washington, D.C. 259 p.
- NELSON, D. A. 1992. Night orientation in sea turtles. Pp. 83-86 in M. Salmon and J. Wyneken, eds. *Proceedings of the Eleventh Annual Workshop on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-302.
- NEVILLE, A., W. D. WEBSTER, J. F. GOUVEIA, E. L. HENDRICKS, I. HENDRICKS, G. MARVIN, and W. H. MARVIN. 1988. The effects of nest temperature on hatchling emergence in the loggerhead sea turtle (*Caretta caretta*). Pp. 71-73 in B. A. Schroeder, ed. *Proceedings of the Eighth Annual Workshop on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFC-214.
- NORTHMORE, D. P. M., and A. M. GRANDA. 1982. Mechanisms of amphibious accommodation in turtles. *Society for Neuroscience Abstracts* 8:699.
- NORTHMORE, D. P. M., and A. M. GRANDA. 1991. Ocular dimensions and schematic eyes of freshwater and sea turtles. *Visual Neuroscience* 7:627-635.
- O'HARA, J. 1980. Thermal influences on the swimming speed of loggerhead turtle hatchlings. *Copeia* 1980:773-780.
- PARKER, G. H. 1922. The crawling of young loggerhead turtles toward the sea. *Journal of Experimental Zoology* 6:323-331.
- PETERS, A., and K. J. F. VERHOEVEN. 1994. Impact of artificial lighting on the seaward orientation of hatchling loggerhead turtles. *Journal of Herpetology* 28:112-114.
- PHILIBOSIAN, R. 1976. Disorientation of hawksbill turtle hatchlings, *Eretmochelys imbricata*, by stadium lights. *Copeia* 1976:824.
- PRITCHARD, P. C. H., and R. MARQUEZ M. 1973. Kemp's ridley turtle or Atlantic ridley, *Lepidochelys kempii*. IUCN Monograph No. 2. Marine Turtle Series. Morges, Switzerland. 30 p.
- PROFFITT, C. E., R. E. MARTIN, R. G. ERNEST, B. J. GRAUNKE, S. E. LECROY, K. A. MULDOON, B. D.

- PEERY, J. R. WILCOX, and N. WILLIAMS-WALLS. 1986. Effects of power plant construction and operation on the nesting of the loggerhead sea turtle (*Caretta caretta*): 1971–84. *Copeia* 1986:813–816.
- RAYMOND, P. W. 1984a. Sea turtle hatchling disorientation and artificial beachfront lighting. Center for Environmental Education, Washington, D.C. 72 p.
- RAYMOND, P. W. 1984b. The effects of beach restoration on marine turtles nesting in south Brevard County, Florida. Unpublished Master's Thesis, University of Central Florida, Orlando. 112 p.
- REINERS, R., M. SALMON, and C. LAVIN. 1993. Hatchling misorientation on an urban beach (Boca Raton, Florida). P. 146 in B. Schroeder and B. Witherington, eds. Proceedings of the Thirteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFC-341.
- ROSSOTTI, H. 1983. *Colour*. Princeton University Press, Princeton, New Jersey. 239 p.
- SALMON, M., and K. J. LOHMANN, 1989. Orientation cues used by hatchling loggerhead sea turtles (*Caretta caretta*, L.) during offshore migration. *Ethology* 83:215–228.
- SALMON, M., and B. E. WITHERINGTON. 1995. Artificial lighting and seafinding by loggerhead hatchlings: Evidence for lunar modulation. *Copeia* 1995:931–938.
- SALMON, M., and J. WYNEKEN. 1987. Orientation and swimming behavior of hatchling loggerhead turtles *Caretta caretta* L. during their offshore migration. *Journal of Experimental Marine Biology and Ecology* 109:137–153.
- SALMON, M., and J. WYNEKEN. 1990. Do swimming loggerhead sea turtles (*Caretta caretta* L.) use light cues for offshore orientation? *Marine Behavior and Physiology* 17:233–246.
- SALMON, M., R. REINERS, C. LAVIN, and J. WYNEKEN. 1995a. Behavior of loggerhead sea turtles on an urban beach. I. Correlates of nest placement. *Journal of Herpetology* 29:560–567.
- SALMON, M., M. G. TOLBERT, D. P. PAINTER, M. GOFF, and R. REINERS. 1995b. Behavior of loggerhead sea turtles on an urban beach. II. Hatchling orientation. *Journal of Herpetology* 29:568–576.
- SALMON, M., J. WYNEKEN, E. FRITZ, and M. LUCAS. 1992. Seafinding by hatchling sea turtles: role of brightness, silhouette and beach slope as orientation cues. *Behaviour* 122:56–77.
- SCHÖNE, H. 1984. *Spatial Orientation*. Princeton University Press, Princeton, N. J. 347 p.
- STONEBURNER, D. L., and J. I. RICHARDSON. 1981. Observations on the role of temperature in loggerhead turtle nest site selection. *Copeia* 1981: 238–241.
- TALBERT, O. R., JR., S. E. STANCYK, J. M. DEAN, and J. M. WILL. 1980. Nesting activity of the loggerhead turtle (*Caretta caretta*) in South Carolina. I. A rookery in transition. *Copeia* 1980:709–719.
- VAN METER, V. B. 1992. *Florida's Sea Turtles*. Florida Power and Light Company. 60 p.
- VAN RHIJN, F. A. 1979. Optic orientation in hatchlings of the sea turtle, *Chelonia mydas*. I. Brightness: not the only optic cue in sea-finding orientation. *Marine Behavior and Physiology* 6:105–121.
- VAN RHIJN, F. A., and J. C. VAN GORKOM. 1983. Optic orientation in hatchlings of the sea turtle, *Chelonia mydas*. III. Sea-finding behaviour: the role of photic and visual orientation in animals walking on the spot under laboratory conditions. *Marine Behavior and Physiology* 9:211–228.
- VERHEIJEN, F. J. 1958. The mechanisms of the trapping effect of artificial light sources upon animals. *Les Archives Neerlandaises de Zoologie* 13:1–107.
- VERHEIJEN, F. J. 1978. Orientation based on directivity, a directional parameter of the animals' radiant environment. Pp. 447–458 in K. Schmidt-Koenig and W. T. Keeton, eds. *Animal Migration, Navigation, and Homing*. Springer-Verlag, Berlin.
- VERHEIJEN, F. J. 1985. Photopollution: artificial light optic spatial control systems fail to cope with. Incidents, causations, remedies. *Experimental Biology* 44:1–18.
- VERHEIJEN, F. J., and J. T. WILDSCHUT. 1973. The photic orientation of sea turtles during water finding behaviour. *Netherlands Journal of Sea Research* 7:53–67.
- WIBBLES, T. R. 1984. Orientation characteristics of

- immature Kemp's ridley sea turtles. NOAA Technical Memorandum NMFS-SEFC-131. 62 p.
- WILLIAMS-WALLS, N., J. O'HARA, R. M. GALLAGHER, D. F. WORTH, B. D. PEERY, and J. R. WILCOX. 1983. Spatial and temporal trends of sea turtle nesting on Hutchinson Island, Florida, 1971-1979. *Bulletin of Marine Science* 33:55-66.
- WITHAM, R. 1982. Disruption of sea turtle habitat with emphasis on human influence. Pp. 519-522 in K. A. Bjorndal, ed. *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- WITHERINGTON, B. E. 1986. Human and natural causes of marine turtle clutch and hatchling mortality and their relationship to hatchling production on an important Florida nesting beach. Unpublished Master's Thesis, University of Central Florida, Orlando. 141 p.
- WITHERINGTON, B. E. 1989. Beach lighting and the seaward orientation of hatchling sea turtles. Pp. 189-190 in S. Eckert, K. Eckert, and T. Richardson, eds. *Proceedings of the Ninth Annual Workshop on Sea Turtle Conservation and Biology*. NOAA Technical Memorandum NMFS-SEFC-232.
- WITHERINGTON, B. E. 1990. Photopollution on sea turtle nesting beaches: problems and next-best solutions. Pp. 43-45 in T. H. Richardson, J. I. Richardson, and M. Donnelly, eds. *Proceedings of the Tenth Annual Workshop on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFC-278.
- WITHERINGTON, B. E. 1991. Orientation of hatchling loggerhead turtles at sea off artificially lighted and dark beaches. *Journal of Experimental Marine Biology and Ecology* 149:1-11.
- WITHERINGTON, B. E. 1992a. Behavioral responses of nesting sea turtles to artificial lighting. *Herpetologica* 48:31-39.
- WITHERINGTON, B. E. 1992b. Sea-finding behavior and the use of photic orientation cues by hatchling sea turtles. Ph.D. Dissertation, University of Florida, Gainesville. UMI Dissertation Information Service, Ann Arbor. 241 p.
- WITHERINGTON, B. E. 1992c. How are hatchling sea turtles able, and unable, to locate the sea? Pp. 127-130 in M. Salmon and J. Wyneken, eds. *Proceedings of the Eleventh Annual Workshop on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-302.
- WITHERINGTON, B. E. In press. The problem of photopollution for sea turtles and other nocturnal animals. In J. R. Clemmons and R. Buchholz, eds. *Behavioral Approaches to Conservation in the Wild*. Cambridge University Press, Cambridge, England.
- WITHERINGTON, B. E., and K. A. BJORNDAL. 1991a. Influences of wavelength and intensity on hatchling sea turtle phototaxis: implications for sea-finding behavior. *Copeia* 1991:1060-1069.
- WITHERINGTON, B. E., and K. A. BJORNDAL. 1991b. Influences of artificial lighting on the seaward orientation of hatchling loggerhead turtles (*Caretta caretta*). *Biological Conservation* 55:139-149.
- WITHERINGTON, B. E., and M. SALMON. 1992. Predation on loggerhead turtle hatchlings after entering the sea. *Journal of Herpetology* 26:226-228.
- WITHERINGTON, B. E., C. CRADY, and L. BOLEN. 1996. A "hatchling orientation index" for assessing orientation disruption from artificial lighting. Pp. 344-347 in J. A. Keinath, D. E. Barnard, J. A. Musick, and B. A. Bell, eds. *Proceedings of the Fifteenth Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-387.
- WITHERINGTON, B. E., K. A. BJORNDAL, and C. M. McCABE. 1990. Temporal pattern of nocturnal emergence of loggerhead turtle hatchlings from natural nests. *Copeia* 1990:1165-1168.
- WITZELL, W. N., and A. C. BANNER. 1980. The hawksbill turtle (*Eretmochelys imbricata*) in Western Samoa. *Bulletin of Marine Science* 30:571-579.
- WORTH, D. F., and J. B. SMITH. 1976. Marine turtle nesting on Hutchinson Island, Florida, in 1973. *Florida Marine Research Publication* 18:1-17.
- WYNEKEN, J., M. SALMON and K. J. LOHMANN. 1990. Orientation by hatchling loggerhead sea turtles *Caretta caretta* L. in a wave tank. *Journal of Experimental Marine Biology and Ecology* 139:43-50.

APPENDICES

APPENDIX A

The following is a list of artificial light sources grouped by the level of disruption they are likely to cause sea turtles. The criteria used to group the sources came from studies of physiological spectral sensitivity (Granda and O'Shea, 1972), hatchling orientation with respect to laboratory light sources (Mrosovsky and Carr, 1967; Mrosovsky and Shettleworth, 1968; Mrosovsky, 1972; Witherington and Bjornald, 1991a; Witherington, 1992b) and commercial light sources (Dickerson and Nelson, 1988, 1989; Witherington, 1989; Witherington and Bjornald, 1991b; Ferreira *et al.*, 1992; Nelson, 1992; Witherington, 1992b), and spectral profiles of commonly used lamps (Anonymous, 1983; Rossotti, 1983; Anonymous, 1989; Witherington and Bjornald, 1991b). Effects are described as being extremely disruptive, highly disruptive, moderately disruptive, or minimally disruptive.

White, broad-spectrum, short-arc lighting (*extremely disruptive*).—These light sources include xenon and mercury arc lamps and are the brightest and highest-energy light sources commonly used. They emit wavelengths rather evenly across the visible spectrum (which is why they appear white) and in the ultraviolet spectrum as well. They are used principally for temporary, intense lighting needs.

White, broad-spectrum, electric-discharge lighting (*extremely disruptive*).—Mercury-vapor, metal-halide, and fluorescent-tube lighting are included in this group. Like sources in the preceding group, these sources emit wavelengths across the visible spectrum. They are used both indoors and outdoors. Fluorescent-tube lighting is becoming more common as an indoor source and is frequently used to light porches and outdoor signs.

Color-phosphor and tinted-fluorescent lighting ("blacklight" ultraviolet, violet, blue, green, and mixtures of these colors) (*extremely disruptive*).—As revealed to some extent by their colors, these electric-discharge tube lamps emit light principally in the short-wavelength end of the visible spectrum. The so-called "blacklight"-type fluorescent tubes, however, emit much of their light in the near-ultraviolet region. These blacklight tubes appear as a dim violet color to humans but are very disruptive to sea turtle hatchlings. Blacklights are often used as insect attractants in insect-electrocuting "bug-zappers." Tubes of other colors are principally used for decorative applications.

White, broad-spectrum, incandescent lighting (*extremely disruptive*).—Light emitted from incandescent sources comes from a glowing filament. This group includes quartz-tungsten-halogen and simple tungsten-filament sources. Without tinting, these sources emit wavelengths throughout the visible spectrum but less so in the short-wavelength end of the spectrum than the sources described above. Incandescent sources are commonly used as outdoor

floodlights, as indoor lighting (*i.e.*, the common light bulb), and as transient lighting (flashlights, lanterns, and electric torches).

Color-tinted incandescent lighting (blue and green) (*extremely disruptive*).—These colored sources are tinted so that they emit principally short-wavelength light; they are often used in decorative applications.

White, pressurized-fuel, glowing-element lanterns (*extremely disruptive*).—These portable lanterns are used for camping, fishing, and other transient nighttime activities.

High-pressure sodium vapor (HPS) lighting (*highly disruptive*).—HPS sources emit light with minor wavelength peaks in the blue and green regions and major peaks in the yellow and orange regions of the visible spectrum. The color of HPS sources is whitish golden to peach. Although less disruptive than the broad-spectrum white sources above, HPS is one of the most commonly used outdoor light sources in the USA and many other countries and is one of the most common causes of hatchling misorientation and mortality.

Open fires (*moderately to highly disruptive*).—Although fires are temporary light sources and emit less short-wavelength light than the sources above, they have been documented as a significant source of hatchling mortality. Unlike other attractive light sources, fires can kill hatchlings quickly (hatchlings are known to crawl into fires and die). The size and temperature of a fire determines how attractive it is to hatchlings.

Yellow-phosphor and amber-tinted fluorescent lighting and red tubes (*moderately disruptive*).—Yellow and amber fluorescent tubes emit principally red, yellow, and green wavelengths but do not exclude light in the blue region of the spectrum as well as yellow incandescent bulbs do. Yellow and amber fluorescent tubes are not generally marketed as "bug lights." Although they are more disrupt-

tive to sea turtles than yellow incandescent bulbs, yellow and amber fluorescents are far better than white or other colored tubes for use near nesting beaches. However, the hue of these yellow fluorescent lamps varies between manufacturers and can have a varied effect on sea-finding in hatchlings. Red tubes are typically used for decoration and can be of two types: red (or reddish), phosphor-fluorescent tubes and red, neon tubes. Reddish or red-purple fluorescent tubes can be very disruptive, depending upon the amount of short-wavelength light that they emit (purplish lights emit both blue and red light). Neon tubes are covered below.

Lamps with yellow or orange dichroic long-pass filters (*minimally to moderately disruptive*).—Because these filters are very good at attenuating short wavelengths, the type of lamp used with them matters little. Consequently, these filters may allow the use of lamps like metal-halide and HPS that have small and easily focused elements. These lamps can be used in more directional fixtures in order to reduce stray light. Dichroic filters are not standard off-the-shelf accessories for commercial fixtures but they have been used in some outdoor applications near nesting beaches.

Color-tinted incandescent lighting (yellow and red) (*minimally to moderately disruptive*).—Yellow or amber incandescent light bulbs (bug lights) are generally only weakly attractive to hatchlings for the same reason that they attract few insects — they emit little short-wavelength light. Although they are minimally disruptive for the most part, bug lights can interfere with sea-finding if they are numerous, of high wattage, or close to the nesting beach. Red-tinted incandescent sources are more variable in color than bug lights. Some red sources can turn purple or pinkish over time (an indication of greater short-wavelength emission) and become more attractive to hatchlings.

Low-pressure sodium vapor (LPS) lighting (*minimally disruptive*).—LPS is by far the least disruptive light source among those commonly used. LPS sources emit a light that is pure (monochromatic) yellow, a region of the spectrum that is only weakly attractive or even aversive (at higher intensities for loggerheads only) to orienting hatchlings. Because

LPS sources have poor color rendition, they are used principally for outdoor applications.

Red light-emitting diode (LED) lighting (*minimally disruptive*).—LEDs are miniature lamps that are not commonly used outdoors. In the future, LEDs may be used to a greater extent as sign lighting and pathway lighting. Red LEDs come close to being ideal for use near sea turtle nesting beaches. Red LEDs emit a pure-red light that does not vary in color over the life of the lamp, and because they are small, they light only a limited area. They are easy to hide from the beach and have a very long life. Green and amber LEDs are marketed but are much less preferred than red.

Neon tubes (*minimally disruptive*).—True neon tubes (not tinted tubes) are a pure-red light source. At present, neon is used almost exclusively for decorative purposes. Neon tubes can be difficult to shield, but their color makes them minimally disruptive. Potential applications include pathway and ground-level lighting.

Transient light sources (flashlights, electric torches, flash photography) (*disruptive characteristics vary*).—This lighting is placed in a separate category because it is generally in use for relatively short time periods. Most of these sources have white incandescent lamps and can be expected to affect sea turtles as the incandescent sources above do. Transient sources are well-known disruptors of sea-finding behavior in hatchlings and adults, but researchers are less certain about how transient sources may affect nesting turtles or those emerging from the ocean to nest. Many workers in the field believe that flashlights and flashes from cameras can turn emerging turtles back to the sea and alter the behavior of nesting turtles. Until additional evidence suggests otherwise, transient light sources should be used sparingly on sea turtle nesting beaches. If handheld lighting is to be used, deep-red filters should be fastened over the lens of the source. Red light appears much brighter to humans than it does to sea turtles and does not degrade the night vision of people using it. People using red light are able to acclimate to the dark, and most are surprised by how well they can see by starlight and moonlight alone.

APPENDIX B

A table of lamp types and their efficiency. Information sources were the lighting manufacturers and distributors listed in Appendix G. General suitability is based upon the lamp characteristics that may affect sea turtle nesting and hatchling orientation.

Lamp Type	General Suitability for Sea Turtle Nesting Beaches	Efficiency (lumens per watt, lamp only)	Common Wattages	Directional Control of Light	Initial Fixture Cost
White incandescent (including tungsten halogen)	poor	15-25	15-1,500	excellent	low
White fluorescent	poor	55-100	9-219	fair	moderate
Metal-halide	poor	80-100	70-1,000	good	high
Mercury-vapor	poor	20-60	40-1,000	good	moderate-high
High-pressure sodium vapor	poor-fair	67-140	35-1,000	good	high
Low-pressure sodium vapor	good	180	18-180	fair	high

APPENDIX C

The following table describes the generally available incandescent lamps (yellow, bug-light bulbs) that can be suitable for use near nesting beaches if employed properly. Lighted lamps are properly employed if they are not visible from the beach. These bulbs can be used in place of white light bulbs in incandescent fixtures (e.g., porch, balcony, doorway, walkway, stairway, and security lighting) and can be used in conjunction with motion-detector fixtures.

Manufacturer	Trade Name	Lamp Wattage
General Electric Lighting	40 A/Y Bug Lite	40
"	60 A/Y Bug Lite	60
"	100 A/Y Bug Lite	100
"	85 PAR/FL/BG Outdoor Floodlight	85
Osram Sylvania	15 A/Y	15
"	25 A/Y	25
"	40 A/Y	40
"	60 A/Y Bug Lite	60
"	100 A/Y Yellow Bug Lite	100
"	100 PAR/EL/Y/RP Yellow Flood	100
"	150 A/Y Yellow Bug Lite	150

Remarks: Other amber or yellow incandescent bulbs and floodlights are available from various manufacturers and are expected to be much better than comparable white incandescent lamps for applications near nesting beaches. However, yellow or amber color alone does not ensure that the lamp will, like true buglights, only moderately disrupt hatchling orientation. Amber-tinted, compact-fluorescent tubes are also sold and are far better than white fluorescent tubes but are not as acceptable as incandescent bug lights. *JANMAR Lighting* (Appendix G) offers 5-, 7-, 9-, and 13-watt (PL-5, PL-7, PL-9, and PL-13), amber-tinted compact-fluorescent tubes.

APPENDIX D

The following tables describe common styles of light fixtures that may be suitable for use near sea turtle nesting beaches if they are employed properly. Fixtures are properly employed if their light is neither directly nor indirectly visible from the beach. Other fixtures are listed here as conditionally acceptable for use near nesting beaches because they contain low-pressure sodium lamps. These light sources should be positioned so that their light is not directly visible from the beach. In all cases, LPS fixtures are greatly preferred to comparable incandescent or HID (high-intensity discharge) fixtures. Abbreviations are as follows: HPS = high-pressure sodium vapor, LPS = low-pressure sodium vapor, MV = mercury vapor, MH = metal halide, Incan. = incandescent, Fluor. = fluorescent.

For current information, choose the Sea Turtle link in the Florida Marine Research Institute web site.

Low-Profile Luminaires, Tier Lights

Used for safety along walkways and around pools and decks.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Intermatic, Inc.	Malibu Tier Lights	Low-voltage incandescent	11
"	Malibu Tier II Lights	"	7
"	Malibu Tier Deck Lights	"	7, 11
"	Malibu Dimension Prismatic	"	11
"	Malibu Shaded Tier Lights	"	11
"	Malibu Metal Tier Lights	"	11
"	Malibu Walklights	"	11
"	Malibu Mushroom Lights	"	11

Remarks: Tier lights are preferable to globe lights, pole-mounted lighting, or floodlights for applications near the crest of the dune or on the seaward side of buildings. However, the fixture should be positioned so that vegetation, topography, or buildings screen the light from the beach, or the fixture should be equipped with shields so that light sources are not visible from the beach. Optional timers are available for the models listed above.

Low-Profile Luminaires, Bollard Lights

Used for safety along walkways and around pools and decks. Also suitable for parking areas.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Lithonia Lighting	KBS6 (6" square bollard) ¹	incandescent	116 max.
"	KBS8 (8" square bollard) ¹	"	150 max.
"	KBR6 (6" round bollard) ¹	"	116 max.
"	KBR8 (8" round bollard) ¹	"	150 max.
Quality Lighting	Design 310 (16" bollard)	HPS ²	150
"		MH and MV ²	175
"	Design HB Post-mounted Luminaire	LPS	18 and 35
"	Design HBB Bollard	LPS	18
Spaulding Lighting	Fresno I LPS (square bollard) ³	LPS	18 and 35
"	Fresno II LPS (round bollard) ³	LPS	18 and 35
Sterner Lighting Systems	Softform Bayshore	incandescent	100 max.
"	Annapolis (square bollard)	"	150 max.
"		MV, MH, and HPS ²	175 max.
"	Annapolis (round bollard)	incandescent	150 max.
"		MV, MH, and HPS ²	175 max.

Remarks: See remarks for tier lighting. Many of the lamp wattages given here are maximum values for the fixture; the lowest-wattage lamp (and corresponding ballast) needed for a specific application should be used. Incandescent bug-light lamps and LPS are the most suitable for use near nesting beaches.

¹Half shields are available for Lithonia bollards.

²HID lamps (HPS, MV, MH) are not recommended for use close to nesting beaches because of the color and high light output of these lamps. LPS and incandescent bug-light lamps are good substitutes.

³Spaulding bollards should be used with optional internal louvers that provide a 90° light cutoff (a complete blocking of lateral light).

Low-Profile Luminaires, Miscellaneous Low-Level Lighting

Used for safety along walkways, around pools and decks, and in parking areas.
Rail lighting and tivolli lighting are used for lighting stairways, steps, and handrails.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Sterner Lighting Systems	Quantico	incandescent	150 max.
"		MH and HPS	175 max.
Lithonia Lighting	Softform Illuminated Rail ¹ Recessed Step Light ELA VSL H1212 ²	fluor. and incan.	varies
Starfire Lighting	Startube Linear Lighting ³	Low-volt. incan.	12
ERS, Inc.	Single-faced LED Strip Lighting ⁴	Low-volt. incan. Red LED	0.5 2 W per light strip
Hydrel	9600 Recessed Wall Lights with Filter ⁵	MH and HPS	100

Remarks: See remarks for tier and bollard lighting.

¹This lighting, which is hidden within handrails, is greatly preferred over elevated lighting for illuminating stairways and walkways. Where possible, incandescent bug-light lamps or amber-tinted fluorescent tubes should be used.

²This louvered lighting is recessed at foot- to waist-level within walls and is greatly preferred over elevated lighting for illuminating stairways and walkways.

³Linear lighting comes encased in plastic strips and is also sold under the trade names Tivoli, Xanadu, Track-tube, Tubelite, and Step Lite. Yellow tubes can be used with this lighting to further reduce effects on sea turtles. Linear lighting mounted at foot-level along walking paths or stairways is greatly preferred over elevated lighting.

⁴A very good light source for beach steps and walkovers. This lighting can be customized for many applications. Red LEDs (light-emitting diodes) should be specified.

⁵This fixture can be equipped with a yellow, dichroic, band-pass filter.

Wall- and Ceiling-Mounted Downlighting

Used for safety and security along walkways, near doorways, on balconies and porches, and along stairways.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Lithonia Lighting	Gotham Incandescent C Series Downlighting (includes wall-, ceiling-, and pendant-mounted cylinders and cuboids)	incandescent	50-300
Voigt Lighting	Pragmatic Universal Indoor/Outdoor Downlights	incandescent LPS	40-60 35

Remarks: Matte-black nonreflective baffles are recommended. For high-elevation applications (e.g., upper-story balconies) or applications near the beach, low-wattage bug-light lamps or LPS lamps are recommended.

Recessed, Ceiling Downlighting

Used for safety and security in place of floodlighting and globe lights. These fixtures are recessed into the soffit (positioned under eaves) or into porch and balcony ceilings.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Lithonia Lighting	Advantage Incandescent LPJ and LP Frame-in Modules	incandescent	75-150
"	Advantage Incandescent LICS, LICJ, and LICM Housings	incandescent	40-100
"	Gotham Incandescent: A, D, E, and R Series with black baffles	incandescent	100-200

Remarks: See remarks for wall- and ceiling-mounted downlighting.

Arm-Mounted and Pole-Top HID Cutoff Luminaires

Used for safety and security at parking areas, roadways, and other outdoor areas.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage	
Lithonia Lighting	KSF: Arm-mounted Premium Cutoff, HID	HPS	70–1,000	
		MH	100–1,000	
		MV	100–1,000	
	"	KVS: Arm-mounted Square Cutoff, HID	HPS	150–1,000
			MH	175–1,000
	"	KAS: Arm-mounted Rectilinear Cutoff, HID	HPS	70–1,000
			MH	100–1,000
	"	KQS: Square Post-top Cutoff, HID	HPS, MH, MV	250–1,000
"	KKS: Square Post-top Cutoff HID	HPS	70–400	
Quality Lighting	Design SND Arm-mounted Luminaire	MH	175–400	
		HPS	400	
	"	Design SJ Sharp-cutoff Arm-mounted Rectilinear Luminaire	MH	400
			HPS	150–1,000
			MH	250–1,000
"	Design SNDY Post-top	HPS, MH	400	
Sterner Lighting	Executive 20, 25, and 30	incandescent, HPS, MH	1,000 max.	
	Diplomat 20 and 25 (pole-top)	incandescent, HPS, MH	400 max.	
	LeBox (pole-top or wall- mount)	HPS, MH	1,000 max.	

Remarks: These HID fixtures are not recommended for applications within 50 meters of a nesting beach or where luminaires are visible from a nesting beach. However, these cutoff luminaires are preferred to less directional luminaires (*e.g.*, globe-style, cube-style, and cobra-head lighting). The luminaires listed here have optional shields that can further reduce the light reaching the beach. Specific reflectors can also be used with each fixture to better direct light. Arm-mounted LPS fixtures are greatly preferred over HID fixtures for the same applications.

Arm-Mounted and Pole-Top LPS Cutoff Luminaires

Used for safety and security at parking areas, roadways, and other outdoor areas.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Voigt Lighting	Slimliner LPS ¹	LPS	35, 55, 90, 135, 180
"	Wideliner LPS	LPS	35, 55, 90, 135
"	SEPOL (Sea turtle Environment Protective Outdoor Luminaire) ¹	LPS	18, 35, 55, 90, 135
Lithonia Lighting	KT: Arm-mounted Cutoff, LPS	LPS	90
Spaulding Lighting	Palomar LPS	LPS	35, 55, 90, 135, 180
"	Oakland LPS	LPS	35, 55, 90, 135, 180
"	Berkeley LPS	LPS	35, 55, 90, 135, 180
"	Phoenix LPS	LPS	35, 55, 90, 135, 180
"	Sunnyvale LPS	LPS	90, 135, 180
Quality Lighting	SM Series Arm-mounted Cutoff LPS	LPS	35, 55, 90, 135, 180
"	Designs SS/SE Rectilinear LPS	LPS	55, 90, 135, 180
Thomas Industries, Gardco Lighting	Form Ten/LPS Rectilinear		
"	Sharp Cutoff Luminaire ²	LPS	90, 135, 180
Sterner Lighting	Softform Pacific LPS	LPS	90, 135
Solar Outdoor Lighting	Solar LPS ²	LPS	18, 35,

Remarks: These cutoff luminaires are preferred to less directional luminaires (*e.g.*, globe-style, cube-style, and cobra-head fixtures). Optional shields on some fixtures can further reduce the light reaching the beach. Specific reflectors can also be used with each fixture to better direct their light. Arm-mounted LPS fixtures are greatly preferred over HID fixtures for the same applications.

¹Optional shields are available for these fixtures.

²These luminaires are powered by solar panels for use at remote locations.

LPS Ceiling-Mounted Fixtures

Used for safety and security at parking garages and large doorway and stairway areas.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Voigt Lighting	Slimliner LPS ¹	LPS	35, 55, 90, 135, 180
"	Under-decker LPS	LPS	35, 55, 90, 135, 180
"	SEPOL (Sea turtle Environment Protective Outdoor Luminaire) ¹	LPS	18, 35, 55, 90, 135
"	Indoor/Outdoor Frugalume II	LPS	35, 55
Spaulding Lighting	Troy LPS Ceiling Mount Luminaire	LPS	18, 35, 55, 90, 135, 180
Thomas Industries, Benjamin Division	New Horizon/OLH Ceiling Mount Luminaire	LPS	35
"	Intensifier/IVP Ceiling Mount Luminaire	LPS	35, 55, 90, 135, 180

Remarks: Ceiling-mounted luminaires on upper stories facing the beach should be shielded or positioned so that their light is not visible from the beach.

¹Optional shields are available for these fixtures.

LPS Wall-Mounted Fixtures

Used for safety and security at parking garages, walkways, and large doorway and stairway areas.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Lithonia Lighting	KTW: Wall Pak, LPS with Full Shield	LPS	90
"	TWH: Glass Refractor Wall Pak	LPS	35
Quality Lighting	Design NW-II: Aluminum Wall Pak	LPS	18
"	Design NW-IV: Aluminum Wall Pak	LPS	90, 135, 180
Spaulding Lighting	Mesa LPS Wall Pack	LPS	35, 55, 90
"	Phoenix LPS Luminaire, PWM	LPS	35, 55, 90, 135, 180
"	Scottsdale LPS Wall Mount	LPS	35, 55
Thomas Industries, Benjamin Division	LEO, OLB, and OLW Luminaires	LPS	18
"	OWP Wall Mount LPS	LPS	35, 55
Voigt Lighting	Pragmatic Universal Downlight	LPS	35
"	Little Protector Wall Mount	LPS	10, 18
"	Midas Touch Wall Mount ¹	LPS	18

Remarks: The light from these wall-mounted fixtures is typically poorly directed, but these fixtures are highly recommended when their light will not be directly visible from the beach. Small 10- and 18-watt LPS fixtures are greatly preferred to incandescent and HID luminaires for porches, balconies, and doorways on the beach side of buildings.

¹Has an optional internal shield.

Floodlighting Fixtures, LPS and HID

Used for safety and security at large walkways, parking lots, road intersections, and other expansive areas.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Voigt Lighting	Wall-Most LPS Flood ¹	LPS	35, 55, 90, 135, 180
Sterner Lighting	Model 871, 872, 875, and 876 Area Lighting	HPS	250, 400, 1,000

Remarks: Floodlighting can be directed well. Floodlighting is properly directed if it faces away from the beach and is mounted at an elevated position facing downward rather than mounted low and facing upward. LPS fixtures are greatly preferred over HID fixtures for applications near nesting beaches. In all cases, care should be taken not to brightly illuminate buildings and other large objects visible from the nesting beach.

¹This fixture has an optional internal uplight shield.

Motion-Detector Lighting

Used for safety and security at walkways, yards, doorways, stairways, and storage areas.

Manufacturer	Trade Name	Lamp Type	Lamp Wattage
Heath Zenith	Reflex Professional Motion Sensor Model SL 5314	incandescent	15-300
Intelectron	Motion Detector Conversion Kit Model BC 8950	incandescent	15-300
"	Motion Detector Security Light Model BC 8700 KW	incandescent	15-300

Remarks: Motion-detector lighting fixtures switch on when approached by moving objects and remain on for a specified time, which can be set at the fixture. This specified time should be 30 seconds or less for fixtures near nesting beaches. To reduce impacts to sea turtles to the greatest extent, yellow bug-light bulbs should be used with these fixtures. If floodlights are used, they should be directed away from the nesting beach.

APPENDIX E

Diagrams of common lighting fixtures showing mounting position, light distribution, and overall suitability for use near sea turtle nesting beaches. For purposes of recommending suitable mounting distances from nesting beaches, the crest of the primary dune is considered to be the landward limit of the beach. Fixtures are assessed for their suitability in minimizing direct and indirect lighting of the beach. For all fixtures, glowing portions of luminaires (including reflectors and globes) should not be visible from the nesting beach.

WALL-MOUNTED AREA LIGHTING

MOUNTING SUITABILITY:

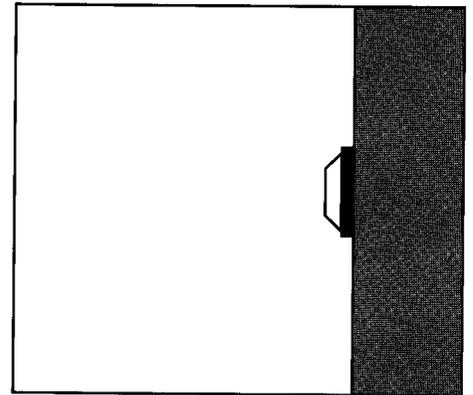
Poor. Very poor when mounted on upper stories.

DIRECTIONAL SUITABILITY:

Poor.

OVERALL SUITABILITY:

Poor. Not suitable for the beach sides of buildings.



WALL-MOUNTED AREA LIGHTING, "WALL PAK"

MOUNTING SUITABILITY:

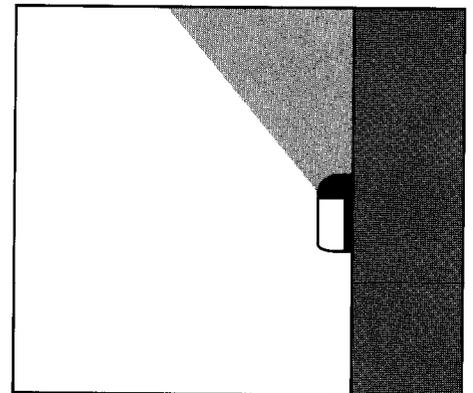
Poor. Very poor when mounted on upper stories.

DIRECTIONAL SUITABILITY:

Poor.

OVERALL SUITABILITY:

Poor. Not suitable for the beach sides of buildings.



DECORATIVE CUBE LIGHT

MOUNTING SUITABILITY:

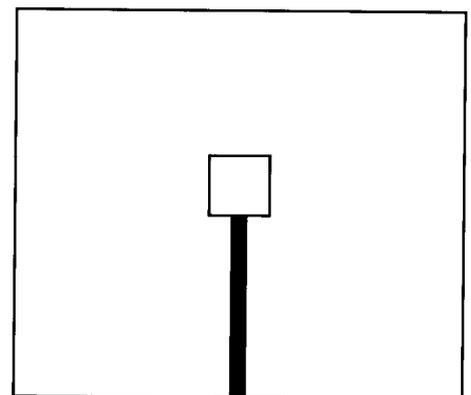
Fair if mounted at heights lower than 2 m. Poor if mounted higher.

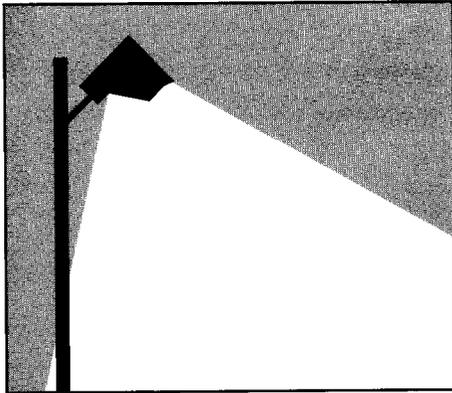
DIRECTIONAL SUITABILITY:

Very poor.

OVERALL SUITABILITY:

Very poor. This fixture is difficult to shield and should not be used near nesting beaches.





POLE-MOUNTED FLOODLIGHTING WITH FULL VISOR

MOUNTING SUITABILITY:

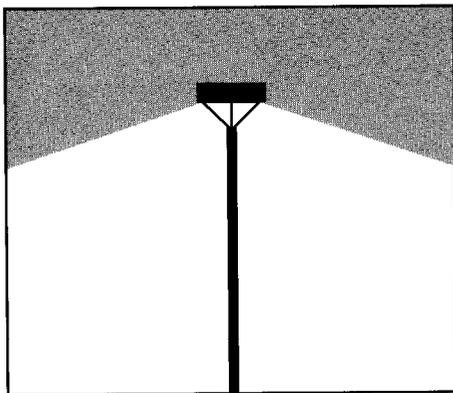
Good if directed downward and away from the beach.

DIRECTIONAL SUITABILITY:

Good.

OVERALL SUITABILITY:

Good if directed downward and away from the nesting beach and if light does not illuminate objects visible from the beach.



POLE-TOP-MOUNTED CUTOFF LIGHTING, "SHOEBOX" FIXTURE

MOUNTING SUITABILITY:

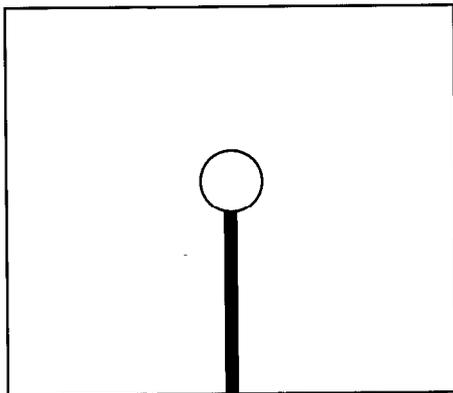
Good to poor, depending on mounting height. Mounting height should be no more than 5 m within 100 m of a nesting beach.

DIRECTIONAL SUITABILITY:

Fair to good, as determined by reflectors.

OVERALL SUITABILITY:

Fair to good when mounting heights are low.



DECORATIVE GLOBE LIGHT

MOUNTING SUITABILITY:

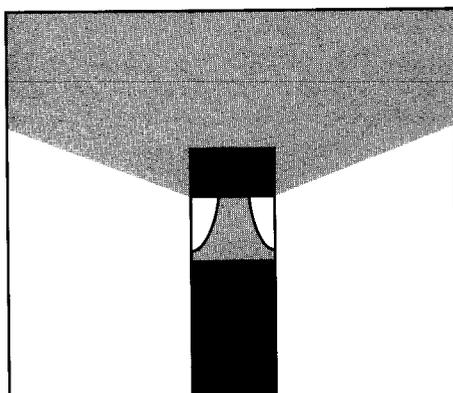
Fair if mounted at heights lower than 2 m. Poor if mounted higher.

DIRECTIONAL SUITABILITY:

Very poor.

OVERALL SUITABILITY:

Very poor. This fixture is difficult to shield and should not be used near nesting beaches.



LIGHTING BOLLARD WITH HIDDEN LAMP

MOUNTING SUITABILITY:

Good if mounting height is near 1 m.

DIRECTIONAL SUITABILITY:

Poor to fair.

OVERALL SUITABILITY:

Fair. Good if additional shields on the beach side of the fixture are used.

LOW-LEVEL "MUSHROOM" LIGHTING

MOUNTING SUITABILITY:

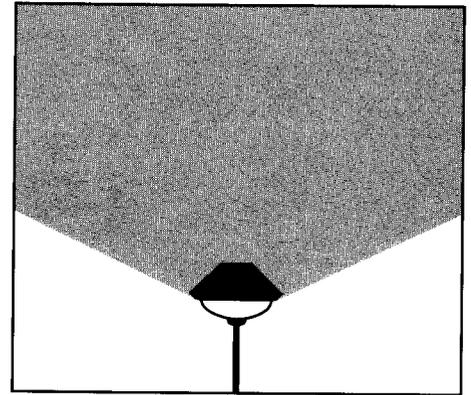
Good if mounted at foot level.

DIRECTIONAL SUITABILITY:

Poor.

OVERALL SUITABILITY:

Fair. Good to excellent if used so that vegetation and topography block its light from the beach.



LOW-LEVEL "TIER" LIGHTING

MOUNTING SUITABILITY:

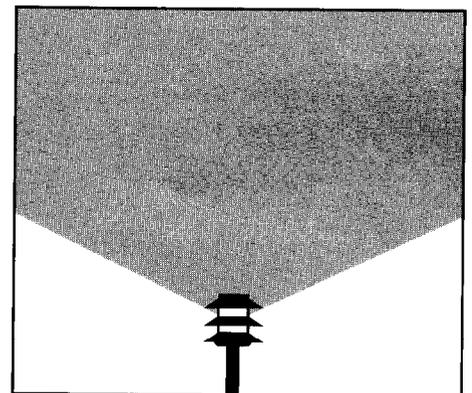
Good if mounted at foot level.

DIRECTIONAL SUITABILITY:

Poor but can be good if the fixture has louvers that eliminate lateral light.

OVERALL SUITABILITY:

Fair. Good to excellent if used so that vegetation and topography block its light from the beach.



LIGHTING BOLLARD WITH LOUVERS

MOUNTING SUITABILITY:

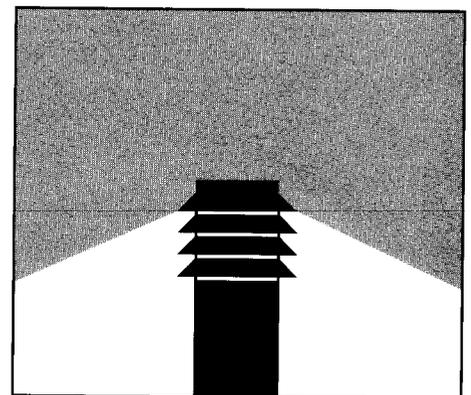
Good if mounting height is near 1 m.

DIRECTIONAL SUITABILITY:

Good.

OVERALL SUITABILITY:

Good.



GROUND-MOUNTED FLOODLIGHTING

MOUNTING SUITABILITY:

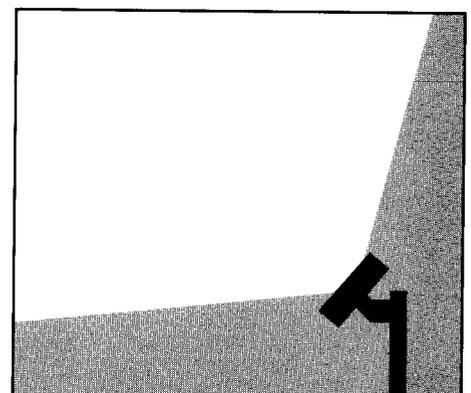
Poor, because of its upward aim.

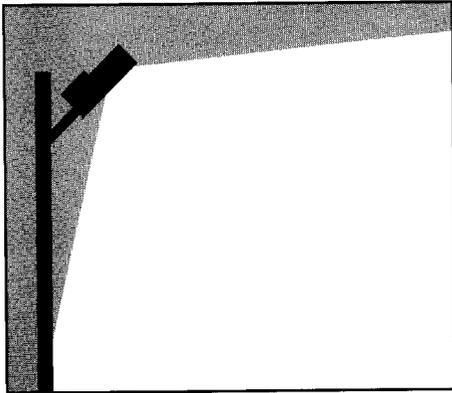
DIRECTIONAL SUITABILITY:

Fair to good.

OVERALL SUITABILITY:

Fair to poor if directed away from the beach. Very poor if directed toward the beach.





POLE-MOUNTED FLOODLIGHTING

MOUNTING SUITABILITY:

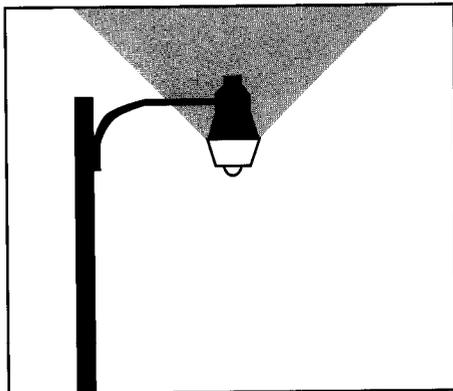
Fair if directed downward and away from the beach.

DIRECTIONAL SUITABILITY:

Fair to good.

OVERALL SUITABILITY:

Fair to good if aimed downward and directly away from the nesting beach and if light does not illuminate objects visible from the beach. Otherwise, poor to very poor.



ARM-MOUNTED AREA LIGHTING, "OPEN-BOTTOM" OR "BARN LIGHT" FIXTURE

MOUNTING SUITABILITY:

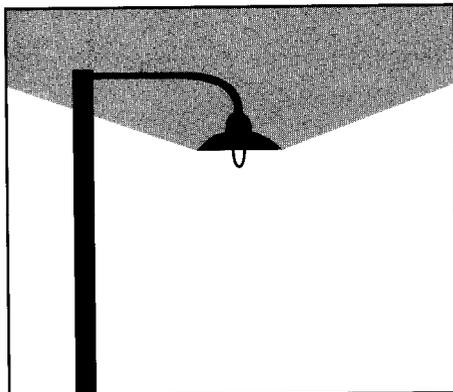
Poor to very poor, depending upon mounting height. Should not be mounted higher than 5 m within 150 m of a nesting beach.

DIRECTIONAL SUITABILITY:

Poor if unshielded. Fair if shielded.

OVERALL SUITABILITY:

Poor.



ARM-MOUNTED AREA LIGHTING, DECORATIVE "PENDANT" FIXTURE

MOUNTING SUITABILITY:

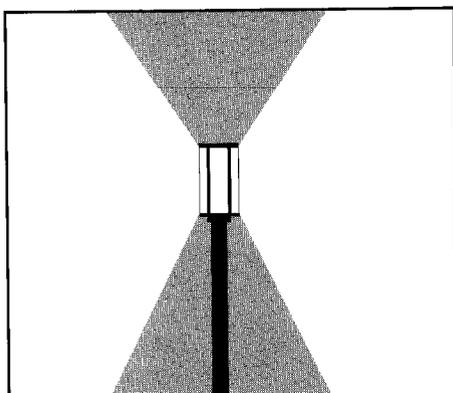
Poor to very poor, depending upon mounting height. Should not be mounted higher than 5 m within 150 m of a nesting beach.

DIRECTIONAL SUITABILITY:

Poor. Difficult to shield properly.

OVERALL SUITABILITY:

Poor.



DECORATIVE "CARRIAGE" LIGHTING

MOUNTING SUITABILITY:

Fair if mounted at heights lower than 2 m. Poor if mounted higher.

DIRECTIONAL SUITABILITY:

Very poor. Fair if properly shielded.

OVERALL SUITABILITY:

Poor.

**ARM-MOUNTED CUTOFF LIGHTING,
"SHOEBOX" FIXTURE****MOUNTING SUITABILITY:**

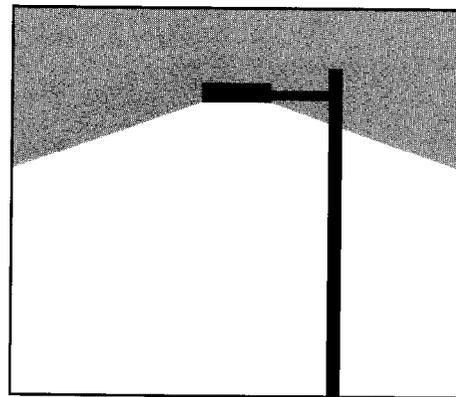
Good to poor, depending on mounting height. Mounting height should be no more than 5 m within 100 m of a nesting beach.

DIRECTIONAL SUITABILITY:

Fair to good, as determined by reflectors.

OVERALL SUITABILITY:

Fair to good when mounting heights are low and fixtures are aimed directly downward.

**ARM-MOUNTED AREA LIGHTING,
"COBRAHEAD" FIXTURE****MOUNTING SUITABILITY:**

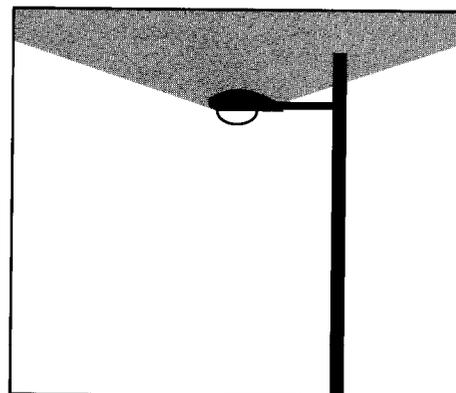
Poor to very poor, depending on mounting height. Mounting height should be no more than 5 m within 150 m of a nesting beach.

DIRECTIONAL SUITABILITY:

Poor. Difficult to shield properly.

OVERALL SUITABILITY:

Poor.

**ARM-MOUNTED AREA LIGHTING,
"FLAT-FACE" CUTOFF FIXTURE****MOUNTING SUITABILITY:**

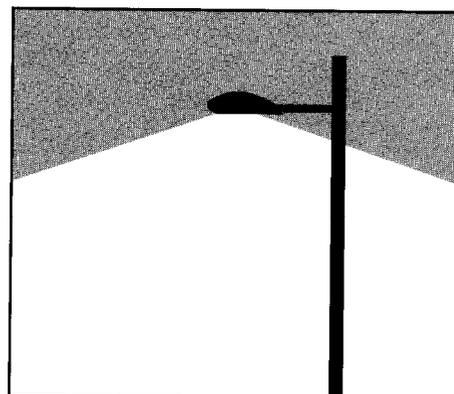
Good to poor, depending on pole height. Mounting height should be no more than 5 m within 100 m of a nesting beach.

DIRECTIONAL SUITABILITY:

Fair to good, as determined by reflectors.

OVERALL SUITABILITY:

Fair to good when mounting heights are low.

**SIGN LIGHTING, BOTTOM-UP STYLE****MOUNTING SUITABILITY:**

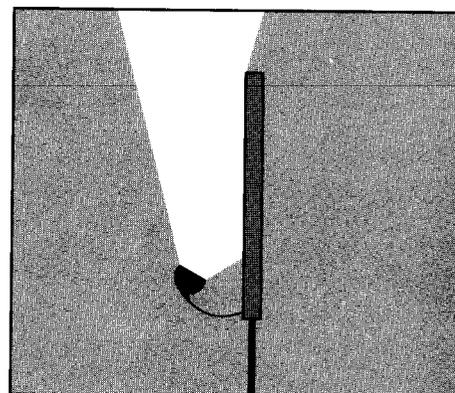
Poor, because of its potential for producing uplight scatter.

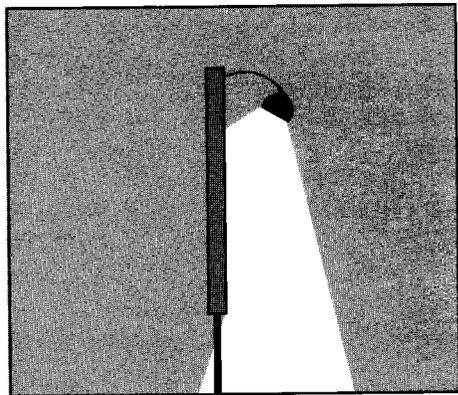
DIRECTIONAL SUITABILITY:

Poor to good.

OVERALL SUITABILITY:

Poor. Signs near nesting beaches should be lighted from the top down. In no case should lighted signs be visible from the beach.





SIGN LIGHTING, TOP-DOWN STYLE

MOUNTING SUITABILITY:

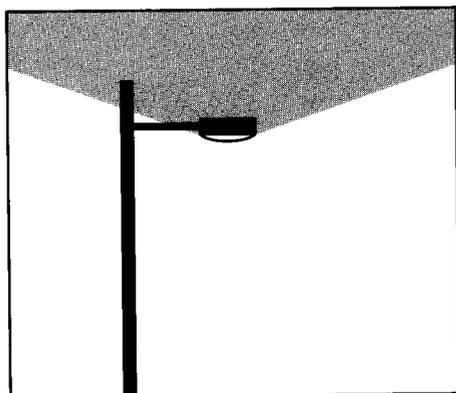
Good.

DIRECTIONAL SUITABILITY:

Poor to good.

OVERALL SUITABILITY:

Generally good if the sign is not visible from the beach and if the lighting is well aimed.



ARM-MOUNTED AREA LIGHTING, FIXTURES WITH REFRACTING GLOBES OR CONVEX LENSES

MOUNTING SUITABILITY:

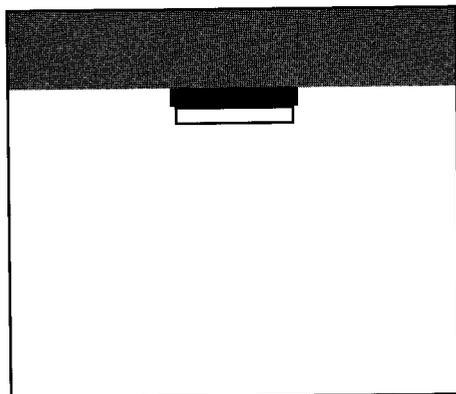
Poor to very poor, depending upon mounting height. Mounting height should be no more than 5 m within 150 m of a nesting beach.

DIRECTIONAL SUITABILITY:

Poor. Fair to good if shielded properly.

OVERALL SUITABILITY:

Poor.



CEILING-MOUNTED AREA LIGHTING, FIXTURES WITH REFRACTING GLOBES OR CONVEX LENSES

MOUNTING SUITABILITY:

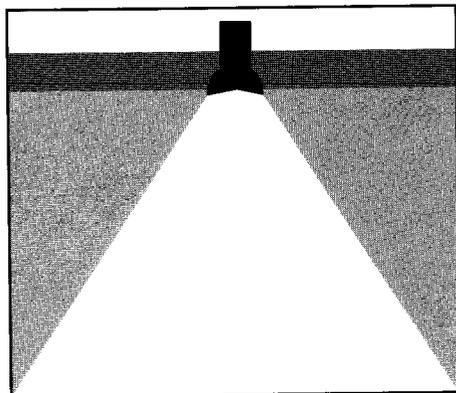
Poor if mounted on the beach sides of buildings or on upper stories. Good if shielded from the beach by buildings.

DIRECTIONAL SUITABILITY:

Poor.

OVERALL SUITABILITY:

Poor to fair, depending upon mounting location.



CEILING-RECESSED DOWNLIGHTING WITH BAFFLES TO ELIMINATE LATERAL LIGHT

MOUNTING SUITABILITY:

Good to excellent when mounted in lower-story ceilings and soffits.

DIRECTIONAL SUITABILITY:

Excellent.

OVERALL SUITABILITY:

Good to excellent.

WALL-MOUNTED AREA LIGHTING, "JELLY-JAR" PORCH LIGHT FIXTURE

MOUNTING SUITABILITY:

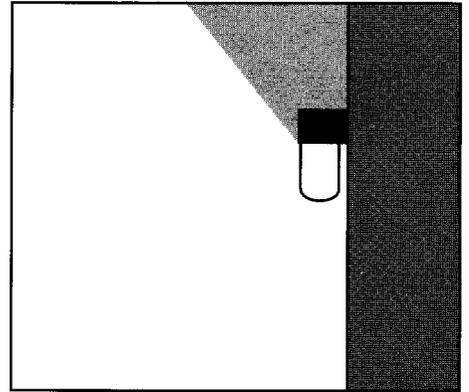
Poor. Very poor when mounted on upper stories.

DIRECTIONAL SUITABILITY:

Poor.

OVERALL SUITABILITY:

Poor.



LINEAR TUBE LIGHTING

MOUNTING SUITABILITY:

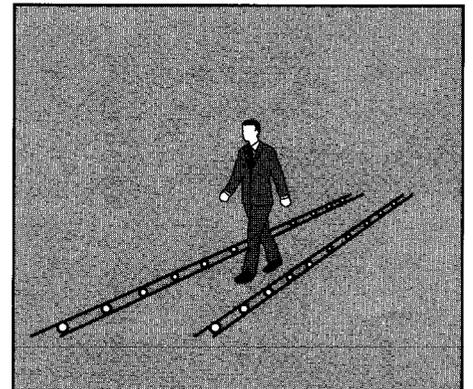
Excellent if mounted at foot level.

DIRECTIONAL SUITABILITY:

Fair to poor, but this lighting is of concern only if mounted high or if large numbers of high-wattage (>3 W) lamps are used.

OVERALL SUITABILITY:

Excellent if low-wattage strips are used sparingly in recessed areas.



LOUVERED STEP LIGHTING

MOUNTING SUITABILITY:

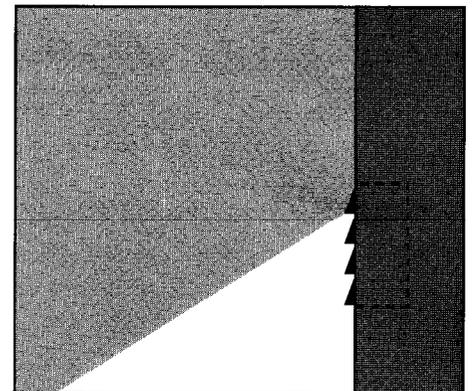
Excellent if mounted at foot level.

DIRECTIONAL SUITABILITY:

Excellent.

OVERALL SUITABILITY:

Excellent.



WALL-MOUNTED DOWNLIGHTING

MOUNTING SUITABILITY:

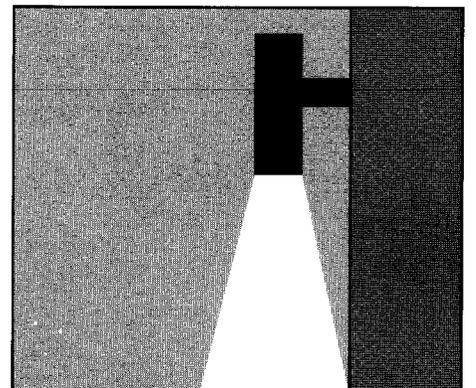
Good to excellent when mounted on lower-story walls.

DIRECTIONAL SUITABILITY:

Excellent.

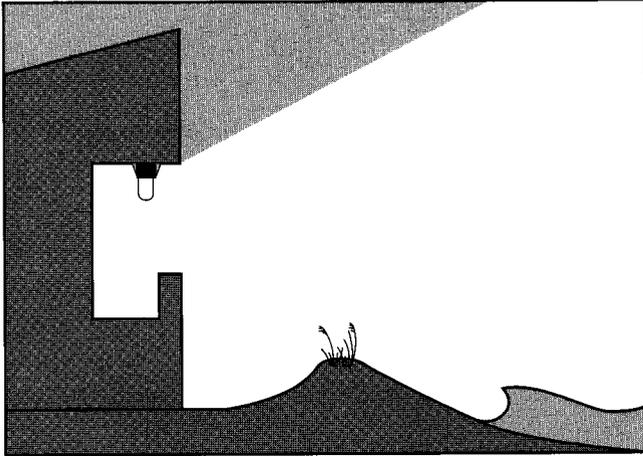
OVERALL SUITABILITY:

Good to excellent.



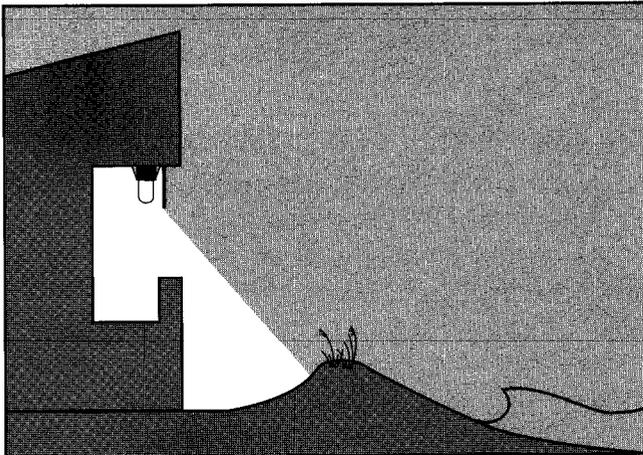
APPENDIX F

Diagrams depicting solutions to two common lighting problems near sea turtle nesting beaches:
balcony or porch lighting and parking-lot lighting.



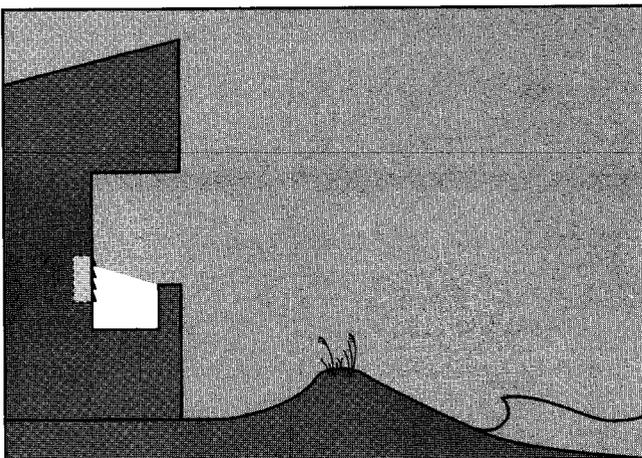
POOR

Poorly directed balcony lighting can cause problems on sea turtle nesting beaches.



BETTER

Completely shielding fixtures with a sheet of metal flashing can reduce stray light reaching the beach.

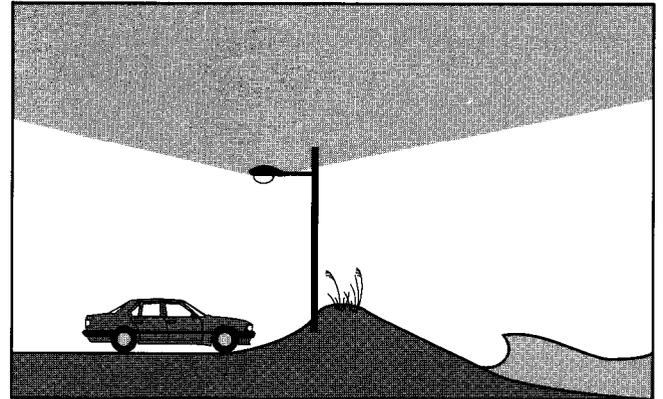


BEST

Louvered step lighting is one of the best ways to light balconies that are visible from nesting beaches.

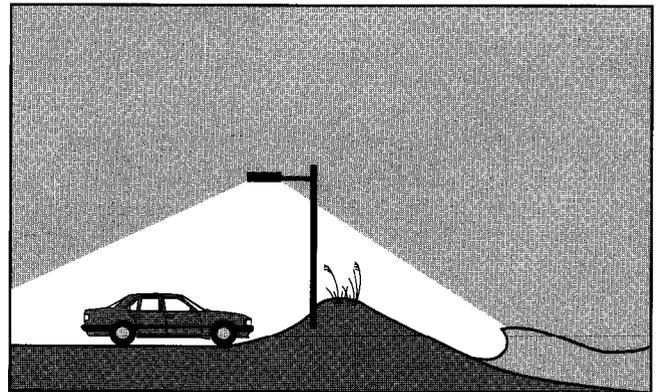
POOR

Poorly directed parking lot lighting can cause problems on sea turtle nesting beaches.



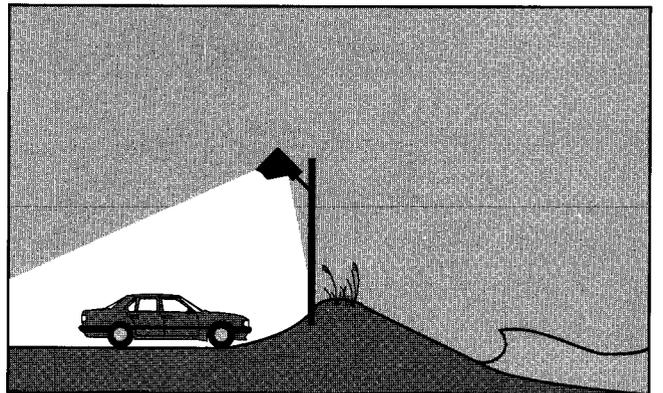
BETTER

Fixtures with 90° cutoff angles can reduce the amount of stray light reaching the beach.



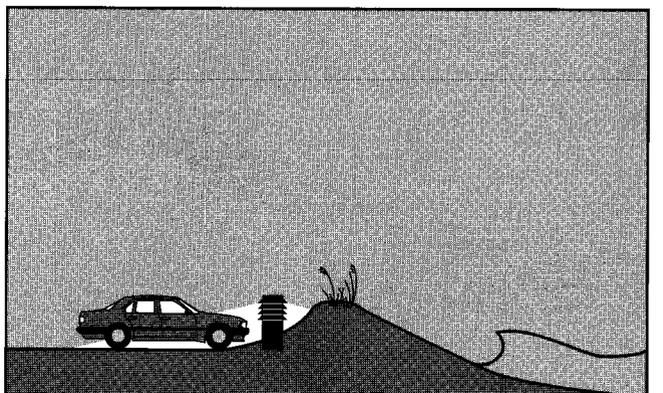
MUCH BETTER

Fully hooded fixtures can direct light accurately and reduce stray light even more.



BEST

Low-mounted, louvered bollard fixtures are the best way to light parking lots near nesting beaches.



APPENDIX G

The following is a list of lighting and window-treatment manufacturers and distributors. For current information, choose the Sea Turtle link in the Florida Marine Research Institute web site.

AFG Industries, Inc.

(tinted glass)

P.O. Box 929
Kingsport, Tennessee 37662 USA
PHONE: 423-229-7200
FAX: 423-229-7211

ERS

(lamps, fixtures)

5106 Bird Lane
Winter Haven, Florida 33884 USA
PHONE: 813-324-7291

General Electric

(lamps)

GE Lighting
1975 Noble Road
Cleveland, Ohio 44112 USA
PHONE: 216-266-2653; 800-435-4448
FAX: 216-266-2780

Heath-Zenith

(lamps, fixtures)

2701 Industrial Drive
P.O. Box 90004
Bowling Green, KY 42102-9004 USA
PHONE: 502-745-7700
FAX: 502-745-7800

Hubbell Lighting, Inc.

(lamps, fixtures, shields)

2000 Electric Way
Christiansburg, Virginia 24073-2500 USA
PHONE: 540-382-6111
FAX: 540-382-1526

Hydrel

(lamps, fixtures)

12881 Bradley Avenue
Sylmar, California 91342 USA
PHONE: 818-362-9465
FAX: 818-362-6548

Intermatic, Inc.

(lamps, fixtures)

Intermatic Plaza
Spring Grove, Illinois 60081-9698 USA
PHONE: 815-675-2321
FAX: 815-675-7055

Janmar Lighting

(lamps, fixtures)

730 West Golden Grove Way
Covina, California 91732 USA
PHONE: 626-858-6776
FAX: 626-967-0314

LEDTronics

(lamps)

23105 Kashiwa Court
Torrance, California 90505 USA
PHONE: 310-534-1505
FAX: 310-534-1424

Lithonia Lighting

(lamps, fixtures)

P.O. Box A
Conyers, Georgia 30207 USA
PHONE: 770-922-9000
FAX: 770-860-3183

Osram Sylvania Incorporated

(lamps)

100 Endicott Street
Danvers, Massachusetts 01923-3623 USA
PHONE: 978-777-1900 or 800-544-4828
FAX: 978-750-2152

Patch Works

(shields)

Pompano Beach, Florida USA
PHONE: 954-784-2314

Phifer Sunscreen

(window light shades)

P.O. Box 1700
Tuscaloosa, Alabama 35403 USA
PHONE: 205-345-2120 or 800-633-5955
FAX: 205-759-4450

PPG Industries*(tinted glass)*

Flat Glass Technical Services
One PPG Place, 31N
Pittsburgh, Pennsylvania 15272 USA
PHONE: 412-434-2858
FAX: 412-434-3675

Quality Lighting*(lamps, fixtures)*

P.O. Box 1389
Franklin Park, Illinois 60131-0309 USA
PHONE: 847-451-0040
FAX: 847-451-6768

SOL, Solar Outdoor Lighting, Inc.*(solar lighting)*

3131 SE Waaler Street
Stuart, Florida 34997 USA
PHONE: 561-286-9461
FAX: 561-286-9616

Solargard*(window tint)*

2400 West Copans Road, Suite #7
Pompano Beach, Florida 33069 USA
PHONE: 800-282-9031

Southwall Technologies*(tinted glass)*

1029 Corporation Way
Palo Alto, California 94303 USA
PHONE: 650-962-9111
FAX: 650-967-8713

Spaulding Lighting*(lamps, fixtures)*

1736 Dreman Avenue
Cincinnati, Ohio 45223 USA
PHONE: 513-541-3486
FAX: 513-541-1454

Starfire Lighting*(lamps, fixtures)*

317 Saint Pauls Avenue
Jersey City, New Jersey 07306-5021 USA
PHONE: 201-656-7888 or 800-443-8823
FAX: 201-656-0666

Sterner Lighting Systems Incorporated*(lamps, fixtures)*

7575 Corporate Way
Eden Prairie, Minnesota 55344 USA
PHONE: 612-906-7300 or 800-328-7480
FAX: 612-906-7338 or 800-328-3635

Supreme Lights*(fixtures)*

812 NW 8th Avenue
Ft. Lauderdale, Florida 33311 USA
PHONE: 954-768-0044
FAX: 954-768-0788

Thomas Industries, Benjamin Division*(lamps, fixtures)*

P.O. Box 180, Route 70 South
Sparta, Tennessee 38583 USA

Thomas Industries, Gardco Lighting*(lamps, fixtures)*

2661 Alvarado Street
San Leandro, California 94577 USA
PHONE: 510-357-6900 or 800-227-0758
FAX: 510-357-3088

Voigt Lighting*(lamps, fixtures)*

135 Fort Lee Road
Leonia, New Jersey 07605 USA
PHONE: 201-461-2493
FAX: 201-461-7827

Westek*(fixtures)*

9295 Farnham Street
San Diego, California 92123-1201 USA
PHONE: 619-268-3422
FAX: 619-268-1681

APPENDIX H

CHAPTER 62B-55 Model Lighting Ordinance for Marine Turtle Protection

- 62B-55.001 Purpose and Intent.
- 62B-55.002 Definitions.
- 62B-55.003 Marine Turtle Nesting Areas.
- 62B-55.004 General Guidance to Local Governments.
- 62B-55.005 Prohibition of Activities Disruptive to Marine Turtles
- 62B-55.006 Model Standards for New Lighting.
- 62B-55.007 Model Standards for Existing Lighting.
- 62B-55.008 Proposed Enforcement and Penalties.
- 62B-55.009 Monitoring and Reporting Guidance.

62B-55.001 Purpose and Intent.—The purpose of this rule is to implement Section 161.163, Florida Statutes, which requires the department to designate coastal areas utilized, or likely to be utilized, by sea turtles for nesting, and to establish guidelines for local government regulations that control beachfront lighting to protect hatching sea turtles. This rule is intended to guide local governments in developing ordinances which will protect hatchling marine turtles from the adverse effects of artificial lighting, provide overall improvement in nesting habitat degraded by light pollution, and increase successful nesting activity and production of hatchlings.

Specific Authority 161.163 F.S., Law Implemented 161.163 F.S., History—New 3-93.

62B-55.002 Definitions.

- (1) “Artificial light” or “artificial lighting” means the light emanating from any human-made device.
- (2) “Beach” means the zone of unconsolidated material that extends landward from the mean low water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation, usually the effective limit of storm waves.
- (3) “Bug” type bulb means any yellow colored light bulb that is marketed as being specifically treated in such a way so as to reduce the attraction of bugs to the light.
- (4) “Coastal construction activities” means any work or activity that is likely to have a material physical effect on existing coastal conditions or natural shore and inlet processes.
- (5) “County” means Bay, Brevard, Broward, Charlotte, Citrus, Collier, Dade, Dixie, Duval, Escambia, Flagler, Franklin, Gulf, Hernando, Indian River, Jefferson, Lee, Levy, Manatee, Martin, Monroe, Nassau, Okaloosa, Palm Beach, Pasco, Pinellas, St. Johns, St. Lucie, Santa Rosa, Sarasota, Suwanee, Taylor, Volusia, Wakulla, and Walton Counties.
- (6) “Cumulatively illuminated” means illuminated by numerous artificial light sources that as a group illuminate any portion of the beach.
- (7) “Department” means the Florida Department of Natural Resources.
- (8) “Directly illuminated” means illuminated as a result of glowing elements(s), lamp(s), globe(s), or reflector(s) of an artificial light source which is visible to an observer on the beach.
- (9) “Dune” means a mound or ridge of loose sediments, usually sand-sized, lying landward of the beach and deposited by any natural or artificial mechanism.
- (10) “Frontal dune” means the first natural or man-made mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value.
- (11) “Ground-level barrier” means any vegetation, natural feature or artificial structure rising from the ground which prevents beachfront lighting from shining directly onto the beach-dune system.
- (12) “Hatchling” means any species of marine turtle, within or outside of a nest, that has recently hatched from an egg.
- (13) “Indirectly illuminated” means illuminated as a result of the glowing element(s), lamp(s), globe(s), or reflector(s) of an artificial light source which is not visible to an observer on the beach.

- (14) "Local government" means any county listed in (4) above and any municipality, community development district, or special taxing district within those counties.
- (15) "Marine turtle" means any marine-dwelling reptile of the families Cheloniidae or Dermochelyidae found in Florida waters or using the beach as nesting habitat, including the species: *Caretta caretta* (loggerhead), *Chelonia mydas* (green), *Dermochelys coriacea* (leatherback), *Eretmochelys imbricata* (hawksbill), and *Lepidochelys kempfi* (Kemp's ridley). For purposes of this rule, marine turtle is synonymous with sea turtle.
- (16) "Nest" means an area where marine turtle eggs have been naturally deposited or subsequently relocated.
- (17) "Nesting season" means the period from May 1 through October 31 of each year for all counties except Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward. Nesting season for Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties means the period from March 1 through October 31 of each year.
- (18) "Nighttime" means the locally effective time period between sunset and sunrise.
- (19) "Person" means individuals, firms, associations, joint ventures, partnerships, estates, trusts, syndicates, fiduciaries, corporations, and all other groups or combinations.
- (20) "Tinted glass" means any glass treated to achieve an industry-approved, inside-to-outside light transmittance value of 45% or less. Such transmittance is limited to the visible spectrum (400 to 700 nanometers) and is measured as the percentage of light that is transmitted through the glass.

62B-55.003 Marine Turtle Nesting Areas.—Scientific investigations have demonstrated that marine turtles can nest along the entire coastline of the state. Historical data are not sufficient to exclude any county as an area utilized by marine turtles for nesting. For the purposes of this rule, however, the coastal areas of the state utilized, or likely to be utilized, by marine turtles for nesting include all beaches adjoining the waters of the Atlantic Ocean, the Gulf of Mexico, and the Straits of Florida and located within Bay, Brevard, Broward, Charlotte, Collier, Dade, Duval, Escambia, Flagler, Franklin, Gulf, Indian River, Lee, Manatee, Martin, Monroe, Nassau, Okaloosa, Palm Beach, Pinellas, St. Johns, St. Lucie, Santa Rosa, Sarasota, Volusia, and Walton Counties; and all inlet shorelines of those beaches.

62B-55.004 General Guidance to Local Governments.

- (1) The responsibility for protecting nesting female and hatchling marine turtles should be a joint responsibility of local government and the department. Local governments are encouraged to adopt, implement, and enforce the guidelines provided herein to assist in that responsibility. Local governments that have adopted less stringent regulations should consider amending existing ordinances to provide greater protection to nesting marine turtles and hatchlings. In the process of implementing these guidelines, the following management goals should also be considered by local governments:
- (a) Public Awareness. Any person submitting an application for coastal construction activities within the jurisdictional boundaries of the local government should be informed of the existence of and requirements within the local government's ordinances concerning artificial lighting and marine turtle protection.
 - (b) Local Government–Department Communication. Upon adoption of these guidelines, a system of communication between the local government and the department should be developed if it does not already exist. Protection of marine turtle nesting habitat, nesting females, and hatchlings is greatly enhanced when local governments manage their beaches and coastal activities in a manner consistent with prudent marine turtle conservation strategies. The department is ready to assist local governments by providing such conservation information and other technical assistance.
 - (c) Inter-Governmental Cooperation. Upon adoption of these guidelines, local governments should develop a system for receiving copies of permits issued by the department, the Department of Environmental Regulation, or the United States Army Corps of Engineers for any coastal construction within the local government's jurisdiction. Activities permitted by these agencies should be assessed for compliance with the local government's lighting ordinance.
 - (d) Enforcement. Local governments should develop a process for the consistent and effective

enforcement of adopted guidelines. This process should include at least one compliance inspection of the beach conducted at night prior to the commencement of the main portion of the marine turtle nesting season and one compliance inspection conducted during the marine turtle nesting season.

(2) The department considers the provisions of this Chapter to be minimum guidelines for the protection of nesting habitat, nesting females, and hatchling marine turtles from the negative effects of artificial lighting. More stringent standards for marine turtle protection may be adopted by local governments. Prior to adoption of any additional standards, local governments are encouraged to consult with the department to ensure that the proposed standards are consistent with the guidelines set forth herein and with all other applicable department rules.

62B-55.005 Prohibition of Activities Disruptive to Marine Turtles.

The following activities involving direct illumination of portions of the beach should be prohibited on the beach at nighttime during the nesting season for the protection of nesting females, nests, and hatchling marine turtles:

- (1) The operation of all motorized vehicles, except emergency and law enforcement vehicles or those permitted on the beach for marine turtle conservation or research.
- (2) The building of campfires or bonfires.

62B-55.006 Model Standards for New Beachfront Lighting.

In order to provide the highest level of protection for nesting marine turtles and their hatchlings, local governments should adopt all of the following standards for artificial light sources on all new coastal construction:

- (1) Exterior artificial light fixtures shall be designed and positioned so that:
 - (a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;
 - (b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and
 - (c) Areas seaward of the frontal dune are not cumulatively illuminated.
- (2) Exterior artificial light fixtures within direct line-of-sight of the beach are considered appropriately designed if:
 - (a) Completely shielded downlight only fixtures or recessed fixtures having low wattage (*i.e.*, 50 watts or less) "bug" type bulbs and non-reflective interior surfaces are used. Other fixtures that have appropriate shields, louvers, or cutoff features may also be used if they are in compliance with subsection (1)(a), (b), and (c) above; and
 - (b) All fixtures are mounted as low in elevation as possible through use of low-mounted wall fixtures, low bollards, and ground-level fixtures.
- (3) Floodlights, uplights or spotlights for decorative and accent purposes that are directly visible from the beach, or which indirectly or cumulatively illuminate the beach, shall not be used.
- (4) Exterior lights used expressly for safety or security purposes shall be limited to the minimum number and configuration required to achieve their functional role(s). The use of motion detector switches that keep lights off except when approached and that switch lights on for the minimum duration possible are preferred.
- (5) Only low intensity lighting shall be used in parking areas within line-of-sight of the beach. Such lighting shall be:
 - (a) Set on a base which raises the source of light no higher than 48 inches off the ground; and
 - (b) Positioned or shielded so that the light is cast downward and the source of light or any reflective surface of the light fixture is not visible from the beach and does not directly or indirectly illuminate the beach.
- (6) Parking areas and roadways, including any paved or unpaved areas upon which motorized vehicles will park or operate, shall be designed and located to prevent vehicular headlights from directly or indirectly illuminating the beach.
- (7) Vehicular lighting, parking area lighting, and roadway lighting shall be shielded from the beach through the use of ground-level barriers. Ground-level barriers must not interfere with marine turtle nesting or hatchling emergence, or cause short- or long-term damage to the beach/dune system.

- (8) Tinted glass shall be installed on all windows and glass doors of single or multi-story structures within line-of-sight of the beach.
- (9) Use of appropriately shielded low-pressure sodium-vapor lamps and fixtures shall be preferred for high-intensity lighting applications such as lighting parking areas and roadways, providing security, and similar applications.
- (10) Temporary lighting of construction sites during the marine turtle nesting season shall be restricted to the minimal amount necessary and shall incorporate all of the standards of this section.

62B-55.007 Model Standards For Existing Beachfront Lighting. In order to provide the highest level of protection for nesting marine turtles and their hatchlings, local governments should adopt all of the following standards for existing artificial beachfront lighting sources:

- (1) Existing artificial light fixtures shall be repositioned, modified, or removed so that:
 - (a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;
 - (b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and
 - (c) Areas seaward of the frontal dune are not cumulatively illuminated.
- (2) The following measures shall be taken to reduce or eliminate the negative effects of existing exterior artificial lighting:
 - (a) Reposition fixtures so that the point source of light or any reflective surface of the light fixture is no longer visible from the beach;
 - (b) Replace fixtures having an exposed light source with fixtures containing recessed light sources or shields;
 - (c) Replace traditional light bulbs with yellow "bug" type bulbs not exceeding 50 watts;
 - (d) Replace non-directional fixtures with directional fixtures that point down and away from the beach;
 - (e) Replace fixtures having transparent or translucent coverings with fixtures having opaque shields covering an arc of at least 180 degrees and extending an appropriate distance below the bottom edge of the fixture on the seaward side so that the light source or any reflective surface of the light fixture is not visible from the beach;
 - (f) Replace pole lamps with low-profile, low-level luminaries so that the light source or any reflective surface of the light fixture is not visible from the beach;
 - (g) Replace incandescent, fluorescent, and high intensity lighting with the lowest wattage low-pressure sodium-vapor lighting possible for the specific application;
 - (h) Plant or improve vegetation buffers between the light source and the beach to screen light from the beach;
 - (i) Construct a ground level barrier to shield light sources from the beach. Ground-level barriers must not interfere with marine turtle nesting or hatchling emergence, or cause short- or long-term damage to the beach/dune system;
 - (j) Permanently remove or permanently disable any fixture which cannot be brought into compliance with the provisions of these standards.
- (3) The following measures shall be taken to reduce or eliminate the negative effects of interior light emanating from doors and windows within line-of-sight of the beach:
 - (a) Apply window tint or film that meets the standards for tinted glass;
 - (b) Rearrange lamps and other moveable fixtures away from windows;
 - (c) Use window treatments (e.g., blinds, curtains) to shield interior lights from the beach; and
 - (d) Turn off unnecessary lights.

62B-55.008 Proposed Enforcement and Penalties.—Enforcement, appeal, and remedy of matters related to this Chapter should be regulated pursuant to procedures established under local ordinances. Penalties for non-compliance should be established and should be sufficient to discourage violations. Enforcement capability should be adequate to respond to possible violations within the timeframe necessary to prevent continued and prolonged impacts to marine turtles and hatchlings.

62B-55.009 Monitoring and Reporting Guidance.

The following information should be compiled on an annual basis and submitted to the department.

- (1) Number of lighting applications reviewed;
- (2) Number of potential violations reported;
- (3) Number of potential violations investigated;
- (4) Disposition of all potential violations including results of enforcement actions and amounts of penalties assessed;
- (5) Results of compliance checks conducted prior to and during the marine turtle nesting season; and
- (6) Status of local lighting ordinances and any amendments to those ordinances.

APPENDIX I

The following is a list of conservation organizations, government agencies, and other groups that may be able to assist in resolving light-pollution problems on sea turtle nesting beaches.

Caribbean Conservation Corporation¹

P.O. Box 2866
Gainesville, Florida 32602 USA
PHONE: 904-375-6441

223 Bartram Hall
University of Florida
Gainesville, Florida 32611 USA

Center for Marine Conservation¹

1725 DeSales Street, NW
Washington, DC 20036 USA
PHONE: 202-429-5609

Office of Protected Species Management^{1,2}

Florida Department of Environmental Protection
3900 Commonwealth Blvd., M.S. 245
Tallahassee, Florida 32399 USA
PHONE: 904-922-4330

Ecological Associates, Inc.¹

P.O. Box 405
Jensen Beach, Florida 34958 USA
PHONE: 407-334-3729

Ogasawara Marine Center⁴

Byobudani, Chichijima
Ogasawara-mura, Tokyo, JAPAN

Florida Marine Research Institute^{1,2,4}

Florida Department of Environmental Protection
Tequesta Field Laboratory
19100 SE Federal Highway
Tequesta, Florida 33469 USA
PHONE: 407-575-5407

Programa de Tortugas Marinas⁴

Escuela de Biología
Universidad de Costa Rica
San Jose, COSTA RICA

Florida Marine Research Institute^{1,2,4}

Florida Department of Environmental Protection
Resource Recovery, Marine Turtles
100 Eighth Avenue SE
St. Petersburg, Florida 33701 USA
PHONE: 813-896-8626

PRONATURA—Yucatán⁴

Calle 13, #203A
Col. García Gineres
Mérida, Yucatán, MEXICO

Florida Power and Light Company²

Environmental Affairs Department
P.O. Box 088801
North Palm Beach, Florida 33408
PHONE: 407-625-7620 or 800-342-5375
FAX: 407-625-7665

Queensland National Parks and Wildlife Service⁴

Sea Turtle Research
P.O. Box 155, Brisbane Albert Street
Queensland 4002 AUSTRALIA

International Dark-Sky Association⁵

3545 North Stewart
Tucson, Arizona 85716 USA

Sea Turtle Protection Society—Greece⁴

Solomou 35
GR-106 82 Athens, GREECE
PHONE: 30-1-364-4146

IUCN—The World Conservation Union³

Marine Turtle Specialist Group, Chair
Archie Carr Center for Sea Turtle Research

TAMAR^{1,4}

CAIXA Postal 2219
Salvador, Bahia
C.E.P. 40210-970, BRASIL

United States Fish and Wildlife Service⁴

National Sea Turtle Coordinator
P.O. Box 1306
Albuquerque, New Mexico 87103 USA

WIDECAST¹

17218 Libertad Drive
San Diego, California 92127 USA
PHONE: 619-451-6894
FAX: 619-451-6894

World Wildlife Fund¹

1250 24th Street NW
Washington, DC 20036 USA

¹May be able to assist in education and legislation efforts.

²Offers a pamphlet for distribution entitled "Sea Turtles and Lights" and a booklet on general sea turtle biology (Van Meter, 1992).

³Maintains worldwide contacts with sea turtle researchers and conservationists.

⁴Compiles national or regional data gathered at sea turtle nesting beaches.

⁵Compiles and distributes information on the causes and effects of light pollution.

APPENDIX J

Responses to some common questions and comments regarding sea turtles and lighting.

When do hatchling sea turtles emerge from their nests?

The first hatchlings of the season emerge from nests approximately eight weeks after the first nesting of the season, and this activity continues for up to eight weeks after the final nesting of the season. Outside the tropics, hatchlings generally emerge throughout the summer and early fall. In the southeastern USA, hatchlings emerge throughout the months of June, July, August, September, and October. It is a myth that hatchlings emerge only around the time of the full moon. Hatchlings ready to emerge wait just beneath the sand surface until conditions become cool. This temperature cue prompts them to emerge primarily at night, although some late-afternoon and early-morning emergences have been documented.

How do hatchling sea turtles know where the ocean is when they emerge from their nests?

Sea turtle hatchlings have an inborn tendency to move in the brightest direction. On a natural beach, the brightest direction is most often the open view of the night sky over, and reflected by, the ocean. Hatchlings also tend to move away from darkly silhouetted objects associated with the dune profile and vegetation. This sea-finding behavior can take place during any phase and position of the moon, which indicates that hatchlings do not depend on lunar light to lead them seaward.

Why do artificial light sources attract hatchling sea turtles?

Hatchlings that crawl toward artificial light sources are following the same instinctive response that leads them seaward on naturally lighted beaches. The apparent brightness and glare of artificial lighting is what often leads hatchlings astray. To a hatchling on a beach, an artificial light source appears bright because it is relatively close by, yet it is not intense enough to brighten the sky and landscape. The resulting glare makes the direction of the artificial source appear overwhelmingly bright—so much brighter than the other directions that hatchlings will ignore other visual cues and move toward the artificial light no matter where it is relative to the sea.

There are other lights near my beachfront property that are visible from the beach. Why should I modify my lights?

Any reduction in the amount of artificial light reaching the nesting beach helps sea turtles. As lighting is reduced, hatchlings emerging on moonlit nights and at locations far from the lighted property will have a better chance of finding the sea.

Can hatchlings be protected by increasing the number of lights on a nesting beach in order to prevent turtles from nesting?

Although artificial lighting tends to deter sea turtles from nesting, many do nest on lighted beaches. Apparently, the level of artificial lighting necessary to misdirect hatchlings is well below the level necessary to deter nesting. But even if beaches were lighted to the extent that no nesting occurred, hatchlings on adjacent beaches would be harmed. Regardless, chasing sea turtles away from nesting beaches means that important habitat is lost to them; therefore, it is not a beneficial conservation strategy.

How bright can a light be without affecting hatchlings or adult sea turtles on the beach?

Unfortunately, no simple measure of light intensity can reveal whether a light source will be a problem. The effects of artificial lighting on sea turtles may actually increase as ambient light-levels decrease on darker, moonless nights. Because any visible light from an artificial source can cause problems, the most reliable “instruments” to use when making judgments about problem lighting may be the eyes of a human observer on the nesting beach. Any light source producing light that is visible from the beach is likely to cause problems for nesting sea turtles and their hatchlings.

What should be done with misdirected hatchlings found on the beach?

Hatchling sea turtles found wandering away from the ocean should be taken to a darkened portion of beach and allowed to walk into the surf on their own. Those that do not crawl vigorously can be placed in the water and allowed to swim away. In all cases, local natural resource or environmental protection agencies should be notified. Consult Appendix I for a list of governmental and non-governmental conservation organizations.

Whom should I notify about a light that is visible from a sea turtle nesting beach?

The owner or resident of the property where the light source is located should be contacted. In most cases, people are simply unaware rather than uncaring. Local government conservation agencies should also be notified. A growing number of coastal communities have adopted ordinances that prohibit lighting on the beach during the nesting season. Code enforcement offices often oversee the enforcement of these ordinances. If there is inadequate regulation of beach lighting in your area or if lighting problems persist, private conservation organizations may be able to help. Consult Appendix I for a list of governmental and non-governmental conservation organizations.

I do not have the ability to turn off a problem light that is located on my property. What can be done?

Luminaires that do not have convenient on-off switches are most often controlled by the utility company. Property owners should contact the entity to whom electricity bills are paid or to whom lighting lease payments are made.

Will lighting on a pier affect sea turtles on the adjacent beach?

Yes. Lighting on piers is very difficult to shield from the beach. Hatchlings on adjacent stretches of beach may crawl for great distances in the direction of the lighted pier. Hatchlings that enter the water near the pier may linger in the glow beneath the lighted structure and fall prey to fish, also attracted to the light, rather than disperse offshore.

Will placing bright lights on platforms offshore guide hatchlings into the water off lighted beaches?

Apart from being an overly expensive and complicated solution, lighting the ocean to draw hatchlings offshore would probably create additional problems. Lighting on the water can interfere with hatchling dispersal and increase mortality from fish predation.

There is not enough sea turtle nesting on this beach to justify beach-darkening efforts. Why is light-management legislation needed?

Beaches where small numbers of turtles nest can be very important. The entire nesting range of a population may be made up of sparsely nested beaches. Hawksbill turtles, for instance, one of the most endangered sea turtles, do not nest in great numbers anywhere. Moreover, any group of nesting turtles may constitute a genetically unique and vulnerable unit. Losing even small populations may mean the permanent loss of diversity. The irony in disregarding lighting problems at sparsely nested beaches is that artificial lighting may have caused the nesting to be so low. Many lighted beaches with little nesting may again attract more nesting turtles once they are darkened.

Crime will increase if the beach is not lighted.

Generally, beaches are not areas where there is a great need for crime prevention. Very little valuable property is stored on beaches and there is seldom much nighttime human activity to require security. Fortunately, areas adjacent to nesting beaches where people reside, work, recreate, and store valuables can be lighted for protection without affecting turtles on the nesting beach. Where this type of light management was legislated in Florida coastal communities, the Florida State Attorney's Office has found no subsequent increase in crime.

Implementing a beach-darkening program will be prohibitively expensive.

Darkening nesting beaches for sea turtles is one of the least expensive ways we can benefit the environment. The simplest solution to the problem—turning off lights visible from the beach during the nesting season—

costs little or nothing and may actually save money in electricity costs. Most of the essential lighting that remains can easily be shielded so that the light performs its intended function without reaching the beach. Proper shields can be fashioned from inexpensive metal flashing and fastened with screws. Replacing fixtures is more expensive but is necessary only when an owner decides that greater lighting efficiency or aesthetics are a concern. Choosing well-designed fixtures and incorporating light-management techniques into the plans for coastal development are the most effective ways to fulfill lighting needs while protecting sea turtles.

There are too many disadvantages to using low-pressure sodium-vapor lighting to protect sea turtles.

As is true for any light source, there are both advantages and disadvantages to using low-pressure sodium-vapor (LPS) lighting. The following is a list of issues specific to LPS.

Expense—The initial costs of LPS are substantially higher than for incandescent and fluorescent sources but are only slightly higher than costs for high-intensity discharge lighting (*e.g.*, HPS). Operating costs, however, are generally much lower for LPS than for any other commercial source.

Color—Because LPS sources are monochromatic, they give poor color rendition. For safety and security applications, however, full-spectrum color is seldom needed. At U.S. Air Force installations near nesting beaches in Florida (areas certain to have rigorous security requirements), most outside security areas are lighted by LPS sources.

Disposal—The lamps within LPS luminaires contain elemental sodium, a substance that can cause fires if not disposed of carefully. However, unlike the mercury-containing high-intensity discharge lamps (*e.g.*, mercury-vapor, high-pressure sodium vapor), the contents of LPS lamps are not toxic.

Availability—Although LPS luminaires are not as readily available in retail stores as other light sources are, a wide variety of LPS fixtures are available from a number of manufacturers (see Appendices D and G).

Sea turtle nests on our beach are moved to darker areas to protect hatchlings from lighting. Are our lights still a problem?

Yes. Although it may seem that moving nests out of harm's way will solve the problem, doing so only partially solves the problem and may create new ones. In moving nests, nothing is done to prevent lighting from deterring nesting turtles and interfering with their orientation on the beach. Moving nests also has its own negative consequences that stem from the limitations of this technique:

1. In nearly every effort to find nests, some are missed. Hatchlings from missed nests will suffer the effects of beach lighting.
2. Moved clutches of eggs often have poorer hatching rates. Moving eggs kills at least some of them, and often many die, depending upon how skillfully the moving is done.
3. Putting eggs in places other than those chosen by the nesting turtle can be detrimental. A specific nest environment is critical, both for the survivorship of eggs and for the determination of the hatchlings' sex ratio.

How can the sacrifice of human safety and security to save a few sea turtles be justified?

Thankfully, no such choice is necessary. The safety and security of humans can be preserved without jeopardizing sea turtles. The goal of any program to reduce sea turtle harassment and mortality caused by lighting is to manage light so that it performs the necessary function without reaching the nesting beach. Still, some may contend that any inconvenience at all is too much and that the concerns of humans should always outweigh those for turtles. People insistent on this generalization should not ignore the large and resolute constituency that values sea turtles. Sea turtles are valuable to people both ecologically and for pure enjoyment. In many ways, the protection of sea turtles is in our own best interests.

What good are sea turtles?

Measuring the true worth of anything is difficult, but it is especially difficult to make this measurement of a common resource. Although some may appreciate sea turtles more than others, sea turtles are of value to all. Short of a thorough discussion on the ecological place of sea turtles, suffice it to say that the world would be a poorer place to live without them. We just don't know how much poorer. With regard to sacrificing the diversity of life, Aldo Leopold wrote in his *Sand County Almanac*:

"The last word in ignorance is the man who says of an animal or plant: 'What good is it?' ... If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering."

APPENDIX K

A glossary of terms.

- Acceptance cone:** A solid angle that describes the apex of a geometrical cone containing the range of directions from which light can be measured by a detector (or an animal).
- Angle of acceptance:** An angle, usually specified as horizontal or vertical, that describes the range of directions from which light can be measured by a detector (or an animal).
- Anthropogenic:** Originating from the actions or devices of humans.
- Artificial lighting:** Light sources that have been produced by humans.
- Beach:** Dynamic coastal areas of sedimentary deposits, usually sand, between the primary dune and the water.
- Bollard lighting:** Lighting fixtures within a waist-level post or bollard. Bollard fixtures are generally designed to illuminate only the immediate area around the bollard.
- Brightest direction:** The direction in which the perception or measurement of brightness is greatest.
- Brightness:** The perception or measure that describes light intensity with respect to a specific spectral sensitivity and angles of acceptance.
- Bug light:** An incandescent lamp that is tinted yellow in order to attenuate its emission of short-wavelength visible light and thus reduce its attractiveness to insects.
- Candela:** The basic, international unit for measuring luminous intensity.
- Clutch:** A group of eggs deposited within a nest.
- Color rendering:** The effect of a light source on the color appearance of an object.
- Color:** The sensation resulting from stimulation of the retina by light of certain wavelengths.
- Cone of acceptance:** *See* Acceptance cone.
- Crawl:** Used as a noun, the tracks and other disturbances left on a beach by a sea turtle that has attempted to nest.
- Cut-off angle:** The angle between a vertical line through a luminaire and the first line of sight at which the glowing elements of the luminaire are no longer visible.
- Diffuser:** Made of translucent material, the part of a luminaire through which light is diffused. One of the elements of a luminaire that appears to glow. Also called a lens or globe.
- Direct lighting:** A luminaire provides direct lighting if any of the glowing elements of the luminaire are visible to an observer on the beach.
- Directional lighting:** A luminaire that can be aimed so that its light reaches only specific areas.
- Disorientation:** Loss of orientation. Being unable to maintain constant directional movement.
- Downlighting:** Generally canister- or cylinder-shaped lighting fixtures that direct light predominately downward and that possess light baffles to reduce lateral light.
- Efficiency:** For a lamp, the ratio of light output (lumens) to electrical power (watts) consumed.
- Electroretinography (ERG):** A method to determine spectral sensitivity in which the relative electrical potential is measured across retinas exposed to light at specific wavelengths and intensities.
- ERG spectrum:** Measured by electroretinography, the spectral sensitivity of an animal.
- False crawl:** An aborted nesting attempt (emergence onto a beach) by a sea turtle.
- Fixture:** The device that holds, protects, and provides the optical system and power connections for a lamp.
- Floodlighting:** High-intensity lighting that can be directed at various angles to illuminate large areas or objects.

- Fluorescent:** An electric-discharge lamp containing argon, neon, mercury, and in some cases krypton, which is coated inside with phosphors that determine color appearance (most commonly, white) when lighted.
- Footcandle:** The English unit for measuring illuminance; the illumination of a surface uniformly one foot from a point source of one candela; one lumen per square foot; equal to 10.76 lux.
- Globe:** A diffuser, usually hemispherical, of a luminaire. One of the elements of a luminaire that appears to glow.
- Hatching success:** The proportion of eggs in a nest that produce living hatchlings.
- Hatchling:** A newly hatched sea turtle.
- High-pressure sodium vapor (HPS) lamp:** An electric discharge lamp containing an amalgam of sodium and mercury, and rarefied xenon, that appears whitish golden or peach-colored when lighted.
- High-intensity discharge (HID) lamp:** Referring to a group of light sources that include high-pressure sodium-vapor, mercury-vapor, and metal-halide lamps.
- Illuminance:** The density of luminous flux on a surface. Luminous flux includes only visible light. Measured in footcandles or lux.
- Incandescent:** A lamp that produces light by means of an electrically heated glowing metal filament and that appears white when lighted. Includes quartz tungsten halogen (or simply tungsten halogen) sources. May be tinted to vary color (*e.g.*, yellow bug lights).
- Indirect lighting:** A luminaire provides indirect lighting if its light is visible to an observer on the beach only after it is reflected by objects near the beach or scattered by mist.
- Irradiance:** The density of radiant flux on a surface. Radiant flux may include light throughout the spectrum.
- Lamp:** The source of light within a luminaire.
- Lens:** See Diffuser.
- Light:** 1) Visible or near-visible radiant energy. 2) A term often used in place of "luminaire" or "light fixture."
- Light color:** See Color.
- Light fixture:** See Fixture.
- Light shield:** Any opaque material fastened to a luminaire that makes the luminaire produce more directional lighting.
- Light meter:** A detector used to measure levels of visible light, typically luminance or illuminance.
- Light pollution:** The introduction of artificially produced detrimental light into the environment. Similar to light trespass: the emission of light into areas where it is unwanted.
- Louver:** A series of light-blocking baffles used to direct light coming from a luminaire.
- Low-pressure sodium vapor (LPS) lamp:** An electric discharge lamp that contains sodium, neon, and argon and that appears amber yellow when lighted.
- Lumen:** A unit of light output or flux, equal to the amount of light flow from one candela through a unit solid angle.
- Luminaire:** A complete unit that artificially produces and distributes light. An artificial light source, including fixture, ballast, mounting, and lamp(s).
- Luminance:** The luminous flux from a surface or light source, per unit area of the surface. Luminous flux includes only visible light.
- Lux:** The metric unit for measuring illuminance; the illumination of a surface uniformly one meter from a point source of one candela; one lumen per square meter; equal to 0.0929 footcandle.
- Mercury-vapor lamp:** An electric-discharge lamp that contains mercury and argon and is sometimes coated with phosphors; appears whitish when lighted.
- Metal-halide:** An electric-discharge lamp that contains mercury, argon, sodium iodide, scandium iodide, and scandium; appears white when lighted.
- Misorientation:** Orientation in the wrong direction. For hatchling sea turtles on the beach, travel in any direction other than the general vicinity of the ocean.

- Monochromatic:** The description of a light source emitting a very narrow set of wavelengths (*i.e.*, a single color).
- Mounting height:** The vertical distance between a luminaire and the surface to be lighted.
- Nest:** The area of disturbed sand on a beach where a sea turtle has buried a clutch of eggs.
- Nesting success:** The proportion of nesting attempts by a sea turtle (emergences onto the beach) that result in eggs being deposited.
- Photometer:** *See* Light meter.
- Photopigments:** The light-absorbing chemicals within the rod and cone cells of the retina.
- Photopollution:** *See* Light pollution.
- Phototropotactic:** Pertaining to phototropotaxis.
- Phototropotaxis:** Directional movement governed by a weighing of sensory excitation from stimuli received by separate light-sensing structures.
- Primary dune:** Coastal areas of elevated sandy deposits closest to the water; generally has well-established vegetation if it has not been artificially cleared.
- Radiance:** The radiant flux from a surface or light source, per unit area of the surface.
- Radiometer:** An instrument for measuring radiant energy (*e.g.*, visible light).
- Recessed:** A term describing a luminaire mounted within a ceiling opening in such a way that the glowing elements of the luminaire are hidden from view.
- Reflector:** An element of a luminaire that directs light from the luminaire by reflection.
- Retina:** The surface within the vertebrate eye that contains the pigmented cells (rods and cones) that are sensitive to light.
- Sea-finding behavior:** The tendency to move in the direction of the ocean.
- Sex ratio:** The proportion of females to males. Sex ratios of sea turtle hatchlings are determined by the environmental conditions (mostly temperature) under which the eggs incubate.
- Shield:** *See* Light shield.
- Skyglow:** The glow of light scattered by mist and clouds over densely lighted areas.
- Spectral light:** Light composed of specific wavelengths.
- Swash zone:** The beach zone where advancing waves wash up the beach and recede.
- Tier lighting:** Small light fixtures with louvers that restrict light to the immediate area around the fixture. These fixtures are generally mounted at ground level.
- Up-lighting:** Lighting fixtures that are directed upward, usually onto objects (flags, monuments, signs, buildings, *etc.*).
- Urban skyglow:** *See* Skyglow.
- Visible spectrum:** The range of wavelengths visible to humans, generally between 380 (violet) and 760 (red) nanometers.
- Wavelength:** The property of a photon of light that determines its energy and color, usually expressed in nanometers (nm, billionths of a meter).
- Xanthophobia:** The tendency to orient away from sources rich in yellow light. A type of orientation seen in loggerhead hatchlings.



Did you Know?



Sales Representatives

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Graphic	Dimensions	Bulbs	Lamping	Option: Open Top	Option: Lensed Top	Option: UL Wet	Notes
	10.5" wide - 5.25" high - 5" ext'n	1	60 to 100 watt max med base	Standard	N/A	N/A	
	6" wide - 8.75" high - 4.25" ext'n	1	60 to 100 watt max med base	No Charge	+\$6.00	+\$2.00	40
	8" wide - 10" high - 5" ext'n	1	60 to 100 watt max med base	No Charge	+\$6.00	+\$2.00	41
	8.5" wide - 13.25" high - 4.5" ext'n	1	60 to 100 watt max med base	No Charge	+\$6.00	+\$2.00	42
	10" wide - 15" high - 4.75" ext'n	2	60 to 150 watt max med base	No Charge	+\$6.00	+\$2.00	Maximum of one bulb if UL Wet 43
	7.5" wide - 8.25" high - 5" ext'n	1	60 to 100 watt max med base	No Charge	+\$6.00	+\$2.00	44
	10" wide - 13.5" high - 5.75" ext'n	2	60 to 150 watt max med base	No Charge	+\$6.00	+\$2.00	Maximum of one bulb if UL Wet 45

AC Lighting Design

Use with 480 lumens or less bug bulbs

Use models that only downlight

\$60.00 retail

TURTLE FRIENDLY™ LIGHTING



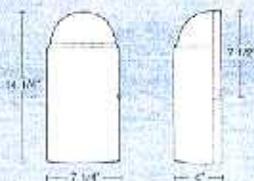
- *Meets Standards for Beachfront, Turtle Safe Lighting.*
- *Made of AP's Exclusive "Stone".™*
- *Totally Non-Corrosive, Built from the Inside-Out to Last!*
- *Non-Corrosive Hardware.*
- *100% Cut Off - Complies with "Dark Sky" Standards.*



S33WT-WH



S33WL-PL7-SN



WHY TURTLE LIGHTING?

- *Six of Eight Sea Turtle Species are Endangered.*
- *Between March & October, Female Sea Turtles are Confused by the Artificial Light from Coastal Dwellings and Head toward Pools and Streets instead of the Safety of the Sea.*
- *AP's Turtle-Friendly Lighting Assures No Light Reaches the Beach to Harm the Hatchling Turtles.*

Turtle Lights Available in Five Colors!
Specify: Blackstone (BK), Whitestone (WH),
Greenstone (GN), Sandstone (SN) or
Graystone (GY)



Approximate cost: \$60.00

Fixtures Available with Turtle or Light House Insignia!

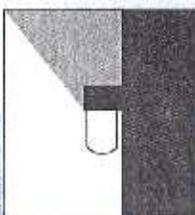
Specify:
Turtle (WT)
Light House (WL)

Incandescent

Max. Wattage: 60 Watt Inc.

Fluorescent

Specify:
7 Watt (PL7)
9 Watt (PL9)
13 Watt (PL13)
2-13 Watt (2PL13)



POOR

- DIRECTIONAL CONTROL **POOR**
- CORROSION RESISTANCE **POOR**
- DECORATIVE APPEAL **POOR**



FAIR

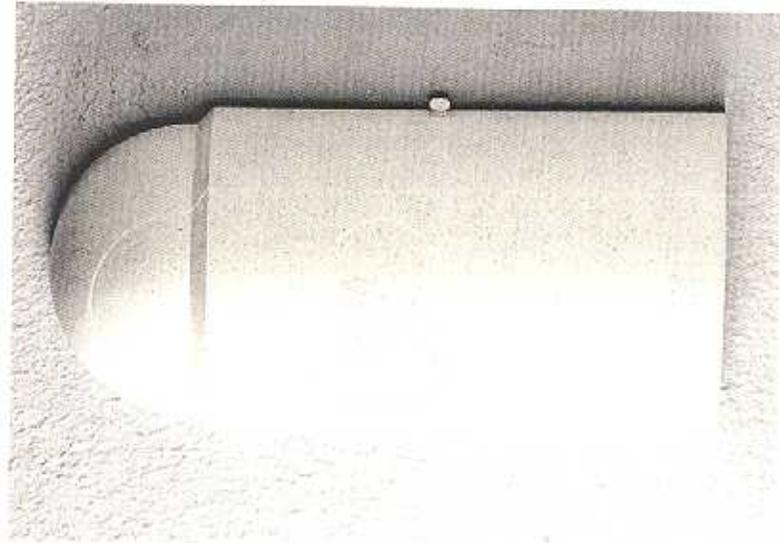
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- CORROSION RESISTANCE **POOR**
- DECORATIVE APPEAL **POOR-FAIR**



EXCELLENT

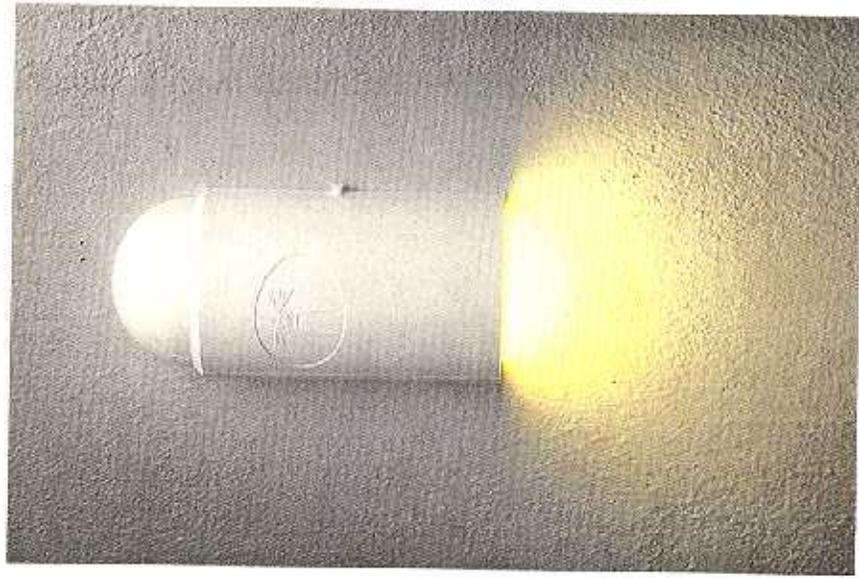
- DIRECTIONAL CONTROL **EXCELLENT**
- CORROSION RESISTANCE **EXCELLENT**
- DECORATIVE APPEAL **EXCELLENT**

YOUR TURTLE FRIENDLY SOLUTION!



Use with a 40 watt or less bug bulb or
7 or 9 watt fluorescent

TURTLE FRIENDLY™ LIGHTING from



ADJUSTA-POST LIGHTING CO.
3960 SUMMIT ROAD
NORTON, OHIO 44203
800-321-2132
www.aplighting.com

Approx. cost: \$60.00

Size: 14 1/4 inches high and
7 1/8 inches wide.

Adjusta-Post Lighting Company

Shades for Floodlights

Use with Motion-detector Outfitted Floodlights

**Use floodlights that accept 40 watt or lower
Bug light bulbs**

FLOOD LIGHTING

Polycarbonate Flood Lights

Available with or without Snap-on Shades!



15RP2



15RP2-W & 15RP2-SHW


+

=


15RP2-W (White)
15RP2 (Black)

15RP-SHW (White)
15RP-SH (Black)

15RP2W & 15RP-SHW (White)
15RP2 & 15RP-SH (Black)

Stainless Steel Hardware!

Will Not Rust or Corrode!

For Flood Light with Shade in Black order (1) 15RP2 & (1) 15RP-SH
For Flood Light with Shade in White order (1) 15RP2-W & (1) 15RP-SHW

Max. Wattage: 150 Watt Inc. Pir Lamp
Note: Flood Light and Snap-on Shades sold and packaged separately! Lamps not included.



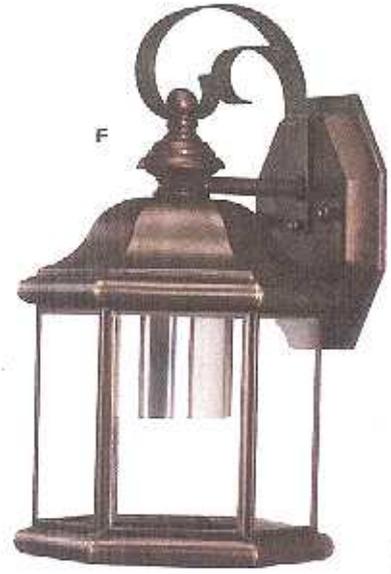
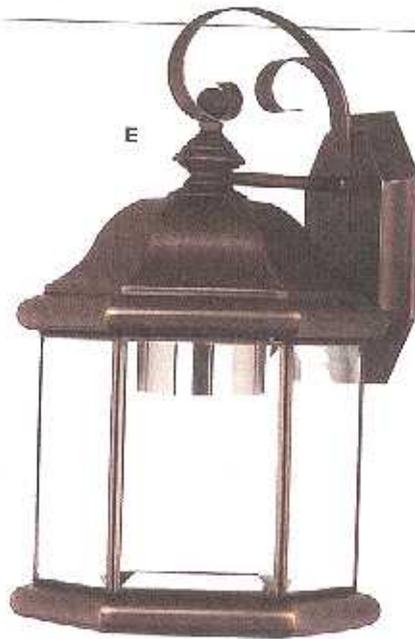
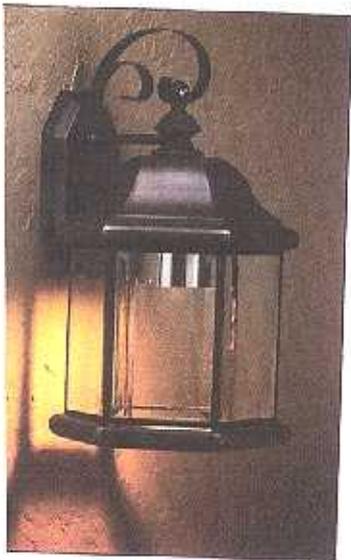


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3960 Summit Rd
P.O. Box 71
Norton, Ohio 44203
Tel: (330) 745-1692
Fax: (330) 745-9746

Customer Service 1-800-321-2132
Website: www.aplighting.com
Light with shade = \$28.00
Bug bulbs 1 = \$1.21

Dark Skies performance and the beauty of Exterior Lanterns.

NO VISIBLE LIGHT SOURCE, NO LAMP IMAGE AND NO SURFACE BRIGHTNESS.



*powder
old iron
copper*

\$85.00

E. 2413 COPPER BRONZE (CB-DS)
 9 1/2" W, 16 1/2" H, 8 1/2" Ext.,
 6" Top To Outlet.
 1-50w Med. (PAR-20)
 or 1-75w Med. (Type A).

\$160.00

F. 2410 COPPER BRONZE (CB-DS)
 7" W, 12" H, 6 1/2" Ext.,
 5 1/2" Top To Outlet.
 1-50w Med. (PAR-20)
 or 1-75w Med. (Type A).

160.00

G. 2334 COPPER BRONZE (CB-DS)
 11" W, 19" H, 12 1/2" Ext.,
 7" Top To Outlet.
 1-50w Med. (PAR-20)
 or 1-75w Med. (Type A).

H. 2335 COPPER BRONZE (CB-DS)
 13" W, 20 1/2" H, 14" Ext.,
 7" Top To Outlet.
 1-50w Med. (PAR-20)
 or 1-75w Med. (Type A).

Hinkley Quality. Hinkley Design. Hinkley Performance.

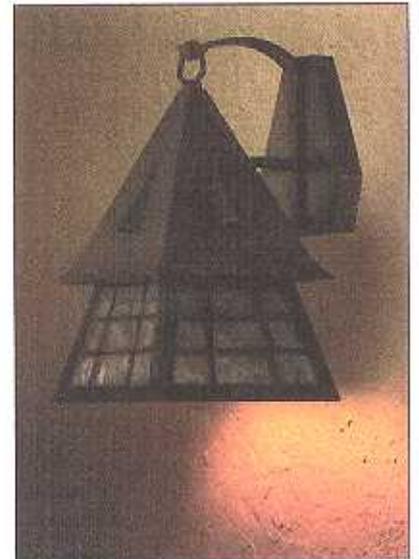
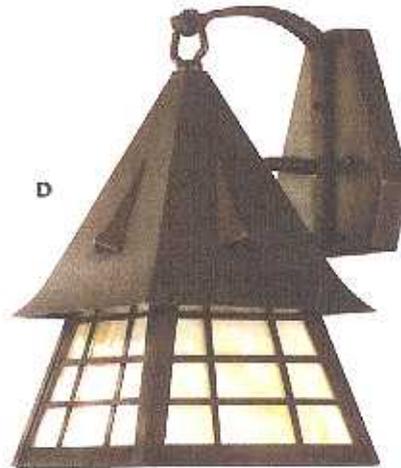
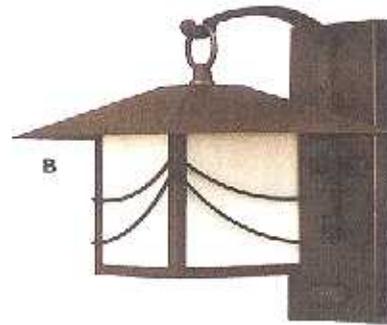
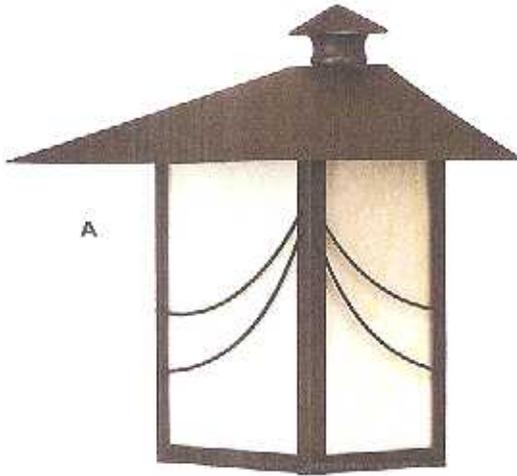
Copyright 2002 Hinkley Lighting

Use 40-watt or less bug bulbs

D A R K S K Y

To preserve and protect the nighttime environment and our heritage of Dark Skies through quality outdoor lighting.

- Control urban sky glow
- Control light trespass/light egress
- Control light pollution
- Control glare
- Meet coastal nocturnal animal regulations
- Conserve energy



A. 1174 COPPER BRONZE (CB-DS)
(Flush Wall Mount)
15" W, 14" H, 10" Ext.,
9" Top To Outlet.
1-100w Med.

B. 1170 COPPER BRONZE (CB-DS)
9" W, 10" H, 10" Ext.,
4" Top To Outlet.
1-75w Med.

C. 2380 COPPER BRONZE (CB-DS)
6 1/2" W, 12 1/2" H, 9" Ext.,
5 1/2" Top To Outlet.
1-60w Med.

D. 2384 COPPER BRONZE (CB-DS)
8" W, 15" H, 9 1/2" Ext.,
5" Top To Outlet.
1-75w Med.

Use 40-watt or less bug bulb

To order Dark Sky performance, add suffix "DS" to any of the items shown here. Note front, side or complete shielding.

Search by fixture #

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HINKLEY
LIGHTING

PRODUCTS

24240I in Olde Iron from the Clifton Park family.

- Width:** 10 1/2"
- Height:** 17 1/2"
- Weight:** 17 lbs
- Material:** Solid Brass
- Glass:** Clear beveled round glass
- Bulb:** Three 40w Candleabra
- Voltage:** 120v
- TTO:** 7"
- Extension:** 10"
- UPC:** 640665242430



The following are all finishes in the Clifton Park family:

- Copper Bronze
- Olde Iron

[back to the Top](#) ^

live help

Add "DS" to make it a Dark Sky fixture

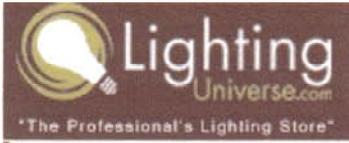
© Copyright 2004 Hinkley Lighting [Sitemap](#) [Terms](#) [Home](#)

1.800.445.3339 - info@hinkleylighting.com

Use only 40-watt or less bay bulb

Ceiling fan lights are not recommended for outside areas on sea turtle nesting beaches. If you must use a light, use shielded, direct downward lights. Use with a 40-watt or lower bug bulb.





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Due to differences in the application of certain finishes, slight variations in color may occur.

Lightinguniverse Price: \$172.18

Do you qualify for Trade Pricing?

Price Calculator

Quantity:

Price Each: \$172.18

Purchase Options

Project Manager Options



Manufacturer Info

1411W - Americana Sconce (Wet)

The Ambiance Collection of ceramic wall sconce collection from Justice Design. The hallmark the indirect, *ambient* light quality that can fill subtle, warm glow. This Americana Wall Sconce is available in a variety of finishes - See Below Shown in Antique Patina finish.

The bulb is not included with this fixture.

Justice Design Frequently Asked Questions

- Part Number:** 1411W-BIS
- Dimensions:** 10¾"h x 14"w x 6½"proj; 3"
- Materials:** Ceramic Bisque
- Voltage:** 120 Volt
- Usually Leaves Warehouse In:** 3 Business Days - 3 Weeks
- Listing:**
- Usage:** Exterior Wet

Finish Options: View

Lamp Options:

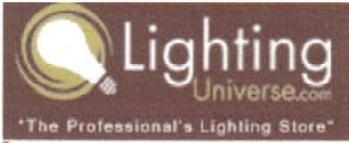
- Bulbs:**
- 36972 - 6 pack
 - 36972 - 60 pack
 - CF15C/DL-1 pack

Accessories:
Ext. Photo Sensor -Dusk to Dawn

Catalog Reference:

Customer Reviews:

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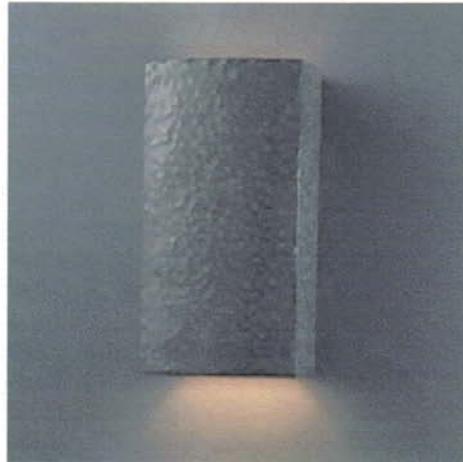
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Due to differences in the application of certain finishes, slight variations in color may occur.

Lightinguniverse Price: \$121.59

Do you qualify for Trade Pricing?

Price Calculator

Quantity: **Get Price**

Price Each: \$121.59

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Project Manager Options

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Justice Design
Manufacturer Info

0915W-Small Rectangle

This wall sconce from the Ambiance Collecti design and a wide array of finish options. Pic iron. The top and bottom are open.

The bulb is not included with this fixture.

- Part Number:** 0915W-BIS-INCAN
- Dimensions:** 9¼" h x 5" w x 4½" p mounting center
- Voltage:** 120 Volt
- Usually Leaves Warehouse In:** 3 Business Days - 3
- Construction Details:** Made to order in the
- Listing:**
- Usage:** Exterior Wet
- Finish Options:** View
- Lamp Options:**

- Bulbs:**
- 36972 - 6 pack
 - 36972 - 60 pack
 - CF15C/DL-1 pack

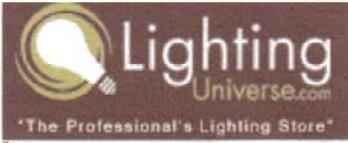
Accessories:
Ext. Photo Sensor -Dusk to Dawn

Catalog Reference:

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Due to differences in the application of certain finishes, slight variations in color may occur.

MSRP: \$90.00

Lightinguniverse Price: \$71.43

Do you qualify for Trade Pricing?

Price Calculator

Quantity: Get Price

Price Each: \$71.43

View All Prices

Purchase Options

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Project Manager Options

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Manufacturer Info

Ambis Outdoor-Ambiance-1800W

This outdoor fixture from the Ambiance colle in Bisque, but is available in a range of finish Please see the option below.

The bulb is not included with this fixture.

Justice Design Frequently Asked Questic

Part Number: 1800W-BIS
Dimensions: 6¾"w x 5¾"h x 4½"proj.
Materials: Ceramic
Voltage: 120 Volt
Usually Leaves Warehouse In: 3 Business Days - 3 Weeks
Listing:
Usage: Exterior Wet
Finish Options: View Bisque (Unfinished,
Lamp Options: (1) 60 Watt G16½ C

Bulbs:
60G16CL3 - 25 pack
60G16CL3 - 500 pack

Catalog Reference:

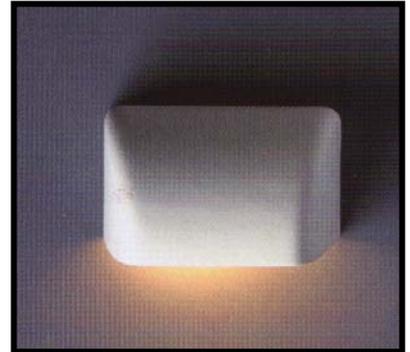
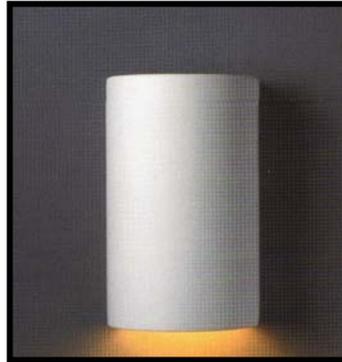
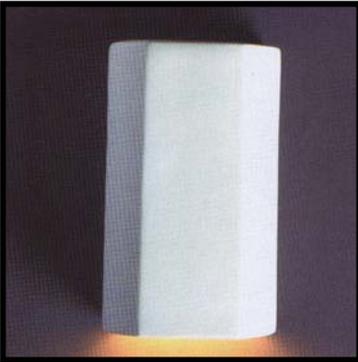
Customer Reviews:

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Balcony and Patio Lights

Justice Design Group



Canister Light – Ambiance wall mount

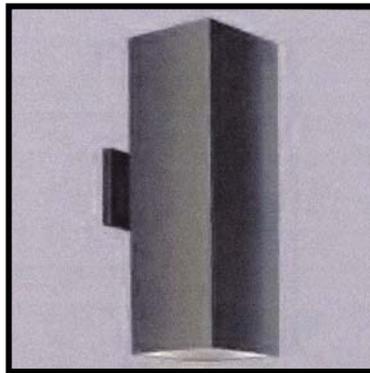
Ceramic (shapes and faux finishes available) Use with 480 lumens or less bug bulb

Cost for fixtures (depending on size and shape): \$35.00 - \$250.00 (avg. \$60-80)

Justice Design Group, Inc., Culver City, CA Tel: (310) 397-8300

Fax: (310) 397-7170 E-mail:sales@jdg.com Website: www.jdg.com

Thomas Lighting and Progress Lighting



Thomas: Canister wall mount
SL-9270-7

Black polymer

Use 480 lumens or less watt
bug bulb

Progress: Canister wall or ceiling
mount. Use with 480 lumens or less
bug bulb

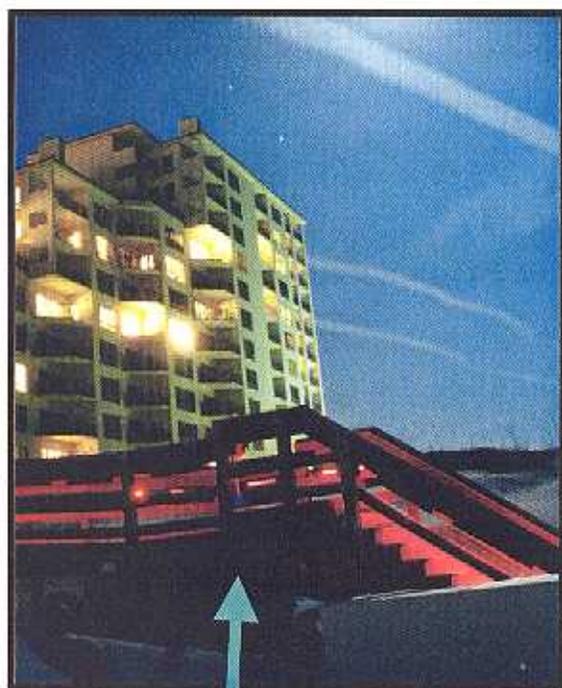
Aluminum, powder coated finish
Note: the aluminum may pit and oxidize in
the marine environment and require
periodic painting

Cost: \$35- \$250.00

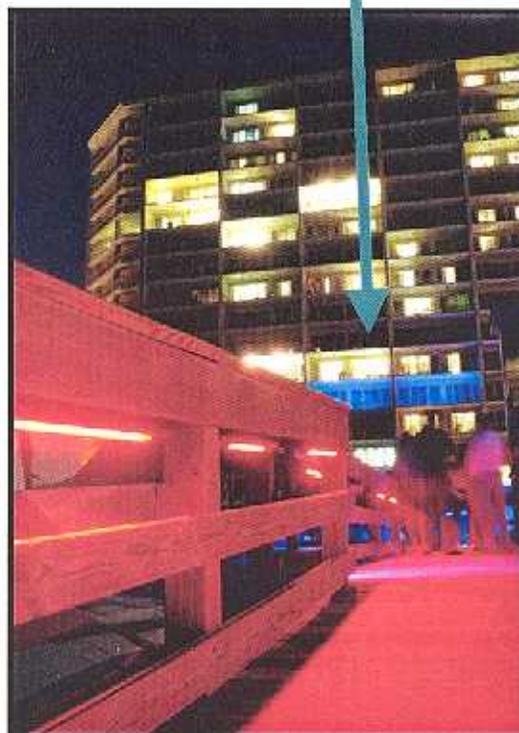
www.progresslighting.com

Boardwalk & Balcony Neon Lights

by Lighting the Way Enterprises, Inc.



Red, blue, green, aqua marine, and purple neon are permitted on balconies (that are "off" the beach).



Only red neon permitted on boardwalks (light source can not shine on or be directed at the beach).

Light Costs

2ft = \$239.00

3ft = \$289.00

installation not included

LTW, Inc.

812 NW 8th Ave

Ft. Lauderdale, FL 33311

Tel: (954) 522-1765

Toll Free: (800) 658-1829

Fax: (954) 768-0645

John Vellela



LED SEA TURTLE LIGHT

DESCRIPTION & FEATURES



- 💡 This fixture meets the IES requirements for 100% full cut-off. This makes the LED Turtle Light an excellent choice for areas with Dark Sky ordinances, light trespass restrictions, and endangered species protection.
- 💡 The LED Turtle Light employs the best available technology (BAT) combining good looks, energy efficiency, and durability with uncompromising Wildlife Lighting standards. The fixture is a type minimally disruptive to nesting sea turtles and is recommended for installations where lights are needed near known nesting beaches.
- 💡 Beautiful clean lines and a rugged high impact polycarbonate body that won't rust or corrode in the harsh coastal environment. Sealed light emitting diode (LED) technology means it will be more than a decade before you have to replace the bulb. Superior optics direct the light right where you need it for safety and security.

SPECIFICATIONS

DIMENSIONS:

HEIGHT:	7 1/2"
WIDTH/DIA:	4 1/4"
EXT. FROM WALL:	8 1/2"

LAMP:

TYPE:	LED; 100,000 HR LAMP LIFE
QUANTITY:	1 LAMP w/40 DIODES
COLOR:	AMBER
WATTAGE:	4.5W

CONSTRUCTION:

HOUSING:	HIGH IMPACT POLYCARBONATE WON'T RUST, CHIP or CORRODE
HARDWARE:	ALL STAINLESS STEEL

MOUNTING:	WALL
BAFFLE:	BLACK SCREW-IN BAFFLE

SUPERIOR OPTICS



Patent Pending
Made in the U.S.A.

FC Lighting - FCC Series Cylinders

All fixtures pictured at right are available for use with incandescent or PL (fluorescent) lamps.

For fixtures with other light sources click -
[HTD](#)

◆ [Click here for fixtures in our Quickship Program](#)

Other Exterior categories:

[Spotlights](#)
[Billards](#)
[Wall Mounts](#)
[Post mounts](#)
[Floods](#)
[RIMs](#)

All may work. Some may need black baffles inside to reduce reflection,
 Top



[Interior](#) | [Exterior](#) | [Recessed](#) | [Track](#) | [Specialty](#)

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FC Lighting - Post / Arm mounts

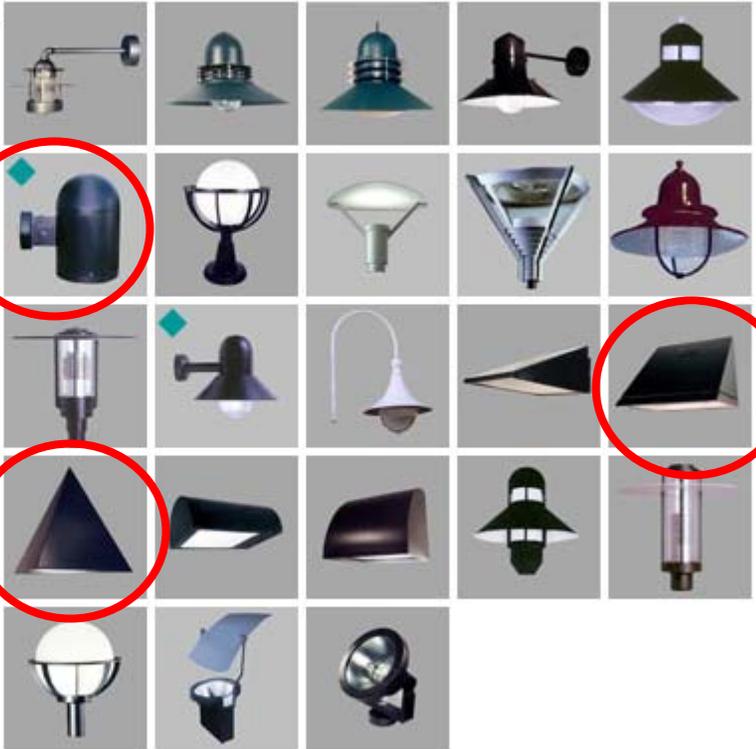
All fixtures pictured at right are available for use with HID lamps.

For fixtures using the following light sources, click - [Fluorescent](#), [Incandescent](#)

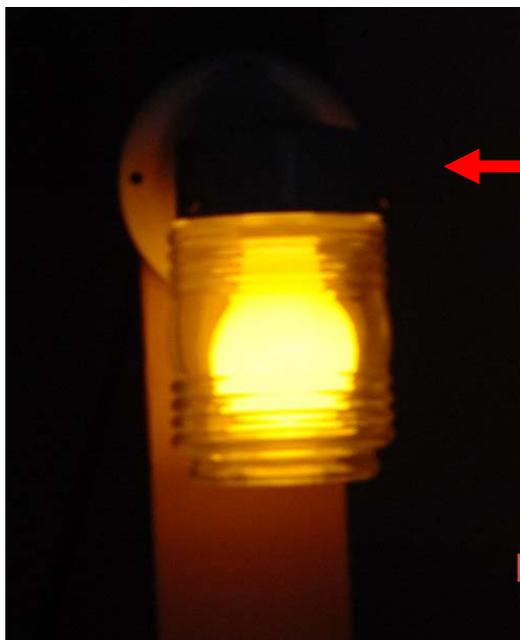
◆ Click here for fixtures in our [Quickship Program](#)

Other Exterior categories:

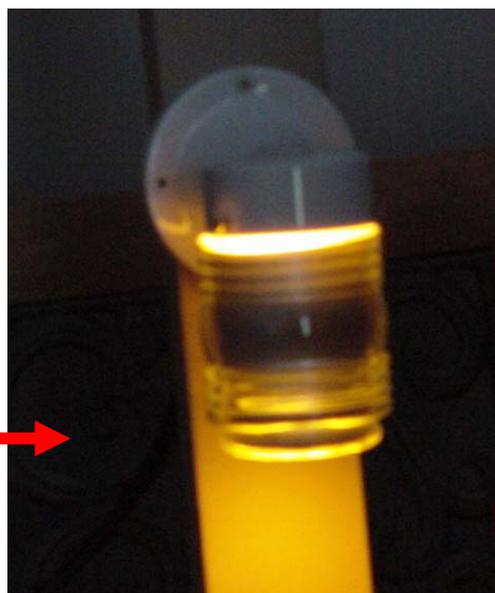
- [Steplights](#)
- [Bollards](#)
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- [Wall Mounts](#)
- [Floods](#)
- [RLMs](#)



"Jelly jar" wall mount or ceiling fixture



Without the shield—light goes in all directions



With the shield—light goes down where it needs to be

Cost:

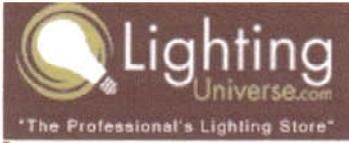
fixture - \$3.00 from most hardware stores

shield material *- \$0.25

Bug bulb, 40 watt \$1.50

Total: \$4.75 each

*The aluminum flashing can be purchase from hardware or home improvement stores. \$7.00 for 10 feet



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Due to differences in the application of certain finishes, slight variations in color may occur.

Lightinguniverse Price: \$172.18

Do you qualify for Trade Pricing?

Price Calculator

Quantity:

Price Each: \$172.18

Purchase Options

Project Manager Options



Manufacturer Info

1411W - Americana Sconce (Wet)

The Ambiance Collection of ceramic wall sconce collection from Justice Design. The hallmark the indirect, *ambient* light quality that can fill subtle, warm glow. This Americana Wall Sc is available in a variety of finishes - See Below **Shown in Antique Patina finish.**

The bulb is not included with this fixture.

Justice Design Frequently Asked Questions

- Part Number:** 1411W-BIS
- Dimensions:** 10¾"h x 14"w x 6½"proj; 3'
- Materials:** Ceramic Bisque
- Voltage:** 120 Volt
- Usually Leaves Warehouse In:** 3 Business Days - 3 Weeks
- Listing:**
- Usage:** Exterior Wet

Finish Options: View

Lamp Options:

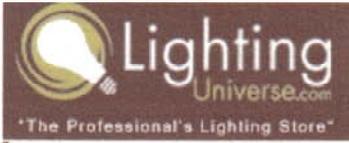
- Bulbs:**
- 36972 - 6 pack
 - 36972 - 60 pack
 - CF15C/DL-1 pack

Accessories:
Ext. Photo Sensor -Dusk to Dawn

Catalog Reference:

Customer Reviews:

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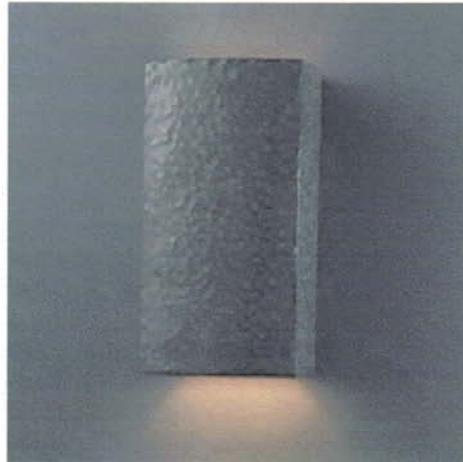
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Due to differences in the application of certain finishes, slight variations in color may occur.

Lightinguniverse Price: \$121.59

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Price Each: \$121.59

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Justice Design
Manufacturer Info

0915W-Small Rectangle

This wall sconce from the Ambiance Collecti design and a wide array of finish options. Pic iron. The top and bottom are open.

The bulb is not included with this fixture.

- Part Number:** 0915W-BIS-INCAN
- Dimensions:** 9¼" h x 5" w x 4½" p mounting center
- Voltage:** 120 Volt
- Usually Leaves Warehouse In:** 3 Business Days - 3
- Construction Details:** Made to order in the
- Listing:**
- Usage:** Exterior Wet
- Finish Options:** [View](#)
- Lamp Options:**

- Bulbs:**
- [36972 - 6 pack](#)
 - [36972 - 60 pack](#)
 - [CF15C/DL-1 pack](#)

Accessories:
[Ext. Photo Sensor -Dusk to Dawn](#)

Catalog Reference:

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Due to differences in the application of certain finishes, slight variations in color may occur.

MSRP: \$90.00

Lightinguniverse Price: \$71.43

Do you qualify for Trade Pricing?

Price Calculator

Quantity: Get Price

Price Each: \$71.43

View All Prices

Purchase Options

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Manufacturer Info

Ambis Outdoor-Ambiance-1800W

This outdoor fixture from the Ambiance colle in Bisque, but is available in a range of finish Please see the option below.

The bulb is not included with this fixture.

Justice Design Frequently Asked Questic

Part Number: 1800W-BIS
Dimensions: 6¾"w x 5¾"h x 4½"proj.
Materials: Ceramic
Voltage: 120 Volt
Usually Leaves Warehouse In: 3 Business Days - 3 Weeks
Listing:
Usage: Exterior Wet
Finish Options: View Bisque (Unfinished,
Lamp Options: (1) 60 Watt G16½ C

Bulbs:
60G16CL3 - 25 pack
60G16CL3 - 500 pack

Catalog Reference:

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Due to differences in the application of certain finishes, slight variations in color may occur.

Lightinguniverse Price: \$152.18

Do you qualify for Trade Pricing?

Price Calculator

Quantity:

Price Each: \$152.18

Purchase Options

Project Manager Options



Justice Design
Manufacturer Info

5200W - Arc

The broad arc of this wall sconce from the A has a closed top and a wide variety of finish Hammered Brass.

The bulb is not included with this fixture.

- Part Number:** 5200W-BIS
- Dimensions:** 6" h x 19½" w x 4" p center
- Materials:** Ceramic Bisque
- Voltage:** 120 Volt
- Usually Leaves Warehouse In:** 3 Business Days - 3
- Construction Details:** Made to order in the
- Listing:**
- Usage:** Exterior Wet
- Finish Options:** View Bisque (Unfinished,
- Lamp Options:** (2) 100w A19 Med l

Accessories:
Ext. Photo Sensor -Dusk to Dawn

Catalog Reference:

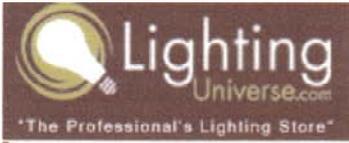
Customer Reviews:

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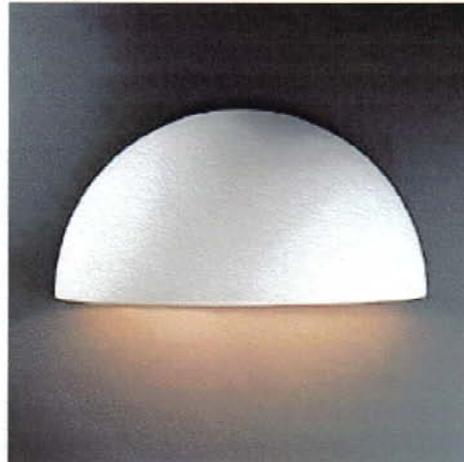
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Due to differences in the application of certain finishes, slight variations in color may occur.

MSRP: \$225.00

Lightinguniverse Price: \$195.59

Do you qualify for Trade Pricing?

Price Calculator

Quantity:

Price Each: \$195.59

Purchase Options

Project Manager Options



Manufacturer Info

1100W-Really Big Quarter

The Ambiance Collection of ceramic wall sconce collection from Justice Design. The hallmark the indirect, *ambient* light quality that can fill subtle, warm glow. The Really Big Quarter available in a variety of finishes - See Below

The bulb is not included with this fixture.

Justice Design Frequently Asked Questions

- Part Number:** 1100W-BIS-INCAN
- Dimensions:** 10" h x 20" w x 7 3/4" mounting center
- Materials:** Ceramic Bisque
- Voltage:** 120 Volt
- Usually Leaves Warehouse In:** 3 Business Days - 3
- Construction Details:** Made to order in the
- Listing:**
- Usage:** Exterior Wet
- Finish Options:** View
- Lamp Options:**

Accessories:
Ext. Photo Sensor -Dusk to Dawn

Catalog Reference:

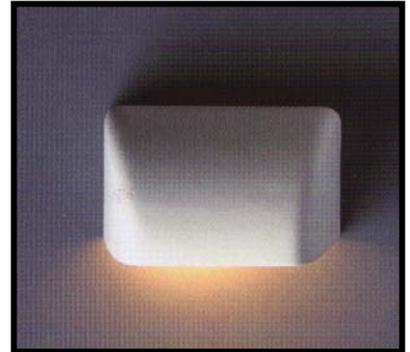
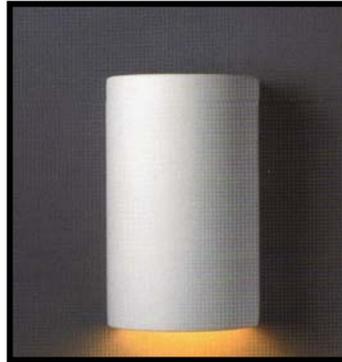
Customer Reviews:

[Click here to be the first to write an online review for this product!](#)

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Balcony and Patio Lights

Justice Design Group



Canister Light – Ambiance wall mount

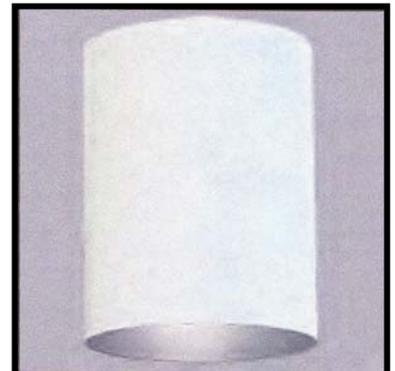
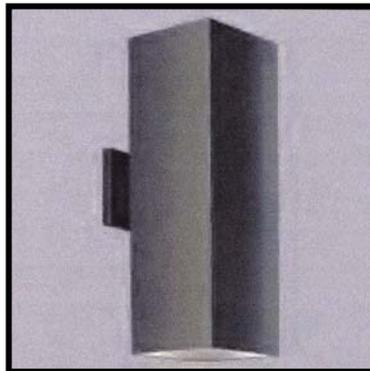
Ceramic (shapes and faux finishes available) Use with 480 lumens or less bug bulb

Cost for fixtures (depending on size and shape): \$35.00 - \$250.00 (avg. \$60-80)

Justice Design Group, Inc., Culver City, CA Tel: (310) 397-8300

Fax: (310) 397-7170 E-mail:sales@jdg.com Website: www.jdg.com

Thomas Lighting and Progress Lighting



Thomas: Canister wall mount
SL-9270-7

Black polymer

Use 480 lumens or less watt
bug bulb

Progress: Canister wall or ceiling
mount. Use with 480 lumens or less
bug bulb

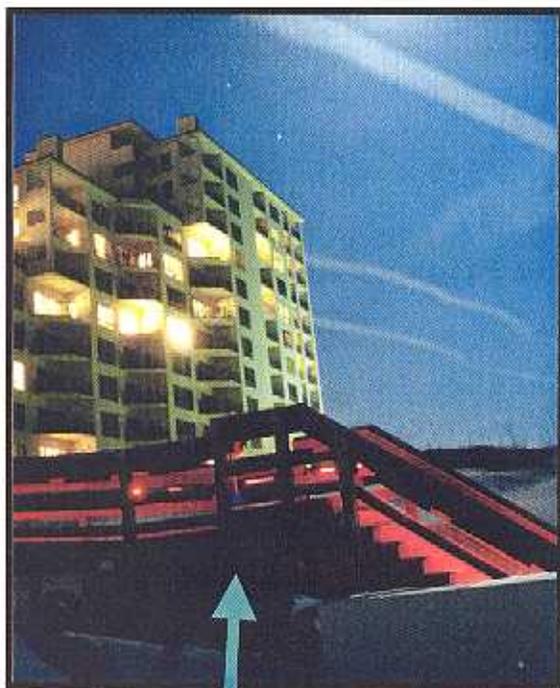
Aluminum, powder coated finish
Note: the aluminum may pit and oxidize in
the marine environment and require
periodic painting

Cost: \$35- \$250.00

www.progresslighting.com

Boardwalk & Balcony Neon Lights

by Lighting the Way Enterprises, Inc.



Red, blue, green, aqua marine, and purple neon are permitted on balconies (that are "off" the beach).



Only red neon permitted on boardwalks (light source can not shine on or be directed at the beach).

Light Costs

2ft = \$239.00

3ft = \$289.00

installation not included

LTW, Inc.

812 NW 8th Ave

Ft. Lauderdale, FL 33311

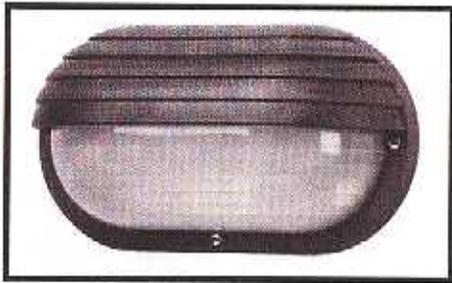
Tel: (954) 522-1765

Toll Free: (800) 658-1829

Fax: (954) 768-0645

John Vellela

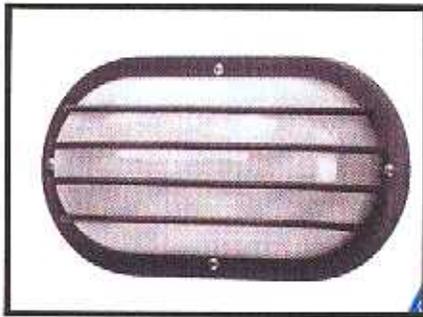
Fixtures that are marginally acceptable or should not be used on beachfront areas



The shields do not adequately direct the light downward. Only suitable for stairways or other areas where they will not shine on the beach.

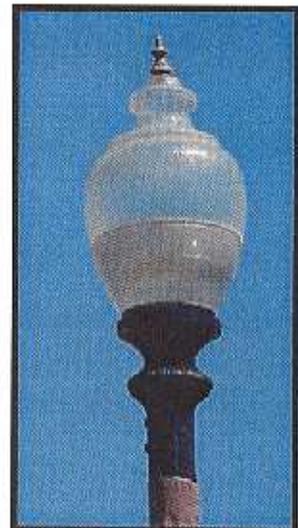
Attach to wall, post, or railing, mount no higher than 18 inches, use 40 watt or less bug bulb

Each: \$10.00 - \$15.00 each



This fixture allows light distribution in all directions even with bug or low pressure sodium light bulbs, it is too much light. Should not be used.

This fixture allows light distribution in all directions even with bug or low pressure sodium light bulbs, it is too much light. Should not be used.



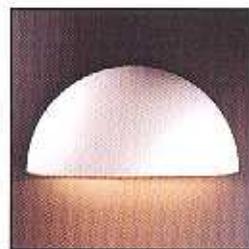
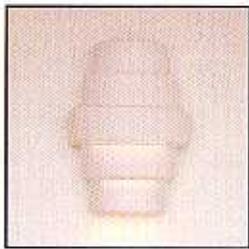
Recessed Ceiling Lights



Recessed ceiling fixtures should incorporate a black baffle trim kit.

**Use with 40-watt or less bug bulbs
or PAR30 bug bulbs**

Night Sky Friendly Ceramic Wall Sconces



Available in dozens of finishes and patterns



Each one of these attractive fixtures has a closed top, ensuring that it will put light only on the ground beneath it—without wastefully shining light into the night sky, or thoughtlessly across property lines.

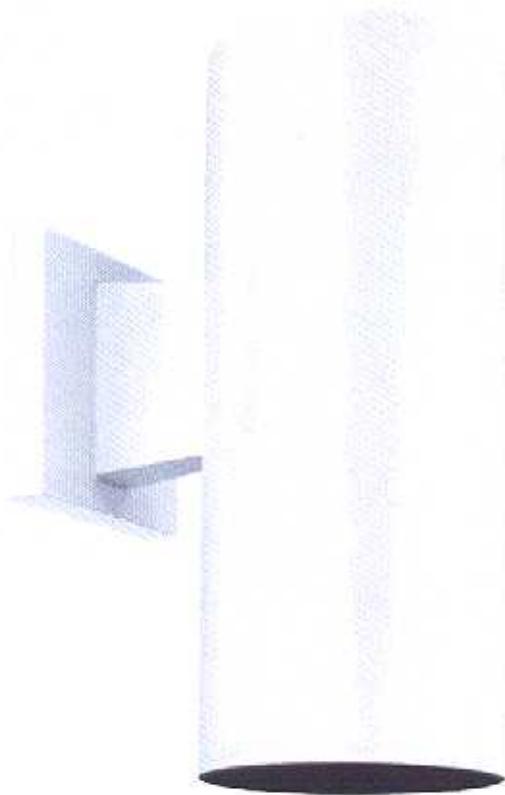
Starry Night
Lights



www.StarryNightLights.com

(877) 604-7377

Starry Night Lights... Saving The Night Sky... One Star at a Time!



Collection/Family:
Turtle Light

Catalog Number:
SL9270-8

Suggested Retail Price:
\$87.90

Description:

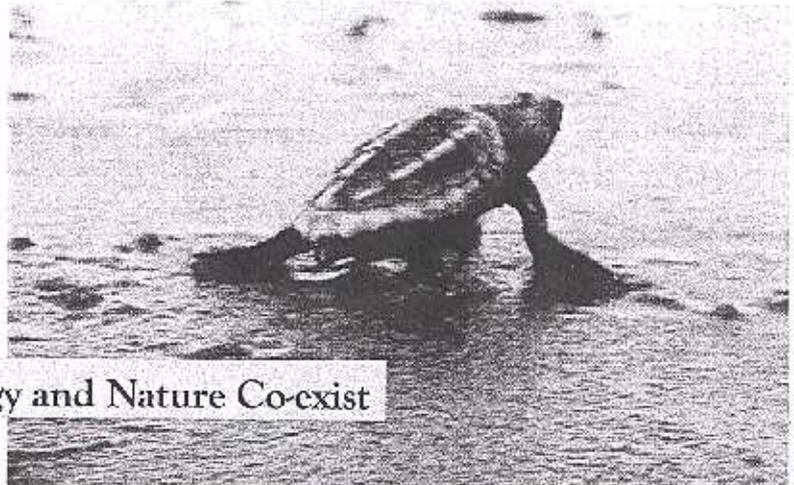
One-light turtle light in white plastic. Injection molded polycarbonate resists corrosion. Provides 100% light cut-off. Suitable for coastal regions with light restrictions for turtle nesting areas.

ADDITIONAL PRODUCT SPECIFICATIONS:

UPC Number : 020389165213
 Width : 5"
 Body Height : 12"
 Overall Length :
 No. Lights : 1
 Max Watt : 50w R20
 Extends : 7 3/4"
 HCO* : 4 5/8"



"Turtle-Friendly" Lighting from Intense



Technology and Nature Co-exist

97% of the World's Loggerhead Turtles hatch on the shores of Southeastern United States." Proper lighting control and care can help bring the population back to safe levels. Intense Lighting has a solution providing light for safety and security around property while not disturbing the nesting of turtles.

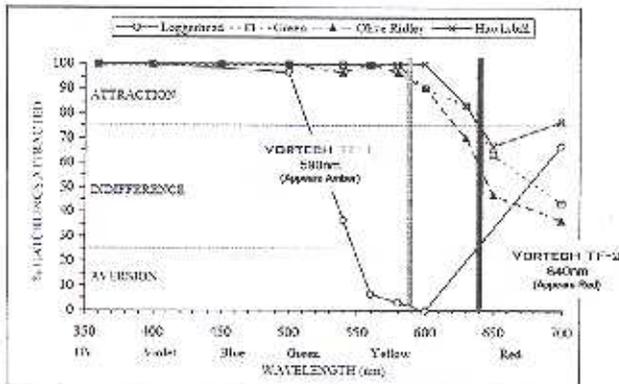


Optional Painted finishes available

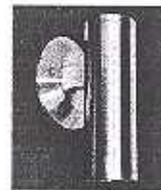
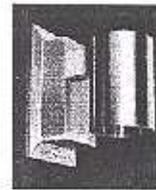
TF (Turtle-Friendly) Options are available on many of the Vortech products. Ask your local representative for more information or visit us at www.intenseighting.com.

A combination of cutoff fixture and shield will usually resolve all but the most serious of lighting problems. For lights very close to the beach, additional modifications may be necessary. "Coastal Beachway Lighting Manual - Florida Power & Light Company"

Special LED filtered lamps, combined with "Marine-Grade" 316 Stainless Steel make the Vortech the perfect solution for pathway and security lighting around shorelines without disturbing turtle hatching sites.



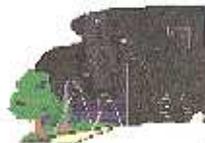
CHOOSE THE PROPER SPECTRUM



Vortech offers a wide variety of styles and options to choose from. All with "Marine Grade" 316 Stainless Steel construction. Choose from MR-16, HID, or LED lamping options.



INTENSE
 LIGHTING
 Where Creativity and Performance Meet



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Wall Mounted Cylinders and Cans

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	Manufacturer:	Lumière
	Model:	LE-716
	Lamp/Wattage:	INC, CFL
	Notes:	Full Cutoff
	Additional Links:	
	Manufacturer:	Lumière
	Model:	LE-714
	Lamp/Wattage:	INC, CFL
	Notes:	Cutoff
	Additional Links:	
	Manufacturer:	FC Lighting Manufacturers, Inc.
	Model:	C-824
	Lamp/Wattage:	INC, CFL
	Notes:	Full Cutoff
	Additional Links:	
	Manufacturer:	iGuzzini
	Model:	KR-5634 C8
	Lamp/Wattage:	HPS/50,150
	Notes:	Full Cutoff
	Additional Links:	

We welcome your input and comments.
 Please use [this link](#) to send comments (on this page) direct to the
 Webmaster & Lighting Advisory Working Group

Help Prevent Light Pollution

W.F. Harris Wall Mount LED Fixture



Shielded Wall Lighting with 3 Watt Amber LED

- ☆ Designed for Coastal Environments
 - Nonconductive
 - Polycarbonate - Injection molded, UV-Stabilized Lens and Housing
 - Rustproof Base Plate - Tempered Marine-grade Aluminum
- ☆ Easy Installation
- ☆ Maintenance Free Performance
- ☆ UL Listed for Wet Locations
- ☆ Lifetime Warranty for Lens, Housing, and Base Plates against Rust, Corrosion, Breakage





Looking for the right light bulbs?

STOP going around to stores or calling through the yellow pages!



-  Home Page
-  Sign-up
-  Log-in
-  Bulb Finder
-  Bulb Catalog
-  Lighting Design
-  Contact Bear



Use the **BEAR BULB FINDER** to identify your lightbulb, and click to go right to its catalog page.

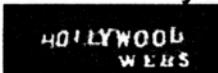
A *one-click process*. Order on line, and your lightbulbs are **RACING** to you the next day.



Real People are available to help you by phone during normal business hours (PST). Call

1-888-988-2327

Powered by:



CASE PRICE	CASE QTY	PRICE EACH	BEAR PART#	DESCRIPTION
53.76	24	2.24	04251	40W A19 YELLOW BUGLIGHT

Desired QTY: Cases Units



info @ bear lighting . com



CornerHardware.com

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Product Path: [Lighting](#) -> [Lightbulbs](#) -> [Specialty Bulbs](#) -> **40 Watt Yellow Bug Light**

40 Watt Yellow Bug Light

Feit Electric
Feit Electric
40 Watt Yellow Bug Light



Quick Quote - Buy Online

Item	Coverage	Price	Unit	Quantity	Subtotal	
40 Watt Yellow Bug Light 40A/Y/2		\$ 2.09	Each	<input type="text"/> Each	<input type="text"/>	BUY NOW

[CALCULATE](#)

YELLOW BUG LIGHT 40 Watts Diameter: 2-3/8" 3000 hours Medium base 4-1/4" length A-19 bulb 1 per package

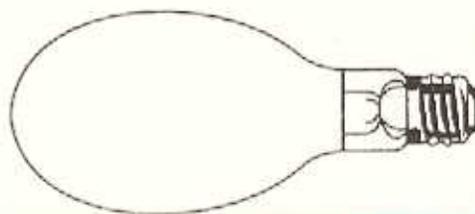
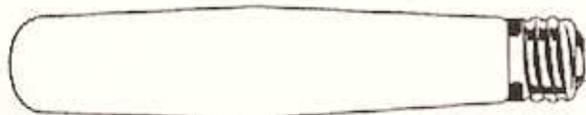
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Tree Or Grass?

From mercury vapor lamps to low and high pressure sodium bulbs, Topbulb's selection comes in a variety of shapes, sizes and wattages. You're sure to find just what you need.

High Pressure Sodium Bulbs

ordering code	watts	description	base type	case qty.	list price	your cost per bulb		
						less than 1 case	1-3 cases	3+ cases
LU70	70	CLEAR	MOGUL	12	66.69	34.95	33.35	31.68
LU100	100	CLEAR	MOGUL	12	69.16	36.50	34.58	32.85
LU150/55	150	CLEAR	MOGUL	12	71.63	37.50	35.82	34.03
LU250	250	CLEAR	MOGUL	12	76.57	38.95	37.00	35.15
LU400	400	CLEAR	MOGUL	12	81.51	40.95	39.00	37.05
LU1000	1000	CLEAR	MOGUL	6	209.95	129.95	123.36	117.19



Low Pressure Sodium Bulbs

ordering code	watts	description	base type	case qty.	list price	your cost per bulb		
						less than 1 case	1-3 cases	3+ cases
SOX18	18	Double contact	bay base	25	46.25	35.50	34.15	33.15
SOX35	35	Double contact	bay base	25	48.25	36.50	35.15	34.15
SOX55	55	Double contact	bay base	25	54.75	40.95	39.81	38.81
SOX90	90	Double contact	bay base	12	110.25	84.75	83.85	82.85

CALL FOR OTHER LOW PRESSURE SODIUM BULBS

Mercury Vapor Lamps

ordering code	watts	description	case qty.	list price	your cost per bulb		
					less than 1 case	1-3 cases	3+ cases
H39KC-175/DX	175	DELUXE WHITE	12	25.94	13.95	12.97	12.32
H37KC-250/DX	250	DELUXE WHITE	12	45.70	20.95	19.97	18.99
H33GL-400/DX	400	DELUXE WHITE	12	36.43	20.95	19.97	18.99
H36GW-1000/DX	1000	DELUXE WHITE	6	82.99	45.95	43.61	41.43

HIGHER PERFORMANCE BULBS
FOR WAREHOUSE USE

www.topbulb.com

800topbulb (800.867.2852) • 877faxbulb (877.329.2852)

Arc Projection

ordering code	your cost
EMINI 300 (EZG)	94.88
4ARC 300/16 (EZM)	79.61
MARC 300/16A use GEMINI 300	
MARC 300/35K (EZZ)	75.30
MARC 350/16T (EZZ)	97.50



Confused?
Call one of our friendly Sales Associates for assistance.

Metal Halide

ordering code	your cost
HTI150W	379.23
HTI250W/22	342.34
HTI250W/32	273.99
HTI250W/32C	349.04
HTI400W/24	288.90
HTI400W/SE	283.71
HQI-DE150/NDX	64.24
MVR100/C/U/MED	70.68
MVR175/U	37.78
MVR175/C/U	40.26
MVR250/C/HOR	69.00
MVR250/C/U	45.42
MVR250/U	42.75
MVR400/U	56.57
MVR400/C/U	38.69
MVR400/C/U	46.18
MVR1000/U	88.28
MVR1000/C/U	106.49
MVR1500/HBU/E	114.90
MYT400/C/U	105.45
MXR32/C/VBU	117.81
MXR70/C/U/MED	78.81
MXR100/BU/BD	61.51
MXR175/BU	50.47

Mercury Short Arc

ordering code	equivalent	your cost
HBO50W L1 or L2	USH-50AC	142.99
HBO50W/3	USH-50DC	143.00
HBO100W/1		168.00
HBO100W/2	USH-102D	142.99
HBO200W/2 L1 or L2	USH-200DP	143.00
HBO200W/4	USH-203A	160.00
HBO350W	USH-350DP	191.00
HBO500W		309.00
HBO500W/2 L1 or L2	USH-5095	309.00

Abbreviation Definitions

C	Cable
BD	Base Down
BU	Base Up
L1/L2	Differences In Voltage & Operating Current
OFR	Ozone Free
SE	Single-Ended
U	Universal

Xenon Short Arc

ordering code	equivalent	your cost
UXL-75XE		240.00
XBO75W/2		144.00
XBO75W/2 OFR		191.00
XBO150W/1	UXL-157	219.00
XBO150W/1 OFR	UXL-157-0	184.00
XBO150W/5		224.00
XBO150W/5S OFR	UXL-150M-0	222.00
XBO150W/4		299.00
XBO250W OFR		438.00
XBO300W OFR		396.00
XBO450W	UXL-451	408.00
XBO450W OFR	UXL-451-0	408.00

Mercury Vapor Lamps

watts	description	ordering code	case quantity	list price	your cost per bulb		
					less than 1 case	1-3 cases	3+ cases
175	DELUXE WHITE	H39KC-175/DX	12	25.94	13.62	12.97	12.32
250	DELUXE WHITE	H37KC-250/DX	12	45.70	20.97	19.97	18.99
400	DELUXE WHITE	H33GL-400/DX	12	36.43	20.97	19.97	18.99
1000	DELUXE WHITE	H36GW-1000/DX	6	82.99	45.90	43.61	41.43

Low Pressure Sodium

watts	description	ordering code	case quantity	list price	your cost per bulb		
					less than 1 case	1-3 cases	3+ cases
18	Double contact bay base	SOX18	25	46.25	35.15	34.15	33.15
35	Double contact bay base	SOX35	25	48.25	36.15	35.15	34.15
55	Double contact bay base	SOX55	25	54.75	40.81	39.81	38.81
90	Double contact bay base	SOX90	12	62.85	47.85	46.85	45.85

High Pressure Sodium Bulbs

watts	description	base type	ordering code	case quantity	list price	your cost per bulb		
						less than 1 case	1-3 cases	3+ cases
70	CLEAR	MOGUL	LU70	12	66.69	35.11	33.35	31.68
100	CLEAR	MOGUL	LU100	12	69.16	36.31	34.58	32.85
150	CLEAR	MOGUL	LU150/55	12	71.63	37.61	35.82	34.03
250	CLEAR	MOGUL	LU250	12	76.57	38.85	37.00	35.15
400	CLEAR	MOGUL	LU400	12	81.51	40.95	39.00	37.05
1000	CLEAR	MOGUL	LU1000	6	209.95	129.85	123.36	117.19

24

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call toll free: 800.867.2852

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Gray Supply

topbulb.com

Amber LED light bulb

R30 AMBER FLOODLIGHT (BUG LIGHT)



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Category 1 of 3 Next >>

Product 1 of 3 Next >>



R30 AMBER FLOODLIGHT (BUG LIGHT)

Watts: 5.6 W
Volts: 120 VAC, 60 Hz
Output: 100 lumens, 40° beam angle
Color: Amber
Type: R30 Floodlight
Length: 6.125 inch
Diameter: 3.625 inch
Dimmable: No
Usually Ships: 24 Hours

SKU: 874340000200
RETAIL: 46.95
PRICE: 15.95

R30 AMBER FLOODLIGHT (BUG LIGHT)

R30 amber LED floodlight (bug light). Clear polycarbonate shell with medium Edison screw base. 50,000 hour life (10 years if used 12 hours per day). Equivalent to a 45W incandescent bulb, but uses 80% less electricity.

Price: \$16.95

Use in the longer cylinder-type or recessed fixtures.

<http://store.lsgc.com/R30-AMBER-FLOODLIGHT-BUG-LIGHT-P1C0.aspx>

YELLOW BUG LIGHTS

Buylighting.com

A19 bug yellow regular light bulb

Stock #: **A19 yellow**

A19 yellow 130 volt bulbs are the exact same size as regular household light bulbs and will help keep the bugs away.

4,000 hour rated life

25 watt and 60 watt

\$1.59 per bulb

<https://secure.tcinternet.net/buylighting/cart/>

1-888-990-9933

Westinghouse

Item: 04251

Shape: A-19

Watts: 40

Base: Standard

Code Abbreviation: 40A19/Y/2

Description: 40W A-19 Bug Light SB 2-Pack 130V Box

Volts: 130

Finish/Beam Type: Yellow

Filament: CC6

Avg. Rated Hours: 4000

Approx. Lumens:

MOL: 4.00

Package Type: Box (2)

Master Carton: 120

Inner Pack: 24

<http://www.westinghouselightbulbs.com>

email: info@westinghouselightbulbs.com

Phone 1-88-417-6222

Lighthouse Supply

25A/Y-130

\$1.24 per bulb

25 watt yellow bug light 130v

<http://www.lighthousesupply.com/default.asp>

Bulbman.Com

40AK/Y-130

\$3.30 per bulb \$2.99 per bulb for order of 24 or more.

40 watt yellow long life krypton light bulb

This lamp is a 40 watt, 130 volt, yellow, long life krypton light bulb. It is an A19 shape with a diameter of 2.375 inches, a standard screw base measuring 26 millimeters in diameter and an overall length of 4.4 inches. It is rated at 10,000 life hours.

<http://www.bulbman.com/product.asp?3=536>

BLI

fluorescent 11, 15, 18 and 23 watt \$14.95 each (also have linear fluorescent yellow bug bulbs)

Incandescent 25, 40, 60, 70 and 100 watt Good Quality \$.99 each Best Quality \$1.99 each

<http://www.budgetlighting.com/buglight/>

www.turtlesafelighting.com

These are GE compact fluorescents with the special optics sleeve designed to mimic low pressure sodium (LPS). The spectral output is longer than a standard bug light. Also the 15-watt lamp only allows 300 lumens output which more closely mimics a 25-watt to 40-watt incandescent bulb. They have a standard screw in base and a 10,000 hour bulb life.

www.turtlesafelighting.com

Note: You trim the light “mask” to fit your needs and the bulb size.



Phillips 15W



Mask



Mask



Masked 3 tube 15W



Masked 3 tube 15W

Turtle Safe Coated Lamps

**Retrofit compact fluorescent lamps
(light bulbs)**



- Provides filtering to recommended standards
- UV protected coating applied directly to outside of the lamp's original envelope for durability
- Enjoy the energy savings, low heat and long life of compact fluorescent lamps
- Replacement lamp for floodlights, porch lights or any standard base lamp. Provides immediate compliance for many standard light fixtures
- Available in Turtle Safe color and Turtle Safe plus masking
- Easy seasonal installation and removal
- Coating warranted to last the life of the lamp

Turtle Safe Lighting lamps (light bulbs) and filters are only effective when used in properly shielded lighting fixtures approved for the application.



Turtle Safe Lighting, LLC

621 Brookhaven Drive Orlando, FL 32803
Tel: 407-447-9191 Fax: 407-447-9192

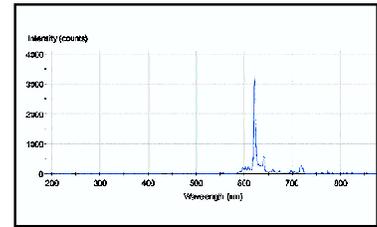
chris@turtlesafelighting.com
kristina@turtlesafelighting.com
www.turtlesafelighting.com



Approved Product

Turtle Safe Lighting

Compact Fluorescent Lamps and Filters



Turtle Safe Lighting compact fluorescent lamps and filters are designed to combine the advantages of compact fluorescent lamps -- long lamp life, cool operation, low energy consumption, and broad applications -- with lighting requirements in coastal areas.

Our products utilize our unique monochromatic filter system, which, applied to high quality lamps (light bulbs), results in a specific spectral output (see figure 1) widely regarded to be less distracting to nesting sea turtles and their hatchlings than white light. The Turtle Safe Lighting output is equal or superior to that of low-pressure sodium light sources, which have been accepted by many researchers and government agencies to be an acceptable source of lighting for coastal applications.

Unlike low-pressure sodium lamps, our products can be used in many standard 120V lighting fixtures, which do not require a ballast. Often, our lamps can be retrofitted into existing lighting fixtures for instant compliance with the local jurisdiction at a minimal cost.

While Turtle Safe Lighting products are one tool in helping to protect sea turtles and other species, no solution is absolute. The technology is based upon the best information available regarding less distracting light sources for sensitive species. Variances are possible species to species and individual to individual.

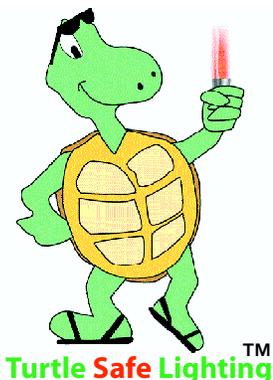
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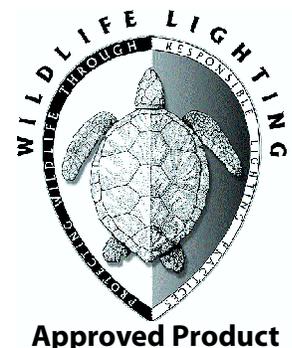
Turtle Safe Lighting lamps (light bulbs) and filters are only effective when used in properly shielded lighting fixtures approved for the application.



Turtle Safe Lighting, LLC

621 Brookhaven Drive Orlando, FL 32803
Tel: 407-447-9191 Fax: 407-447-9192

chris@turtlesafelighting.com
kristina@turtlesafelighting.com
www.turtlesafelighting.com



Turtle Safe Poly Sleeves

for compact fluorescent lamps
(light bulbs)



- Provides filtering to recommended turtle-friendly standards
- Highest quality, UV protected polycarbonate
- Available in sizes to fit most compact fluorescent lamps
- Available in Turtle Safe color and Turtle Safe plus masking
- Easy seasonal installation and removal
- Available with or without compact fluorescent lamp
- Five-year warranty

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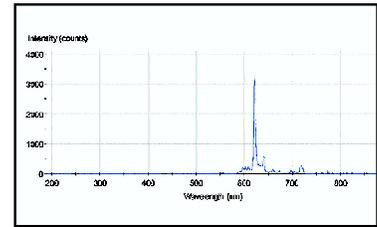
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Turtle Safe Lighting

Compact Fluorescent Lamps and Filters



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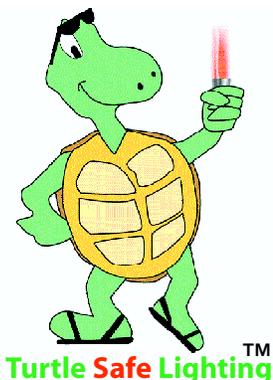
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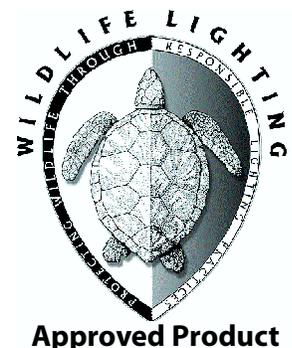
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Turtle Safe Poly Sleeves

for linear fluorescent lamps
(light bulbs)



- Provides filtering to recommended turtle-friendly standards
- Highest quality, UV protected polycarbonate
- Available in standard 4' lengths for T-5, T-8 and T-12 size fluorescent lamps
- Available in Turtle Safe color and Turtle Safe plus masking
- Easy seasonal installation and removal
- Works with standard lamps
- Five-year warranty

(Not recommended for high output lamps)

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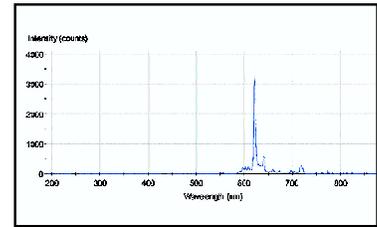
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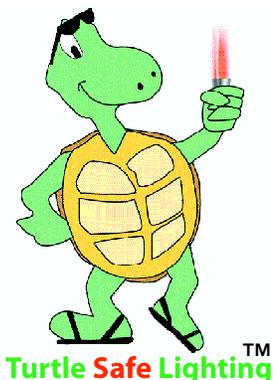
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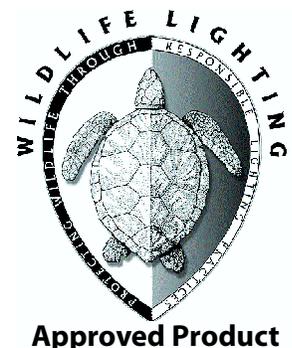
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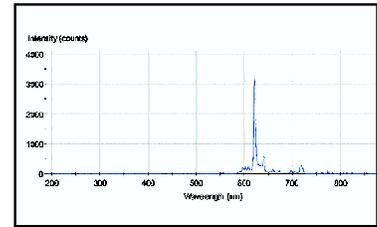
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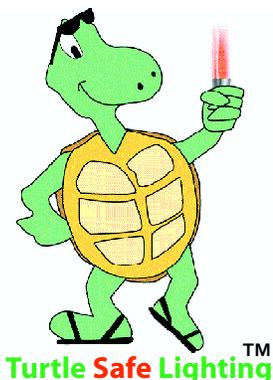
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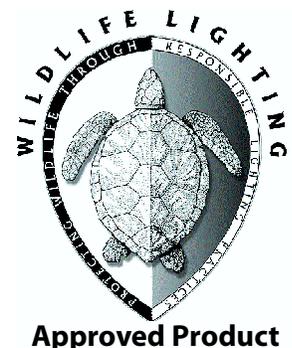
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Turtle Safe Snap-on Filter

for CF PAR-38 lamps (light bulbs)



- Provides filtering to recommended turtle-friendly standards
- Quick, simple and inexpensive compliance with most local and state ordinances
- Highest quality, UV protected polycarbonate
- Easy seasonal installation and removal
- Works with inexpensive PAR style compact fluorescent (cf) lamps in common PAR-38 lighting fixtures
- One-year warranty

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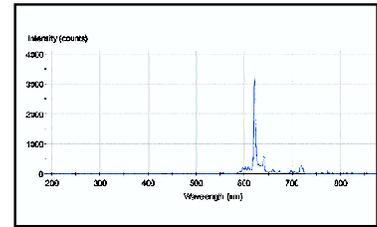
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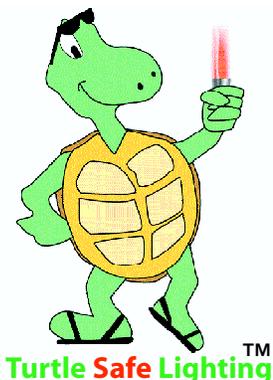
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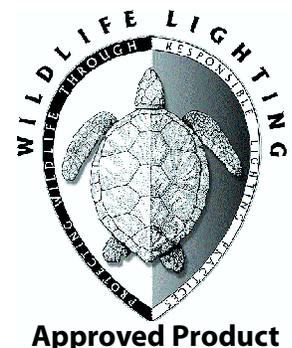
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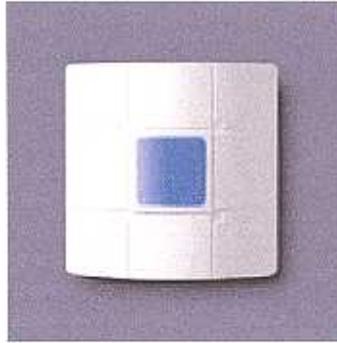
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Architectural Area Lighting

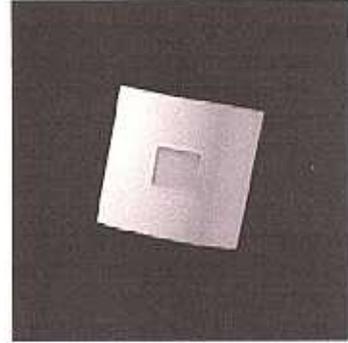
period	contemporary	floodlights	steplights	wall sconce	bollards
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miniFlex



eSconce



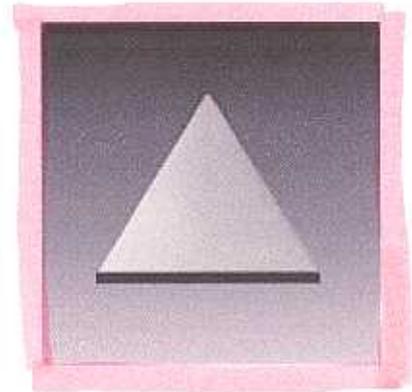
mini • eSconce



Universe Collection

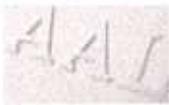


Spectra



Mitre

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Architectural Area Lighting

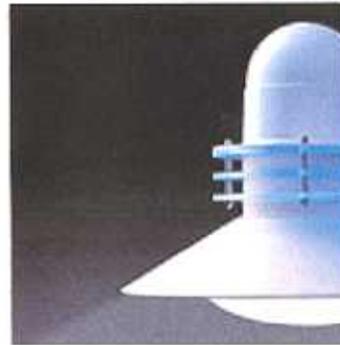
period	contemporary	floodlights	steplights	wall sconce	bollards
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Flex



Indirect



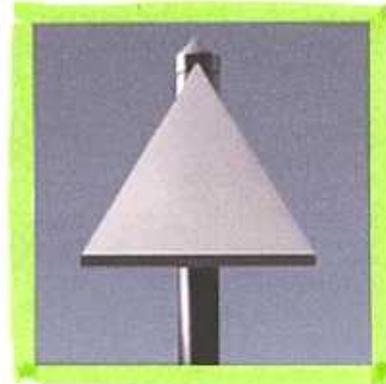
Universe Collection



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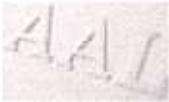


Largent



Mitre

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Architectural Area Lighting

period	contemporary	floodlights	steplights	wall sconce	bollards
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Trad. Con. Bollards



Concrete Bollards



Mitre



Spectra

*shields
needed
on
seaward
side*

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ARCHITECTURAL AREA LIGHTING

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eCommerce

Site Map

Mon, May 15, 2006

Tel.: (714) 994-2700

Fax: (714) 994-0522

eMail: info@aal.net



Providence Series™

The new period style fixture from AAL combines optical performance with aesthetics in a traditional form. The fixture utilizes efficient lamp sources and electronic ballast (long lamp life and color correction). Optical systems include horizontal reflectors, as well as an indirect version for ambient illumination.

More Product Information:

[Side Show](#) [Elevated Scale](#)

Spec Sheets & Photometric

[Spec Sheets](#) [Photometric](#)


specifications

types

PROV

optics

Vertical reflector

Horizontal reflector

Indirect

lamp types

T6-Ceramic MH
(70-150 Watts)ED-17 Standard MH
(70-175 Watts)ED-17 Standard HPS
(70-150 Watts)

options

Lightly diffused lens

House side shield

Quartz restrike controller

Halogen lamp socket

Decorative spikes

*can be retrofitted
with LPS bulbs*

CM851 Series

High Abuse Surface Fixture
Mini-Fluorescent / H.I.D. / Induction Lamp



We reserve the right to revise the design or components of any product without notice.

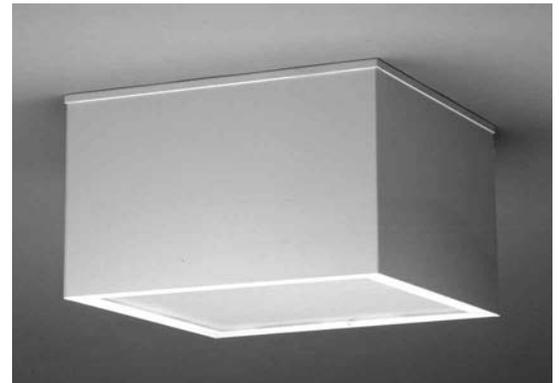
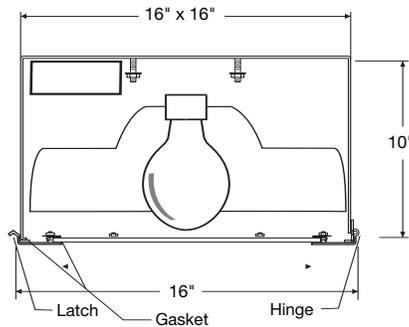
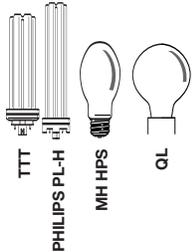
Catalog Number	
Project/Location	Type
Approved By	

SPECIFICATIONS

- HOUSING— Heavy Gauge Cold Rolled Steel or Aluminum -- Die Formed And Seam Welded Construction
- REFLECTOR— .032 Specular Aluminum to Optimize Light Output
- LENS— .125" Thick Clear Tempered Glass Lens Is Standard (See Lens Options for Others.)
- LENS FASTENERS— Heavy gauge Aluminum Retaining Angles Attached To Thru Door Studs For Positive Lens Clamping
- GASKETING— Silicone Around Inside Perimeter Of Door Frame And Lens Opening To Seal Out Dust And Moisture
- LAMP— MEDIUM BASE (H.I.D.) or Compact Fluorescent (CFL) - Supplied by Others. Induction QL - INCLUDED.
- BALLAST— 120/277 volt Electronic <10 THD CW 0° start Standard. Optional EBU — Programmable Start Universal Volt (120-277v) Electronic Ballast. NPF, HPF for HID.
- UL/ULC— UL/ULC Listed to U.S. and Canadian safety standards - Suitable for wet locations

INDUCTION LAMP

- Reduced Maintenance costs due to 60,000 - 100,000 hour rated life
- Starts down to -40°C
- No color shift over system life
- Can be switched ON/OFF frequently
- Instant Start HOT or COLD
- Flicker free light output
- 12,000 Lumens (165 Watt)



APPLICATIONS

- Parking Garages
- Gymnasiums
- School/Church Multi-purpose rooms
- Industrial Applications
- Retail Stores

FEATURES

- Low Brightness
- 1, 2, or 3 Circuits (CFL Only)
- Emergency Battery Back-up (EL-CFL) (CFL Only)
- Instant On (CFL and IND Only)
- Energy Efficient

Dimensions - W x H x D

Fluorescent TTT

Fluorescent DTT

Fluorescent TTT

Fluorescent PL-H

High Pressure Sodium

Metal Halide

QL Induction - **Up to 100,000 HR Lamp Life

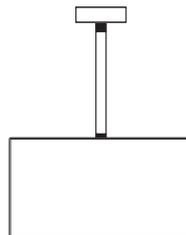
ICE Induction - **Up to 100,000 HR Lamp Life

** Lamping system is WARRANTED by Osram and Philips for 40,000 HOURS.

* means Backbox Required.

Lamp Quantity & Wattage listed below

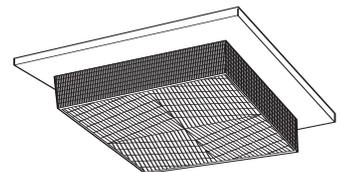
16" x 16" x 10-1/2"
consult factory
consult factory
(1, 2 or 3)26/32/42/57w
n/a
50/70/100/150/175w
50/70/100/125/150/175/200w
55/85/125/165w
n/a



PEND option (choose stem length)



optional QL Induction with Internal Reflector saves 80% of otherwise lost light



Drop Square (DS) lens Option

Catalog Number Ordering Guide

Example: **CM851 TTT(2)42 277 EB 81 QM**

SERIES	CM851 = CM851 SERIES
LAMP TYPE	TTT = Triple Twin Tube PL-H = Compact Fluorescent (Philips) MH = Metal Halide -- MEDIUM BASE HPS = High Pressure Sodium -- MEDIUM BASE QL = QL Induction Lamp (Included with Fixture)
LAMP QUANTITY/WATTAGE	Refer to Above Chart
COLOR TEMP (INDUCTION ONLY)	3K = 3000K (QL) color temperature 4K = 4000K (QL) color temperature

VOLTAGE	120 = 120 Volts 240 = 240 Volts 277 = 277 Volts 347 = 347 Volts EBU = Universal Volt (120-277v) Electronic Ballast Programmable Start QV = 120/208/240/277 Volts
POWER FACTOR	NPF = Normal Power Factor EB = Electronic Ballast EBHT = Extreme Temperature (-30° to +90° C) IND = HF Generator - Induction
LENS OPTIONS	80 = .125 K12 Prismatic Polycarbonate 81 = .156 K12 Prismatic Polycarbonate 92 = .187 Clear Polycarbonate 93 = .156 C73 Prismatic Tempered Glass

OPTIONS	AL = Aluminum Construction DS = Drop Square Diffuser EL-CFL = Emergency Battery - 650 Lumens (M & D size cast only) EL-CW = Cold Weather Emergency Battery ELH-CFL = High Lumen (1300) Emergency Battery (M & D size cast only) FUS = Single Fusing DFUS = Double Fusing PEND = Pendant Mounting Kit, 1/2" conduit entrance hole Must Specify Stem Length Pulse Start for Metal Halide PS = Pulse Start for Metal Halide QL-R = QL-R Induction Lamp with Internal Reflector (Incl'd with Fixture) QM = Quick Mount Bracket QRS = Quartz Restrike Relay (120V Only) - LAMP by others RMB = Rapid Mount Box SS = Stainless Steel TMB = Trunnion Mount Bracket BK = Black Finish BZ = Bronze Finish CC = Custom Color Finish (consult factory) WH = White Finish
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PHONE: 847-260-0333 FAX: 847-260-0344
www.eclipselightinginc.com
quotes@eclipselightinginc.com

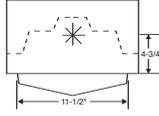
PHOTOMETRIC DATA:

CM851 SERIES

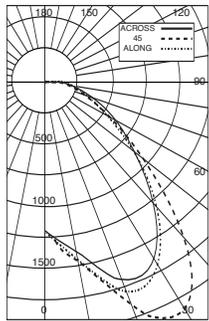
LSI test # 18102 CM851-QL-85W-120-WH-DP specular reflector and prismatic plastic drop lens

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	745	12.42	26.78
0-40	1280	21.35	49.46
0-50	2076	34.61	80.20
0-60	2558	42.64	98.80
40-90	1277	21.29	49.24
60-90	481	8.03	18.60
90-180	31	0.52	1.20
0-180	2589	43.16	100.00



Candela Summary: CP Curve and Table



Angle	CP
0	628
5	672
10	726
15	824
20	938
25	1064
30	1204
35	1360
40	1532
45	1720
50	1924
55	2144
60	2380
65	2632
70	2900
75	3184
80	3484
85	3800
90	4132
95	4480
100	4844
105	5224
110	5620
115	6032
120	6460
125	6904
130	7364
135	7840
140	8332
145	8840
150	9364
155	9904
160	10460
165	11032
170	11620
175	12224
180	12844

Rm. Percentage=20%
PCC-Ceiling Reflectance
PW-Wall Reflectance

Coefficients of Utilization

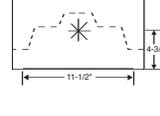
PCC>	80%			70%			50%		
	70%	50%	30%	70%	50%	30%	50%	30%	
0	51	51	51	50	50	50	48	48	
1	47	45	43	46	44	43	42	41	
2	43	40	38	42	39	37	38	36	
3	40	36	33	39	35	32	34	31	
4	37	32	29	36	32	29	31	28	
5	34	29	25	33	28	25	28	25	
6	32	26	23	31	26	22	25	22	
7	29	23	20	28	23	20	22	19	
8	27	21	18	26	21	18	20	17	
9	25	19	16	24	19	16	18	15	
10	23	18	14	23	17	14	17	14	

Room Cavity Ratio

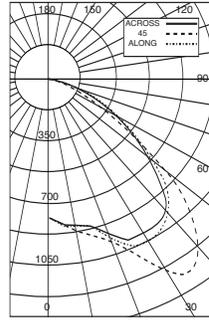
LSI test # 18101 CM851-QL-85W-120-WH-93 specular reflector and clear flat glass lens

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	819	13.66	25.33
0-40	1513	25.22	46.79
0-50	2838	47.31	87.76
0-60	3234	53.91	100.00
40-90	1721	28.89	53.21
60-90	395	6.80	12.24
90-180	0	0.00	0.00
0-180	3234	53.91	100.00



Candela Summary: CP Curve and Table

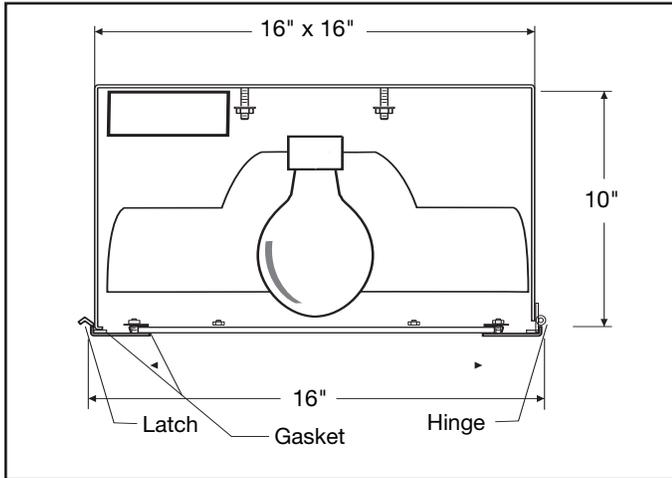


Rm. Percentage=20%
PCC-Ceiling Reflectance
PW-Wall Reflectance

Coefficients of Utilization

PCC>	80%			70%			50%		
	70%	50%	30%	70%	50%	30%	50%	30%	
0	64	64	64	63	63	63	60	60	
1	60	58	56	58	56	55	54	53	
2	55	52	48	54	50	48	49	46	
3	51	46	42	50	45	41	44	40	
4	47	41	37	46	40	37	39	36	
5	43	37	32	42	36	32	35	31	
6	39	33	28	38	32	28	31	27	
7	36	29	24	35	28	24	28	24	
8	33	26	21	32	25	21	25	21	
9	30	23	19	30	23	19	22	18	
10	28	21	16	27	20	16	20	16	

Room Cavity Ratio



APPLICATIONS

- Parking Garages
- Gymnasiums
- School/Church Multi-purpose rooms
- Industrial Applications
- Retail Stores

FEATURES

- Low Brightness
- 1, 2, or 3 Circuits – CFL Only
- Emergency Battery Back-up (EL-CFL) – CFL Only
- Instant On – CFL and IND Only
- Energy Efficient

INDUCTION LAMP

- Reduced Maintenance costs due to 60,000 – 100,000 hour rated life
- Starts down to -40°C
- No color shift over system life
- Can be switched ON/OFF frequently
- Instant Start HOT or COLD
- Flicker free light output
- 12,000 Lumens (165 Watt)

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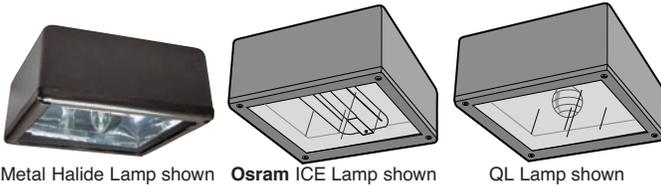
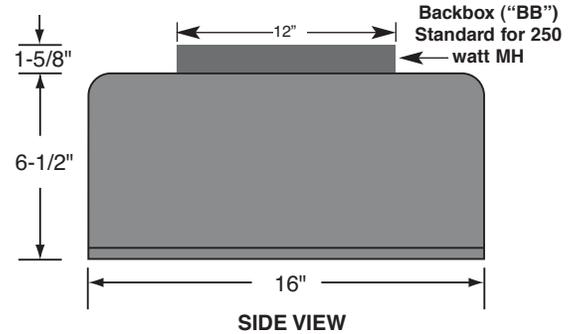
CM1616 Series

Ceiling Pole or Wall Mount Luminaire

Symmetrical/Asymmetrical Distribution

SPECIFICATIONS

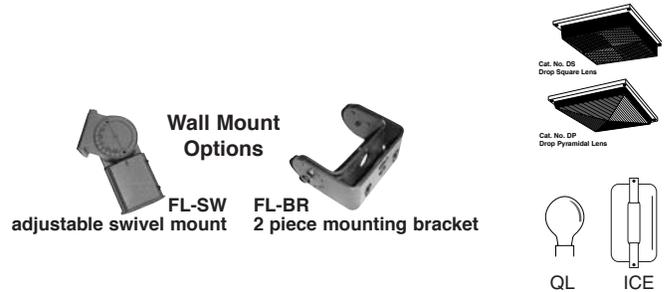
- **HOUSING**— Seamless die cast aluminum -- Finished in Bronze oven baked Polyester Powder Coat
- **REFLECTOR**— .032 textured aluminum for high efficiency and reduce arc tube voltage rise
- **LENS**— A clear, tempered glass lens secured in a hinged, gasketed frame. Optional Polycarbonate, C73 Prismatic Tempered glass
- **GASKETING**— High temperature, non-aging black EPDM neoprene rubber concealed in housing pocket and enclosed by cast-in drip shield and rear wire entrance hole to protect against outside contaminant's
- **LENS FASTENERS**— Stainless steel tamperproof screws --(4) To secure lens in place
- **SOCKET**— 4 KV rated medium base porcelain with 16 gage 200 degrees C -- SF-2 lead wires
- **LAMP**— PL-H Philips Compact Fluorescent - MEDIUM BASE High Pressure Sodium or Metal Halide (Recommend use of Venture UV Guard) as required - SUPPLIED BY OTHERS
- **BALLAST**— 120/277 volt Electronic <10 THD CW 0° start Standard. Optional EBU – Universal Volt (120-277v) Electronic Ballast. NPF for HPS.
- **UL LISTED**— Suitable for wet locations
- **MOUNTING**— Direct Mount: Housing is supplied with four 0.188" clearance holes for #8 screws. Four #8 X 1" sheet metal screws and sealing washers are provided for a water tight seal. When surface or feed-thru wiring is required specify "SCE" option
 — **Mounting Brackets:** FL-SW – Adjustable Swivel Mount, fits over 2" pole or tenon with locking rotor plate from 90° to 180°. Enclosed and gasketed internal chamber. FL-BR – 2 Piece; for wall, ground, roof or wood pole mounting. Allows vertical tilt to any angle.



Metal Halide Lamp shown

Osram ICE Lamp shown

QL Lamp shown



FL-SW adjustable swivel mount

FL-BR 2 piece mounting bracket

QL

ICE

ORDERING INFORMATION

Example: CM1616 MH 200 120 EB PS QRS	
SERIES	OPTIONS
CM1616 = CM1616 SERIES Symmetrical	277 = 277 Volt Ballast
CM1617 = CM1617 SERIES Asymmetrical	BK = Black Finish
LAMP TYPE	CC = Custom Color (consult factory)
DTT = Double Twin Tube	DP = Drop Pyramid Diffuser
TTT = Triple Twin Tube	DS = Drop Square Diffuser
PL-H = Compact Fluorescent (Philips)	EBU = Universal Volt (120-277v) Electronic Ballast
MH = Metal Halide -- MEDIUM BASE	FL-BR = Two Piece Mounting Bracket
HPS = High Pressure Sodium -- MEDIUM BASE	FL-SW = Adjustable Swivel Mounting Bracket
QL = Induction Fluorescent	FUS = HLR/GLR Fuse and Fuseholder
ICE = Induction Fluorescent (Osram)	LP = Lamped with Philips PL-H
WATTAGE	PEND = Pendant Mounting Kit, 1/2" conduit entrance hole; specify stem length
DTT = 3 or 4 Lamp, 18 or 26 Watt	PS = Pulse Start for Metal Halide
TTT = 3 or 4 Lamp, 26, 32 or 42 Watt; 2 or 3 Lamp 57 Watt	QM = Quick Mount
PL-H = 2 or 3 Lamp, 120 Watt	QRS = Quartz Restrike Relay (120V Only) -- LAMP BY OTHERS
MH = 70, 100, 125, 150, 175, 200 or 250 Watt	TMB = Trunnion Mount Bracket
HPS = 70, 100, 150 or 250 Watt (250 req' BB)	WHT = White Finish
QL = 85 Watt Induction (120v Only); 165 Watt Induction (277v Only)	#81 = .156 K12 Prismatic Polycarbonate
ICE = 70, 100 or 150 Watt Induction (Osram 120v or 277v)	#92 = .187 Clear Polycarbonate
	#93 = .156 C73 Prismatic Tempered Glass
	#86 = .250 Clear Polycarbonate
VOLTAGE	
120 = 120 Volts	
240 = 240 Volts	
277 = 277 Volts	
QV = 120, 208,240 & 277 Volts	
POWER FACTOR	
EB = Electronic Ballast (Fluorescent or MH)	
IND = HF Generator (Induction)	
NPF = Normal Power Factor for HPS	
	9002 (Torx) Tamperproof Screwdriver



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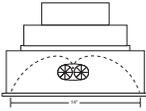
PHOTOMETRICS DATA:

CM1616 SERIES

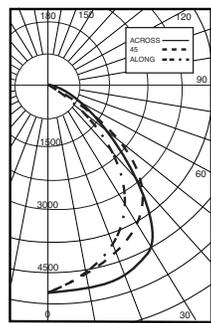
LSI test # 16042 CM1616-IND-ICE-150W-277-B2 specular reflector and c73 prismatic glass lens

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	3664	30.54	37.24
0-40	5803	48.36	58.96
0-60	8874	73.96	90.18
0-90	9840	82.01	100.00
40-90	4037	33.64	41.82
60-90	966	8.05	9.82
90-180	0	0.00	0.00
0-180	9840	82.01	100.00

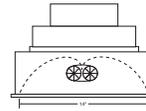


Candela Summary: CP Curve and Table

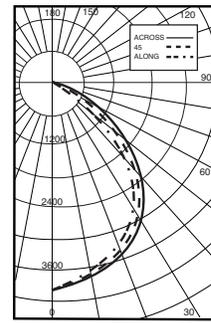


Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	2824	23.24	35.02
0-40	4371	36.43	54.20
0-60	6912	57.61	85.71
0-90	8064	67.21	100.00
40-90	3859	31.78	49.80
60-90	1152	9.60	14.29
90-180	0	0.00	0.00
0-180	8064	67.21	100.00



Candela Summary: CP Curve and Table



Room Cavity Ratio	0	1	2	3	4	5	6	7	8	9	10
80%	98	98	98	95	95	95	91	91			
70%	92	89	86	90	87	85	83	82			
50%	85	81	76	84	79	75	76	73			
30%	79	73	68	78	72	67	69	65			
15%	74	66	61	73	65	60	64	59			
7.5%	69	60	54	67	59	54	58	53			
3.75%	64	55	49	63	54	48	53	48			
1.875%	59	50	44	58	49	43	48	43			
0.9375%	55	46	39	54	45	39	44	39			
0.46875%	52	42	36	50	41	35	40	35			
0.234375%	48	38	32	47	38	32	37	32			

Rm. Percentage=20%
PCC=Ceiling Reflectance
PW=Wall Reflectance

Coefficients of Utilization

PCC>	80%			70%			50%		
	70%	50%	30%	70%	50%	30%	50%	30%	
0	98	98	98	95	95	95	91	91	
1	92	89	86	90	87	85	83	82	
2	85	81	76	84	79	75	76	73	
3	79	73	68	78	72	67	69	65	
4	74	66	61	73	65	60	64	59	
5	69	60	54	67	59	54	58	53	
6	64	55	49	63	54	48	53	48	
7	59	50	44	58	49	43	48	43	
8	55	46	39	54	45	39	44	39	
9	52	42	36	50	41	35	40	35	
10	48	38	32	47	38	32	37	32	

Rm. Percentage=20%
PCC=Ceiling Reflectance
PW=Wall Reflectance

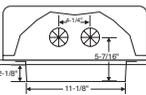
Coefficients of Utilization

PCC>	80%			70%			50%		
	70%	50%	30%	70%	50%	30%	50%	30%	
0	80	80	80	78	78	78	75	75	
1	75	72	70	73	71	68	68	66	
2	69	65	61	68	63	60	61	58	
3	64	58	54	62	57	53	55	52	
4	60	53	48	58	52	47	50	46	
5	55	48	42	54	47	42	46	41	
6	51	43	38	50	43	38	42	37	
7	47	39	34	46	39	34	38	33	
8	44	36	31	43	35	30	35	30	
9	41	33	28	40	32	28	32	27	
10	38	30	25	38	30	25	29	25	

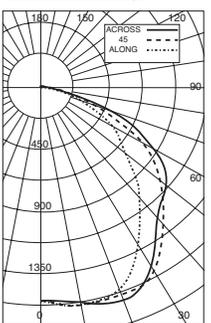
LSI test # 18501 CM1616-TTT-(2)70W-EB-DS semi-specular reflector and prismatic plastic drop lens

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	1313	12.63	27.09
0-40	2144	20.82	44.21
0-60	3760	36.16	77.52
0-90	4719	45.38	97.28
40-90	2574	24.75	53.07
60-90	958	9.22	19.77
90-180	131	1.27	2.72
0-180	4850	46.64	100.00



Candela Summary: CP Curve and Table



Rm. Percentage=20%
PCC=Ceiling Reflectance
PW=Wall Reflectance

Coefficients of Utilization

PCC>	80%			70%			50%		
	70%	50%	30%	70%	50%	30%	50%	30%	
0	55	55	55	54	54	54	51	51	
1	51	49	47	49	48	46	45	44	
2	47	43	40	45	42	39	40	38	
3	43	38	35	42	37	34	36	33	
4	39	34	30	38	34	30	32	29	
5	36	31	27	35	30	26	29	26	
6	33	27	23	32	27	23	26	23	
7	31	25	21	30	24	20	23	20	
8	28	22	18	28	22	18	21	18	
9	26	20	16	26	20	16	19	16	
10	24	18	15	24	18	15	18	14	



SUBMITTAL INFORMATION

Project _____

Location _____

Catalog No. _____

Fixture Type _____

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CM2424 Series



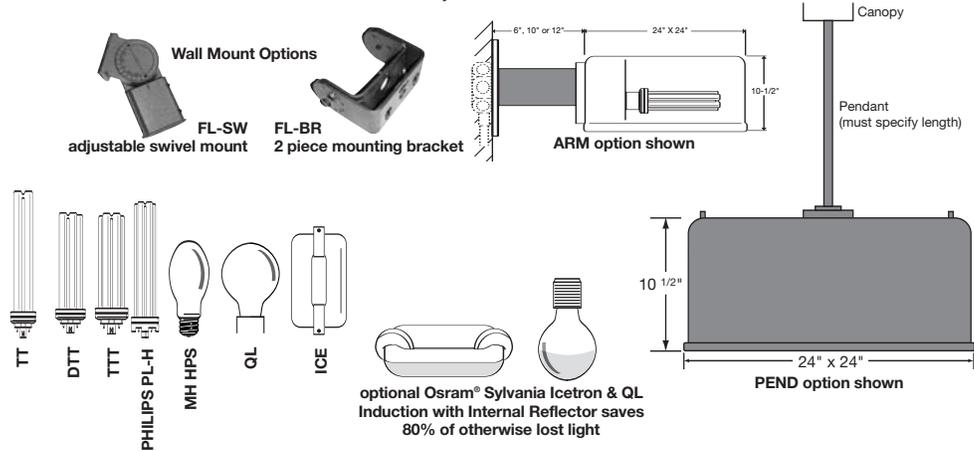
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Catalog Number	
Project/Location	Type
Approved By	

Ceiling Pole or Wall Mount
Symmetrical/Asymmetrical Distribution

SPECIFICATIONS

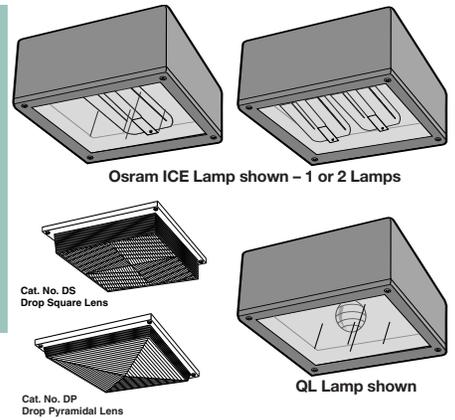
- HOUSING**— Seamless die cast aluminum -- Finished in Bronze oven baked Polyester Powder Coat
- REFLECTOR**— .032 textured aluminum for high efficiency and reduce arc tube voltage rise
- LENS**—85 .156" thick clear, tempered glass lens secured in a hinged, gasketed frame. Optional Polycarbonate, C73 Prismatic Tempered glass
- GASKETING**— High temperature, non-aging black EPDM and/or neoprene rubber concealed in housing pocket and enclosed by cast-in drip shield and rear wire entrance hole to protect against outside contaminant's
- LENS FASTENERS**— Stainless steel tamperproof screws --(4) To secure lens in place
- SOCKET**— 4 KV rated medium base porcelain with 16 gage 200 degrees C -- SF-2 lead wires
- LAMP**— Compact Fluorescent; MEDIUM BASE High Pressure Sodium or Metal Halide (Recommend use of Venture UV Guard) as required - SUPPLIED BY OTHERS. Induction ICE or QL - INCLUDED.
- BALLAST**— 120/277 volt Electronic <10 THD CW 0° start Standard. Optional EBU – Programmable Start Universal Volt (120-277v) Electronic Ballast. NPF for HPS.
- MOUNTING**— Direct Mount: Housing is supplied with four 0.188" clearance holes for 8 screws. Four 8 X 1" sheet metal screws and sealing washers are provided for a water tight seal. When surface or feed-thru wiring is required specify "SCE" option — Mounting Brackets: FL-SW – Adjustable Swivel Mount, fits over 2" pole or tenon with locking rotor plate from 90° to 180°. Enclosed and gasketed internal chamber. FL-BR – 2 Piece; for wall, ground, roof or wood pole mounting. Allows vertical tilt to any angle. ARM – Extended arm for wall mount. Ceiling Mount: GD – Grid Lay; PEND – Pendant, must specify stem length.
- UL/ULC**— UL/ULC Listed to U.S. and Canadian safety standards - Suitable for wet locations



Lamp Quantity & Wattage listed below

Dimensions - W x H x D	24" x 24" x 10-1/2"
Fluorescent TT	(4 or 5)36/39/55/80w
Fluorescent DTT	Consult Factory
Fluorescent TTT	(4 or 5)70w
Fluorescent PL-H	Consult Factory
High Pressure Sodium	250/400w
Metal Halide	200/250/320/400w
QL Induction - **Up to 100,000 HR Lamp Life	(1 or 2)85w; (1)165w
ICE Induction - **Up to 100,000 HR Lamp Life	(1 or 2)70/100w; (1)150W

** Lamping system is WARRANTED by Osram and Philips for 40,000 HOURS.
* means Backbox Required.



Catalog Number Ordering Guide

Example: CM2424 QL (2)85 4K 277 EB 85 RM

<p>SERIES CM2424 = CM2424 SERIES Symmetrical CM2425 = CM2425 SERIES Asymmetrical</p> <p>LAMP TYPE TT = Twin Tube TTT = Triple Twin Tube MH = Metal Halide -- MEDIUM BASE HPS = High Pressure Sodium -- MEDIUM BASE QL = QL Induction Lamp (Included with Fixture) ICE = Osram® Sylvania ICE Induction Lamp (Included with Fixture)</p> <p>LAMP QUANTITY/WATTAGE Refer to Above Chart</p> <p>COLOR TEMP (INDUCTION ONLY) 3K = 3000K (QL) or 3500K (ICE) color temp 4K = 4000K (QL) or 4100K (ICE) color temp</p> <p>VOLTAGE 120 = 120 Volts 240 = 240 Volts 277 = 277 Volts 347 = 347 Volts EBU = Universal Volt (120-277v) Electronic Ballast Programmable Start 120/208/240/277 Volts</p>	<p>POWER FACTOR NPF = Normal Power Factor HPF = High Power Factor EB = Electronic Ballast (1, 2, 3 or 4) EBHT = Extreme Temperature (-30° to +90° C) Electronic Ballast Programmable Start — (1, 2, 3 or 4) IND = HF Generator - Induction</p> <p>LENS OPTIONS 81 = .156 K12 Prismatic Polycarbonate 85 = .156 Clear Tempered Glass STANDARD 86 = .250 Clear Polycarbonate 92 = .187 Clear Polycarbonate 93 = .156 C73 Prismatic Tempered Glass</p>	<p>OPTIONS ARM = Extended Arm, Specify Length — 6", 10" or 12" DP = Drop Pyramid Diffuser DS = Drop Square Diffuser EL-CFL = Emergency Battery Pack for CFL-- 650 Lumens EL-CW = Cold Weather Emergency Battery Pack ELH-CFL = High Lumen (1300) Emergency Battery Pack for CFL FL-BR = Two Piece Mounting Bracket FL-SW = Adjustable Swivel Mounting Bracket FUS = Single Fusing DFUS = Double Fusing GD = Grid Lay In ICE-R = Osram® Sylvania ICE-R Induction Lamp with Internal Reflector (Incl'd with Fixture) PEND = Pendant Mounting Kit, 1/2" conduit entrance hole Must Specify Stem Length PS = Pulse Start for Metal Halide QL-R = QL-R Induction Lamp with Internal Reflector (Incl'd with Fixture) QM = Quick Mount Bracket QRS = Quartz Restrike Relay (120V Only) -- LAMP by others RG = Remote Generator (Osram Only) RM = Recessed Mount BK = Black Finish CC = Custom Color Finish (consult factory) WH = White Finish</p>
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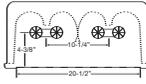
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CM2424 SERIES

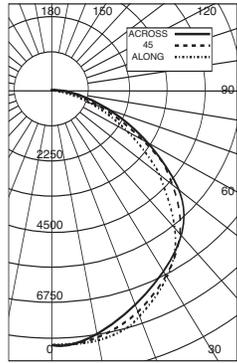
LSI test # 19766 CM2424-IND-ICE-(2)150W-240-BZ
 specular reflector and clear flat glass lens

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	6268	26.12	29.07
0-40	10259	42.75	47.58
0-60	17915	74.65	83.09
0-90	21561	89.84	100.00
45-90	11301	47.09	52.42
60-90	9845	15.19	45.11
90-180	0	0.00	0.00
0-180	21561	89.84	100.00



Candela Summary: CP Curve and Table



Angle	CP
0.0	8120
2.5	8112
5.0	8097
7.5	8080
10.0	8061
12.5	8034
15.0	7998
17.5	7950
20.0	7890
22.5	7818
25.0	7734
27.5	7638
30.0	7530
32.5	7410
35.0	7278
37.5	7134
40.0	6978
42.5	6810
45.0	6630
47.5	6438
50.0	6234
52.5	6018
55.0	5790
57.5	5550
60.0	5298
62.5	5034
65.0	4758
67.5	4470
70.0	4170
72.5	3858
75.0	3534
77.5	3200
80.0	2856
82.5	2502
85.0	2139
87.5	1767
90.0	1386
92.5	996
95.0	606
97.5	216
100.0	0

Rev. Percentage=20%
 PCC=Ceiling Reflectance
 PW=Wall Reflectance

Coefficients of Utilization

Room Cavity Ratio	90%			70%			50%		
	70%	50%	30%	70%	50%	30%	50%	30%	
0	109	109	109	104	104	104	100	100	
1	109	97	94	97	94	90	90	87	
2	93	87	81	89	83	78	80	76	
3	86	77	70	82	74	68	72	66	
4	79	69	61	76	67	60	65	59	
5	74	62	54	70	60	53	58	52	
6	68	55	48	64	54	47	52	46	
7	62	50	42	59	48	41	47	40	
8	57	45	37	55	44	37	43	36	
9	53	41	33	51	40	33	39	32	
10	49	37	30	47	36	30	35	29	

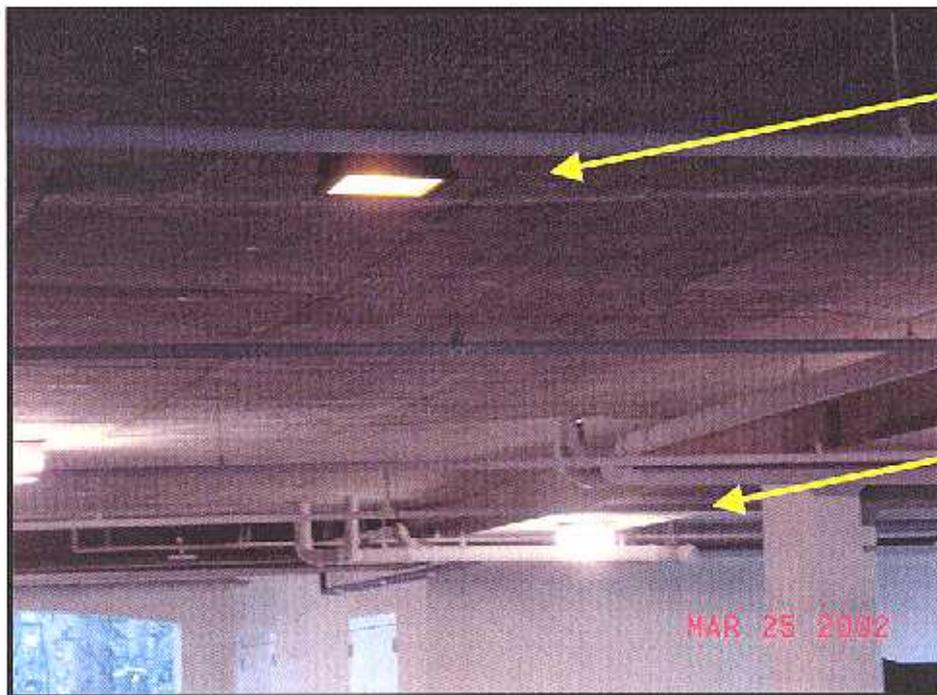
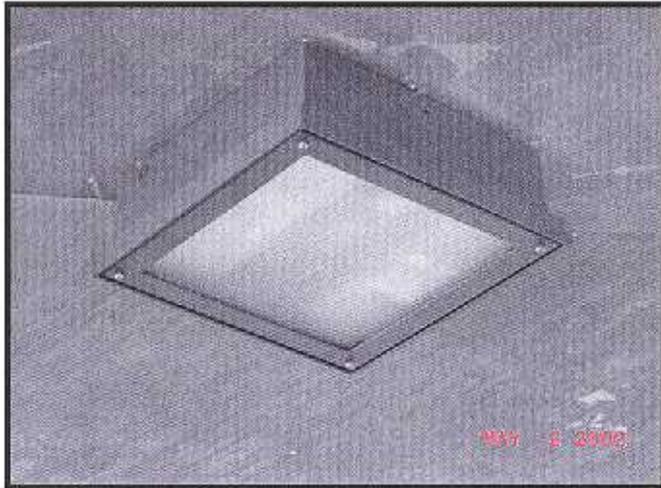


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9245 W. IVANHOE ST., SCHILLER PARK, IL 60176
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 www.eclipselightinginc.com
 quotes@eclipselightinginc.com

Parking Garage and other Common Area Lights



CM833

**Another type
no shield**

Eclipse CM833 Series use with 40 w bug bulb

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FC Lighting - Post / Arm mounts

All fixtures pictured at right are available for use with HID lamps.

For fixtures using the following light sources, click -
[Fluorescent](#), [Incandescent](#)

◆ [Click here for fixtures in our Quickship Program](#)

Other Exterior categories:

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[Ballards](#)
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[RLMs](#)



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800-227-0758 / 510-357-6900

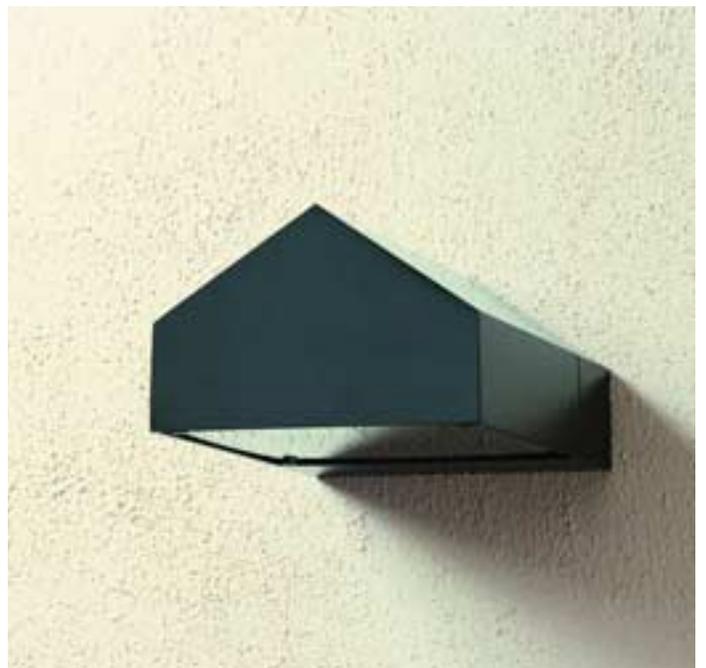
<http://www.sitelighting.com/index.cfm>

<http://www.sitelighting.com/Family.cfm?Brand=gar&ProLine=LPS>

Model: Form 10 LPS
Wattage: 1 x 55-180
Available pole- and wall-mount

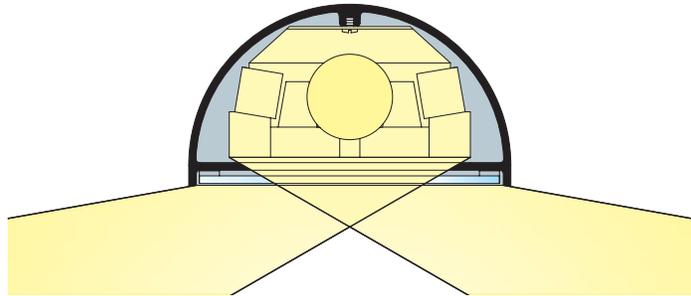


Site Wallforms



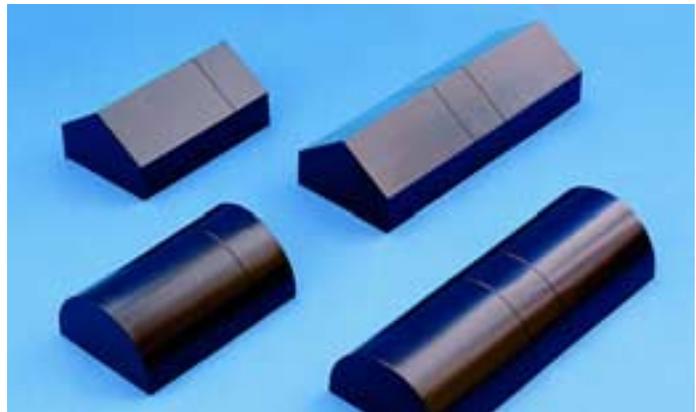
Full Cutoff Optics in SL1 - SL4 / SW1 and SW3

For projects requiring full cutoff pole-mounted luminaires for light trespass or dark-sky considerations, the **SL1 - SL4** maintains this theme at the pedestrian level. Each SL fixture has an optical module engineered to produce an asymmetric light distribution using a horizontal lamp, and flat tempered glass lens. Because of the low mounting height, coated H.I.D. lamps are recommended for optimum uniformity of illumination.



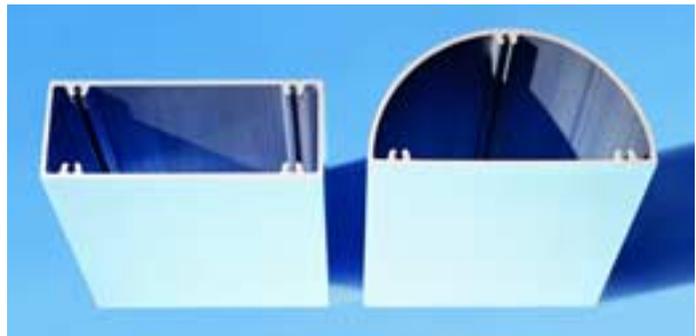
Heavy-Wall Cast Aluminum Heads

Kim SL fixtures are specifically designed and engineered to combine contemporary form with rugged vandal-resistant construction. Low level luminaires are often subject to abuse because of their proximity to pedestrian traffic. To combat this, all fixture heads are heavy-wall one-piece aluminum castings. SL models use concealed mechanical head-to-shaft connections for greater strength and clean detailing. **SL1 - SL4** models use flat tempered glass lenses, and **SL5** and **SL6** models use flat polycarbonate lenses.



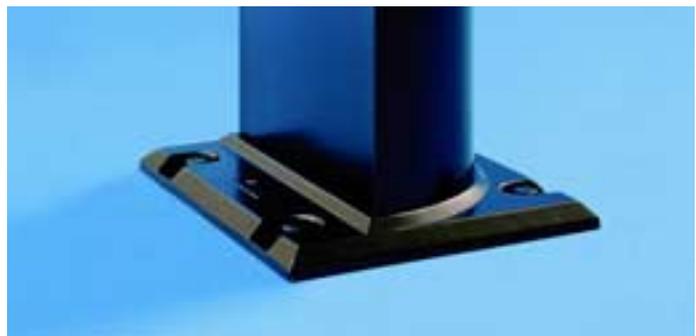
One-Piece Extruded Aluminum Shafts

To achieve a clean sharp-cornered architectural appearance with superior strength, all SL shafts are one-piece heavy-wall aluminum extrusions. Integral mounting tracks are incorporated for mechanical attachment of the head and base, which provides superior strength over welding.



Low Profile, High Strength Base

The SL mounting base is unique in the lighting industry, combining superior strength with a low-profile design. The shaft-to-base attachment is by concealed bolts threaded into the shaft extrusion. Kim tests show this method to be twice the strength of a welded connection. Anchor bolts are provided with couplings, allowing standard black stainless steel bolts to secure the base and eliminate unsightly protruding anchor bolts.



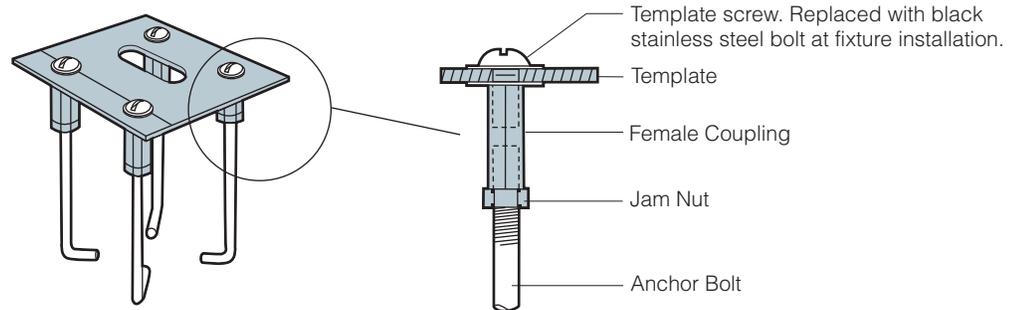
See page 39 for anchor bolt and installation details.

Installation Details

Site Lightforms and Site Wallforms

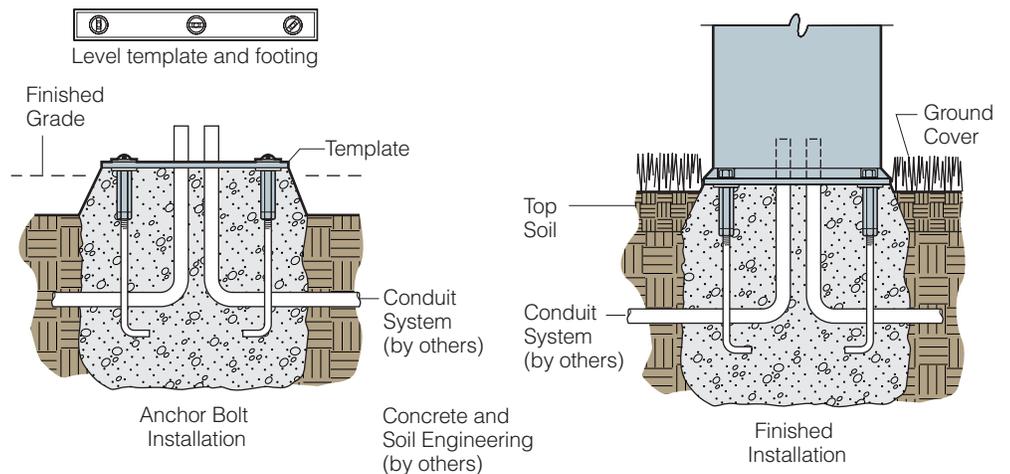
Anchor Bolts and Template

All SL models are supplied complete with anchor bolts and rigid template. The unique anchor bolt system employs female threaded couplings that allow the standard black stainless steel bolts to secure the base, eliminating unsightly protruding anchor bolts.



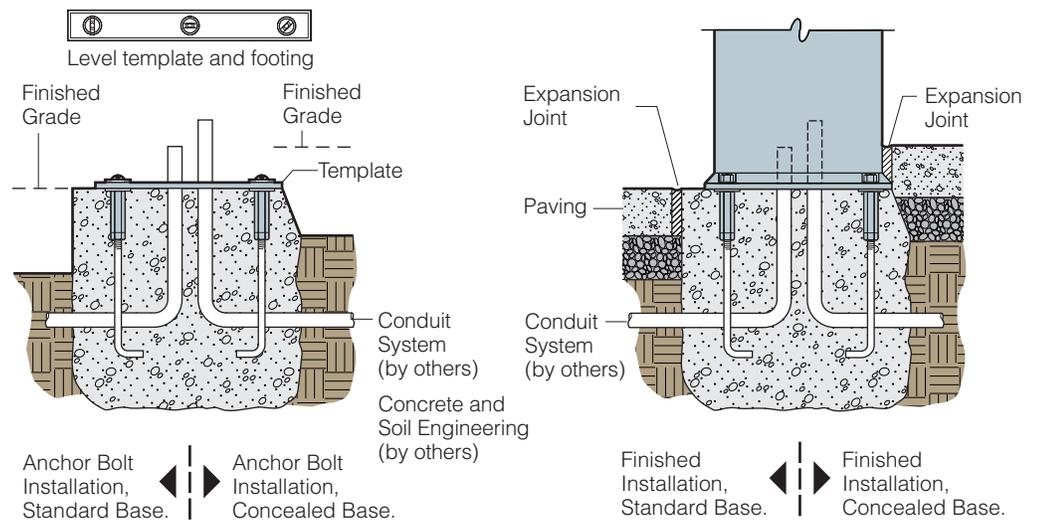
Installation in Planted Areas

When SL fixtures are to be installed in planted areas, slightly elevate the base to avoid prolonged submersion during heavy rains or irrigation. Allow ground cover or shrubbery to conceal the base. In this application, the template elevation must allow for any top soil or mulch that will be added. The SL template is the same size as the fixture base, and can be used to shape the concrete footing to blend with the base casting. A carefully leveled template will provide a smooth flat mounting surface and a level fixture.



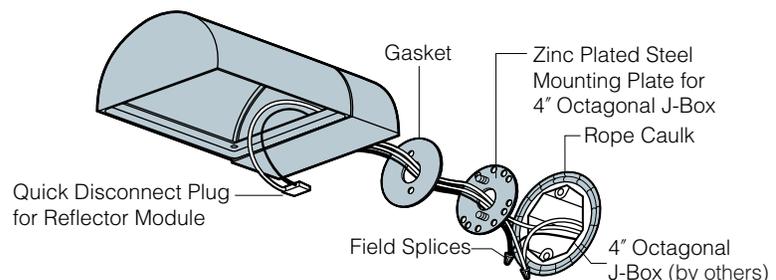
Installation in Paved Areas

SL fixtures are easily installed in paved areas with an option of a standard or concealed base detail. For standard base installations, the concrete footing is poured with the template at finished grade level. While the SL base casting is very low in profile, it can also be totally concealed by paving up to the fixture shaft. Although a concealed base detail is aesthetically very clean, it must be remembered that future removal will be difficult if required.



Installation of Wallforms

The SW mounting system is designed for ease of installation, and has a sealed fixture-to-wall joint with no exposed hardware. Field wire connections are made prior to fixture mounting leaving both hands free to install and align the housing. A quick-disconnect plug wires the reflector module inside the fixture.

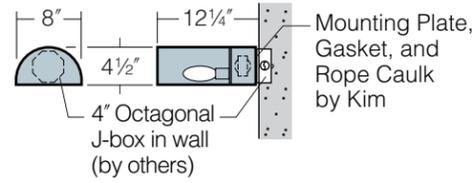


Site Wallforms

Site Wallforms

SW1 Model
 50 watt H.I.D.
 Medium Base Lamps
 42 watt Compact Fluorescent

SW1
 Maximum weight: 8 lb

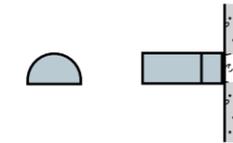


Ordering Information

Ordering Example:

Fixture	Electrical Module	Luminaire Finish
SW1	/ 50MH277	/ WH-P
1	2	3

1 Fixture:
 Cat. No. designates **SW** fixture.



Cat. No.: **SW1**

2 Electrical Module:
HPS = High Pressure Sodium
INC = Incandescent
MH = Metal Halide
PL = Compact Fluorescent



50HPS120	50MH120 50MH277	
60INC120	13PL120¹ 13PL277¹	42PL120² 42PL208² 42PL240² 42PL277²

See lamp and electrical data on page **65** for ballast types and characteristics.

¹Two lamps required per fixture.
²**42PL** operates one 26, 32, or 42 watt lamp at 120 thru 277 volts (50-60 Hz).
NOTE: For lamp/ballast information outside of the U.S.A. and Canada, please consult your local Kim representative.

Lamp	Lamp	Line
Watts	Type	Volts
50	MH	277

Coated lamps recommended.

3 Luminaire Finish:
 Super TGIC powder coat paint over chromate conversion coating.

Color:	Black	Dark Bronze	Light Gray	Platinum Silver	White	Custom Colors
Cat. No.:	BL-P	DB-P	LG-P	PS-P	WH-P	CC-P
						Consult representative for custom colors.

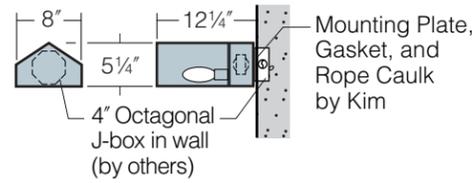
Site Wallforms

Ordering Information

Site Wallforms

SW3 Model
 50 watt H.I.D.
 Medium Base Lamps
 42 watt Compact Fluorescent

SW3
 Maximum weight: 8 lb



Ordering Example:

Fixture	Electrical Module	Luminaire Finish
SW3	/ 50MH277	/ WH-P
1	2	3

1 Fixture:
 Cat. No. designates **SW** fixture.



Cat. No.: **SW3**

2 Electrical Module:
HPS = High Pressure Sodium
INC = Incandescent
MH = Metal Halide
PL = Compact Fluorescent
 See lamp and electrical data on page **65** for ballast types and characteristics.



50HPS120	50MH120 50MH277 50MH347	
60INC120	13PL120¹ 13PL277¹	42PL120² 42PL208² 42PL240² 42PL277²

¹Two lamps required per fixture.
²**42PL** operates one 26, 32, or 42 watt lamp at 120 thru 277 volts (50-60 Hz).
NOTE: For lamp/ballast information outside of the U.S.A. and Canada, please consult your local Kim representative.

Lamp	Lamp	Line
Watts	Type	Volts
50	MH	277

Coated lamps recommended.

3 Luminaire Finish:
 Super TGIC powder coat paint over chromate conversion coating.

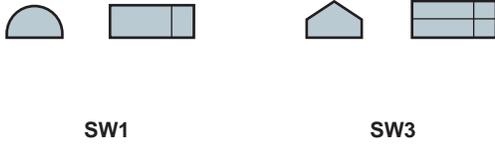
Color:	Black	Dark Bronze	Light Gray	Platinum Silver	White	Custom Colors
Cat. No.:	BL-P	DB-P	LG-P	PS-P	WH-P	CC-P
						Consult representative for custom colors.

SW1 / SW3 Luminaires

	Wattage	Lamp ¹	Initial Lumens
A	50W. HPS	ED17 Medium Base	3800
B	50W. MH	ED17 Medium Base	2688
C (2)	13W. PL	GX23 Base	900 each
D	42W. PL	GX24q-3 Base	3200
E	60W. INC.	T10 I.F. Medium Base	745

Footcandle
Correction
Factors (CF)

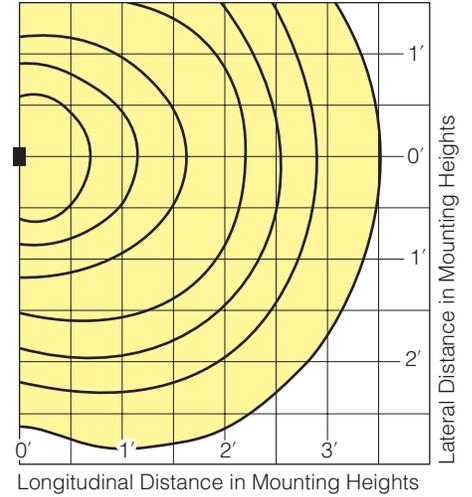
Mtg.Ht.	CF
6'	1.78
8'	1.00
10'	0.64
12'	0.44



Typical Half

Initial Horizontal Footcandles at
8' Mounting Height (Grade to Lens)

	A	B	C	D	E
5	3.5	2	3.6	1	
3	2.1	1	1.7	.50	
1.7	1.2	.50	.88	.20	
.70	.50	.20	.36	.12	
.40	.28	.10	.19	.07	
.20	.14	.05	.08	.04	
.10	.07	.02	.04	.02	



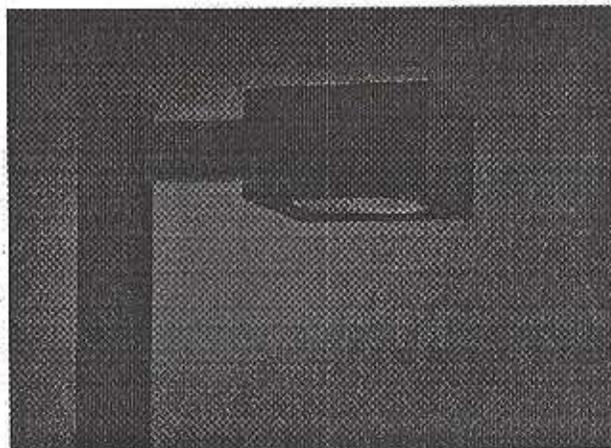
LS Series Luxmaster Classic

Area/Site Lighting

70-150W HPS, 175W MH/MV

Applications:

- Parking lots
- Office complexes
- Security lighting
- Residential areas
- Commercial environments



Features:

- **Attractive One Piece Formed Aluminum Housing** - with clean precision formed edges.
- **Durable Baked On Polyurethane Powder Paint Finish** - dark bronze color is standard.
- **Impact Resistant Tempered Glass Lens** - with captive hinges.
- **Easily Installed Power Pad Assembly.**
- **"Breathing Seal" Gasket** - developed by American Electric for preventing contaminants from entering optical assembly.
- **Mogul Base Socket** — porcelain, single piece screw shell, spring loaded center contact.

Wattages, Voltages:

- High Pressure Sodium 70-150 watts
- Metal Halide 175 watts
- Mercury Vapor 175 watts
- Available Voltages 120, 208, 220, 240, 277, 480 or Multi-Volt
- Ballast Type Regulated or Lag Auto
50 Hz available, contact factory

Materials, Finishes:

Housing Material	Formed aluminum housing
Housing Finish	Polyester Powder Coated - Bronze is Standard
Lens	Tempered Glass, Polycarbonate

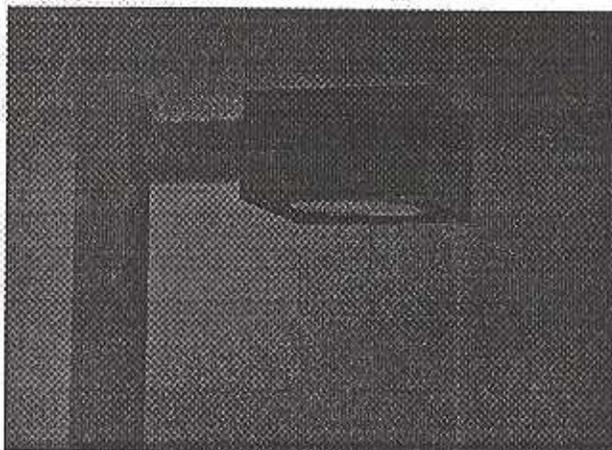
Certifications:

- ISO 9002 Certified Manufacturing
- Minimum starting temperature -20°F or -30°C for MV/MH,
-40-F or -40°C for HPS
- UL 1572 Listed for Wet Locations

LM Series Luxmaster Classic

Area/Site Lighting

200-400W HPS, 400W MH/MV



Applications:

- Parking lots
- Office complexes
- Security lighting
- Residential areas
- Commercial environments



Features:

- **Attractive One Piece Formed Aluminum Housing** - with clean precision formed edges.
- **Durable Baked On Polyurethane Powder Paint Finish** - dark bronze color is standard.
- **Impact Resistant Tempered Glass Lens** - with captive hinges.
- **Easily Installed Power Pad Assembly.**
- **"Breathing Seal" Gasket** - developed by American Electric for preventing contaminants from entering optical assembly.
- **Mogul Base Socket** — porcelain, single piece screw shell, spring loaded center contact.

Wattages, Voltages:

- High Pressure Sodium 200-400 watts
- Metal Halide 400 watts
- Mercury Vapor 400 watts
- Available Voltages 120, 208, 220, 240, 277, 480 or Multi-Volt
- Ballast Type CWA Regulated or Lag Auto 50 Hz available, contact factory

Materials, Finishes:

Housing Material	Formed aluminum housing
Housing Finish	Polyester Powder Coated - Bronze is Standard
Lens	Tempered Glass, Polycarbonate

Certifications:

- ISO 9002 Certified Manufacturing
- Minimum starting temperature -20°F or -30°C for MV/MH, -40°F or -40°C for HPS
- UL 1572 Listed for Wet Locations



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800-227-0758 / 510-357-6900

<http://www.sitelighting.com/index.cfm>

<http://www.sitelighting.com/Family.cfm?Brand=gar&ProLine=LPS>

Model: Form 10 LPS
Wattage: 1 x 55-180
Available pole- and wall-mount





P.O. Box A
Conyers GA 30012
770-922-9000
<http://www.lithonia.com/>



Model: KT
Wattage: 1 x 90, 2 x 90
Available pole- and wall-mount
[Manufacturer's Page](#)



Low Pressure Sodium
Shoebox Fixture
55 watt or less
12 ft. or less height
Additional shielding if necessary



[Chandeliers](#)
[Hall & Foyer](#)
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[Undercabinet](#)
[Bath & Vanity](#)
[Outdoor](#)
[Landscape](#)
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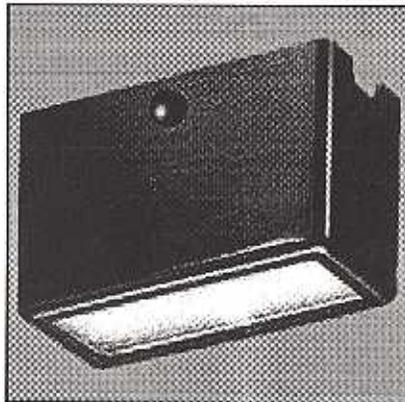


LightingCenter.com / BuilderLighting.com

Oklahoma City, OK 73114
 Phone - 405-879-0405, Fax - 405-879-0445
 Email - sales@lightingcenter.co
 Website - <http://www.lightingcenter.co>

Fixture Details

SKU P5224-31WB



Price: \$ 23.85

Buy It

Catalog Page: 364
Category: Landscape

Description: Durable cast aluminum is powder-coat painted for superior resistance to chipping, fading and the effects of salt air. Easy installation on continuous runs of UV resistant #12 and #16 cable. 12-volt.

Finish: Black

Glass: Clear

Type: Deck

Notes: #For complete installation see accessory categories. Lamp included.#

Width/Diameter: 3"

Height: 1-3/4"

Depth Extension: 1-3/8"

Lamp Quantity: One

Lamp Type: T-5 Wedge Base

Lamp Wattage: 13w

Low Voltage: Yes

may be too bright for some locations

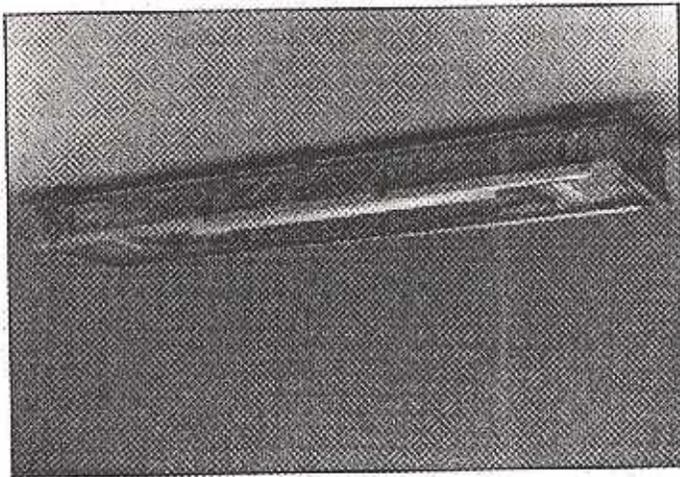
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SSU/STU Underpass/Tunnel Luminaire

Roadway Lighting Luminaires

55-180W LPS



Applications:

- Tunnels
- Bridges
- Underpasses
- Transportation terminals
- Overpasses
- Industrial areas

Features:

- **Extremely Efficient LPS Lamps** - Coupled with specifically designed reflectors for meeting the higher footcandle requirements within tunnel entrance zones.
- **Housing/Construction** - Rugged, corrosion resistant aluminum with extruded neoprene gasketing to provide a continuous seal between lens and housing.
- **Captive Latches** - Provides access for relamping and servicing. Fixture shipped with the necessary LPS lamps.
- **Light Distribution** - Available with symmetrical or asymmetrical light distribution
- **Electro-Brightened Reflector** - For optimal performance and long life.
- **Clear Polycarbonate Lens** - Provides protection from vandalism.
- **Socket** — Double contact bayonet

Wattages, Voltages:

- Low Pressure Sodium 55-180 watts
- Available Voltages 120, 208, 240, 277 or 480 volt
- Ballast Type Reactor, Lag

Materials, Finishes:

- | | |
|------------------|------------------------------|
| Housing Material | Corrosion-resistant aluminum |
| Housing Finish | Natural Finish is Standard |
| Lens | Polycarbonate |

Certifications:

- ISO 9002 Certified Manufacturing
- Suitable for Wet Locations
- Minimum Starting Temperature -20°F or -30°C for LPS
- Complies with ANSI: C136.2
- For UL options contact Thomas & Betts



[Chandeliers](#)
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[Recessed](#)
[FAQ's](#)



LightingCenter.com / BuilderLighting.com

Oklahoma City, OK 73114
 Phone - 405-879-0405, Fax - 405-879-0445
 Email - sales@lightingcenter.co
 Website - http://www.lightingcenter.co

Fixture Details

SKU P5223-31WB



Price: \$ 23.37

Buy It

Catalog Page: 364
Category: Landscape

Description: Durable cast aluminum. Black finish is powder-coat painted to resist chipping, fading and the effects of salt air. 72 inch leads. 12-volt.

Finish: Black

Glass: N/A

Type: Deck

Notes: #For complete installation see accessory categories. Lamp included.#

Width/Diameter: 3-1/8"

Height: 2"

Depth Extension: 1-3/8"

Lamp Quantity: One

Lamp Type: T-5 Wedge Base

Lamp Wattage: 13w

Low Voltage: Yes

*may be too bright
 for some
 locations*

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Add louvers or baffles



- Chandeliers
- Hall & Foyer
- Pendants
- Accessories
- Close-to-Ceiling
- Socones
- Store Policies
- Modular Fluorescent
- Undercabinet
- Bath & Vanity
- Outdoor
- Landscape
- Track
- Recessed
- FAQ's



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 Phone - 405-879-0405, Fax - 405-879-0445
 Email - sales@lightingcenter.co
 Website - http://www.lightingcenter.co

Fixture Details

SKU P5251-31WB



Price: \$ 23.85

Buy It

Catalog Page: 364
Category: Landscape

Description: Black Mini-Cylinder deck light with cast aluminum and twist off housing for easy relamping.

Finish: Black

Glass: NA

Type: Path

Width/Diameter: 2"

Height: 2-1/2"

Wire Length: 36"

Lamp Quantity: One

Lamp Type: Xenon

Lamp Wattage: 18W

Low Voltage: Yes

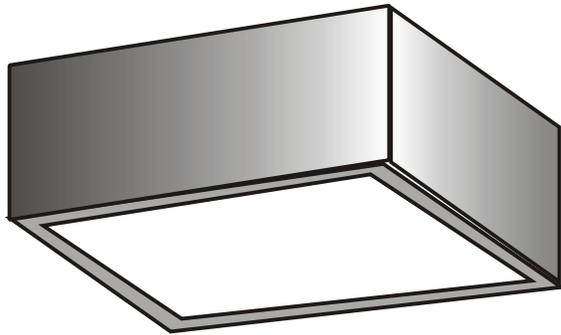
may be too bright for some locations

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Use baffle or louvers

SELS RECESSED SERIES



SHOWN WITH CLEAR FLAT
TEMPERED GLASS LENS

ORDERING INFORMATION
SELS-35LPS-120V-HF3-BZ

Electrical Data:

Low Pressure Sodium Ballast
DCB-Double Contact Bayonnette base socket

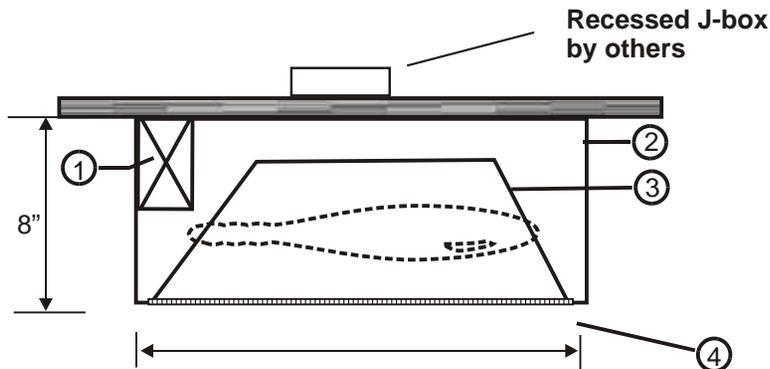
Lamp: (by others)
35LPS

Options:

CG Clear tempered glass
SM Surface Ceiling Mount

Finish:

Polyester powder coat finish - semi-gloss white



24" SQUARE

SIDE VIEW

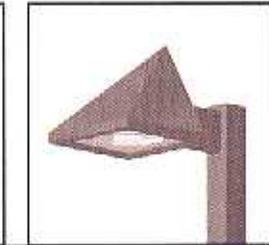
- ① 60Hz core/coil ballast, 120V operation
- ② Satin coat steel housing suitable for surface ceiling mount. Independent support by installer
- ③ Hammertone symmetric reflector system
- ④ Clear tempered glass lens flush in hinged frame.

Listing:
Complies with CSA, UL approved with
ETL label for wet location.

CAT. NO.: SELS-35LPS-120V-HF3-BZ			
227 Wilkinson Rd. Brampton, Ontario. L6T 4M2 Tel. 905-457-4777 Fax 905-457-1115		 solera www.soleracorp.com architectural lighting innovations	
DWG NO. OD-CR408-B2		PROJECT: THE VIEW CONDO	
TYPE PGA		SCALE NTS	SIZE A REV A QTY: 9



Night Sky Friendly Commercial Lighting Fixtures



Architectural Lighting

Area Lighting

Starry Night
Lights



www.StarryNightLights.com

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Starry Night Lights... Saving The Night Sky... One Star at a Time!

W.F. Harris Wall Mount LED Fixture



Shielded Wall Lighting with 3 Watt Amber LED

- ☆ Designed for Coastal Environments
 - Nonconductive
 - Polycarbonate - Injection molded, UV-Stabilized Lens and Housing
 - Rustproof Base Plate - Tempered Marine-grade Aluminum
- ☆ Easy Installation
- ☆ Maintenance Free Performance
- ☆ UL Listed for Wet Locations
- ☆ Lifetime Warranty for Lens, Housing, and Base Plates against Rust, Corrosion, Breakage



MODEL 50F - AVAILABLE IN FLUORESCENT ONLY

Stylish Model 50 Flat round fixture available in three sizes and multiple compact fluorescent lamp choices. Opal White acrylic lens, aluminum base plate/pan painted white.

Click image and scroll down for pricing.



Model 50, Wall/Ceiling Fixture, 11" Flat Opal White Lens, two 13-Watt Fluorescent Lamps Included, HPF

Housing Color:	White	# of Lamps:	2
Lamp Type:	Fluorescent-PL	Voltage:	120-277
Spec. Sheet:	SpecSheet.pdf	Wattage:	13W

[More Information](#)

\$57.94 /ea.

[Add to Cart](#)

[Show Similar Items](#)



Model 50, Wall/Ceiling Fixture, 11" Flat Opal White Lens, two 13-Watt Fluorescent Lamps Included, NPF

Housing Color:	White	# of Lamps:	2
Lamp Type:	Fluorescent-PL	Voltage:	120
Spec. Sheet:	SpecSheet.pdf	Wattage:	13W

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Model 50, Wall/Ceiling Fixture, 11" Flat Opal White Lens, one 22-Watt Fluorescent Lamp Included, NPF

Housing Color:	White	# of Lamps:	1
Lamp Type:	Fluorescent-FL	Voltage:	120
Spec. Sheet:	SpecSheet.pdf	Wattage:	22W

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Model 50, Wall/Ceiling Fixture, 14" Flat Opal White Lens, two 13-Watt Fluorescent Lamps Included, NPF

Housing Color:	White	# of Lamps:	2
Lamp Type:	Fluorescent-PL	Voltage:	120
Spec. Sheet:	SpecSheet.pdf	Wattage:	13W

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Model 50, Wall Fixture, 14" Flat Opal White Lens, three 13-Watt Fluorescent Lamps Included, NPF

Housing Color:	White	# of Lamps:	3
Lamp Type:	Fluorescent-PL	Voltage:	120
Spec. Sheet:	SpecSheet.pdf	Wattage:	13W

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Model 50, Wall/Ceiling Fixture, 14" Flat Opal White Lens, two 26-Watt Fluorescent Lamps Included (Electronic Ballast), HPF

Housing Color:	White	# of Lamps:	2
Lamp Type:	Fluorescent-PLC	Voltage:	120-277
Spec. Sheet:	SpecSheet.pdf	Wattage:	26W

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Model 50, Wall Fixture, 19" Flat Opal White Lens, one 32/40-Watt Fluorescent Lamp Included, HPF

Housing Color:	White	# of Lamps:	1
Lamp Type:	Fluorescent-FL	Voltage:	120
Spec. Sheet:	SpecSheet.pdf	Wattage:	

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Model 50, Wall/Ceiling Fixture, 11" Flat Opal White Lens, two 9-Watt Fluorescent Lamps Included, NPF

Housing Color:	White	# of Lamps:	2
Lamp Type:	Fluorescent-PL	Voltage:	120
Spec. Sheet:	SpecSheet.pdf	Wattage:	9W

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Model 50, Wall Fixture, 11" Flat Opal White Lens, one 13-Watt Fluorescent Lamp Included, NPF



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Housing Color: White # of Lamps: 1
Lamp Type: Fluorescent-PL Voltage: 120
Spec. Sheet: [SpecSheet.pdf](#) Wattage: 13W
[More Information](#)

Model 50, Wall/Ceiling Fixture, 14" Flat Opal White Lens, one 32-
-Watt Fluorescent Lamp Included, NPF



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Housing Color: White # of Lamps: 1
Lamp Type: Fluorescent-FL Voltage: 120
Spec. Sheet: [SpecSheet.pdf](#) Wattage: 32W
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Light Sources Contributing to Reported Disorientation Events in Florida, 2006

Light Source	Number of Disorientation Events Where Source Was Cited	Percent of Total Disorientation Events*
Condominium Exterior Lights	689	47.03%
Condominium Interior Lights	581	39.66%
City Glow/Sky Glow/Urban Glow	428	29.22%
Street Light	414	28.26%
Parking Lot	205	13.99%
Single Family Home Exterior Lights	201	13.72%
Single Family Home Interior Lights	143	9.76%
Motel/Hotel/Rental	128	8.74%
No Possible Lights Observed/Identified	105	7.17%
Restaurant/Bar	87	5.94%
Dune Cross Over	72	4.91%
Pool	36	2.46%
Flashlights, Flash Photography, Car Lights, Transient Lights, Fireworks, Bonfires, Fishing Lanterns	35	2.39%
Pier	34	2.32%
Space Center/Launch Pads	30	2.05%
Too Many Lights to Determine	22	1.50%
Construction	20	1.37%



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Pier	34	2.32%
Space Center/Launch Pads	30	2.05%
Too Many Lights to Determine	22	1.50%
Construction	20	1.37%

Parking Garage/Carport	8	0.55%
Stores/Shopping Centers/Gas Stations	8	0.55%
Port Everglades	6	0.41%
Traffic Signals	5	0.34%
Airport	3	0.20%
Jetty Lights	3	0.20%
Beachfront Park	3	0.20%
Boats	1	0.07%
Sports Lighting	1	0.07%

* Please note that multiple light sources can contribute to the occurrence of a single disorientation event. For that reason, more than one light source may be cited when reporting disorientation events, resulting in the sum of the percentages amounting to greater than 100%.

Reported Disorientation Events in Florida (As of December 5, 2006)

	1999	2000	2001	2002	2003	2004	2005	2006
Total Number of Hatchling Disorientation Events (Number of Nests Disoriented)	668	1,043	743	896	1,446	888	976	1,426
Total Number of Hatchlings Involved in Disorientation Events	28,157	46,845	28,674	43,226	79,357	46,487	41,521	70,560
Total Number of Adult Disorientation Events (Nesting Females Disoriented)	9	22	19	37	18	24	50	39
Total Number of Events (Adults and Hatchlings)	677	1,065	762	933	1,464	912	1,026	1,465

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ORDINANCE NO. 02-07

AN ORDINANCE OF BAY COUNTY, FLORIDA, ESTABLISHING A SEA TURTLE CONSERVATION ZONE AND LIGHTING ORDINANCE IN THE WESTERN BEACHES AREA OF UNINCORPORATED BAY COUNTY; PROVIDING FOR A PURPOSE AND APPLICABILITY; PROVIDING FOR DEFINITIONS; PROVIDING STANDARDS FOR NEW CONSTRUCTION ACTIVITIES; PROVIDING STANDARDS FOR EXISTING LIGHTING; PROVIDING FOR ENFORCEMENT AND PENALTIES; PROVIDING FOR INTERPRETATION; PROVIDING FOR SEVERABILITY AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, Bay County, Florida, is a coastal community with an extensive shoreline on the Gulf of Mexico; and,

WHEREAS, Bay County's extensive shoreline is good habitat for sea turtle nesting and many sea turtles make their nests on Bay County's beaches; and,

WHEREAS, Bay County's shoreline is developed or will be developed with numerous structures on the shoreline in close proximity to sea turtle nests; and,

WHEREAS, structures which are built on or near the shoreline usually include some source of artificial lighting; and,

WHEREAS, scientific studies have determined that certain types of artificial lighting have a detrimental effect on nesting sea turtles and their hatchlings due to the disorientation that occurs when the sea turtle mistakes the artificial lighting as the reflection of the moon light from the waters of the Gulf of Mexico; and,

WHEREAS, the Bay County Board of County Commissioners (the "Board") is desirous of implementing this lighting ordinance with the intention that the detrimental effects of artificial lighting on sea turtles will be relieved; and,

WHEREAS, the Board desires to test the effects of this ordinance first in the limited area of the

westernmost beaches area of unincorporated Bay County with the intention to expand it to other areas of Bay County; provided that, the expected positive effects of the ordinance are realized;

NOW THEREFORE, BE IT ORDAINED by the Board of County Commissioners of Bay County, Florida:

Section 1. PURPOSE AND APPLICABILITY

(1) This purpose and intent of this ordinance is to protect threatened and endangered sea turtles along the Gulf of Mexico beaches in the western unincorporated area of Bay County from the westernmost municipal boundary of the City of Panama City Beach west to the Bay/Walton County boundary. This ordinance is intended to protect nesting sea turtles and sea turtle hatchlings from the adverse effects of artificial lighting, provide overall improvement in nesting habitat degraded by light, and to increase successful nesting activity and production of hatchlings on the beaches.

(2) The provisions of this ordinance apply during the nesting season. Note that "nesting season" is defined in Section 2.

Section 2. DEFINITIONS

(1) *Artificial light or artificial lighting* means the light emanating from a manmade point source (see *Point source of light*, below).

(2) *Beach* means the zone of unconsolidated material that extends landward from the mean low-water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation, usually the effective limit of storm waves.

(3) *Bug type light* means any yellow colored incandescent light bulb that is specifically treated in such a way so as to reduce the attraction of bugs to the light, but does not include bug killing devices.

(4) *Construction* means the carrying out of any building, clearing, filling, excavating or substantial improvement in the size or use of any structure or the appearance of any land. When appropriate to the context, the term "construction" refers to the act of constructing or the result of construction, and includes remodeling or reconstruction of existing buildings or structures.

(5) *Cumulatively illuminated* means illuminated by numerous artificial light sources that as a group illuminate any portion of the beach.

(6) *Directly illuminated* means illuminated by one or more point sources of light directly visible to an observer on the beach.

(7) *Dune* means a mound or ridge of loose sediments, usually sand-sized, lying landward of the beach and deposited by any natural or artificial mechanism.

(8) *Frontal dune* means the first natural or human-made mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value.

(9) *Ground-level barrier* means any vegetation, natural feature or artificial structure rising from the ground which prevents beachfront lighting from shining directly onto the beach-dune system.

(10) *Hatchling* means any individual of a species of sea turtle, within or outside of a nest, that has recently hatched from an egg.

(11) *Indirectly illuminated* means illuminated by one or more point sources of light not directly visible to an observer on the beach.

(12) *Low-pressure sodium light* means an electric discharge lamp containing sodium, neon, and argon, that when illuminated appears amber-yellow.

(13) *Nest* means an area where sea turtle eggs have been naturally deposited or subsequently relocated by an authorized permittee of the Florida Department of Environmental Protection.

(14) *Nesting season* means the period from sunset until sunrise during May 1 through October 31 of each year.

(15) *Person* means individuals, firms, associations, joint ventures, partnerships, estates, trusts, syndicates, fiduciaries, corporations, and all other groups or combinations.

(16) *Point source of light* means a manmade source emanating light, including, but not limited to: incandescent, tungsten-iodine (quartz), mercury vapor, fluorescent, metal halide, neon, halogen, high-pressure sodium, low-pressure sodium light sources, as well as torches, camp and bonfires.

(17) *Pole lighting* means a light fixture set on a base or pole which raises the source of light higher than twenty four (24) inches off the ground.

(18) *Sea turtle* means any marine-dwelling reptile of the families Cheloniidae or Dermochelyidae found in Florida waters or using the beach as nesting habitat, including the species: *Caretta caretta* (loggerhead), *Chelonia mydas* (green), *Dermochelys coriacea* (leatherback), *Eretmochelys imbricata* (hawksbill), and *Lepidochelys kempi* (Kemp's ridley). For purposes of this rule, sea turtle is synonymous with marine turtle.

(19) *Sea Turtle Conservation Zone* means the beach area seaward of the Coastal Construction Control Line in the unincorporated area of Bay County from the westernmost municipal boundary of the City of Panama City Beach west to the Bay/Walton County boundary.

(20) *Shield* means a non-reflective covering, canopy or other such device fitted over and extended below a light source preventing light from illuminating the beach.

(21) *Turtle glass* means any tinted glass treated to achieve an industry-approved, inside-to-outside light transmittance value of 45% or less. Such transmittance is limited to the visible spectrum (400 to 700 nanometers) and is measured as the percentage of light that is transmitted through the glass.

Section 3. STANDARDS FOR NEW CONSTRUCTION ACTIVITIES

In order to provide the highest level of protection for nesting sea turtles and their hatchlings, the following standards for artificial light sources on all new coastal construction in the Sea Turtle Conservation Zone are adopted:

(1) Exterior artificial light fixtures shall be designed and positioned so that:

(a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;

(b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and

(c) Areas seaward of the frontal dune are not cumulatively illuminated.

(2) Exterior artificial light fixtures within direct line-of-sight of the beach will be permitted only

if designed and installed as follows:

- (a) Completely shielded downlight only fixtures or recessed fixtures having bug lights not exceeding 50 watts and non-reflective interior surfaces are used. Other fixtures that have appropriate shields, louvers, or cutoff features may also be used if they are in compliance with subsection (1)(a), (b) and (c) above; and
 - (b) All fixtures are mounted as low in elevation as possible through the use of low-mounted wall fixtures, low bollards, and ground-level fixtures.
- (3) Floodlights, uplights or spotlights that are directly visible from the beach, or which indirectly or cumulatively illuminate the beach, are prohibited.
- (4) Exterior lights used expressly for safety or security purposes must comply with subsection 2(a) and shall be limited to the minimum number and configuration required to achieve their functional role(s). The use of motion detector switches that keep lights off except when approached and that switch lights on for the minimum duration possible are required.
- (5) Only low intensity lighting shall be used in parking areas within line-of-sight of the beach. Such lighting shall be:
- (a) Set on a base which raises the source of light no higher than 48 inches off the ground; and
 - (b) Positioned or shielded so that the light is cast downward and the source of light or any reflective surface of the light fixture is not visible from the beach and does not directly or indirectly illuminate the beach.
- (6) Parking area lighting, and roadway lighting shall be shielded from the beach through the use of ground-level barriers. Ground-level barriers must not interfere with sea turtle nesting or hatching emergence, or cause short or long term damage to the beach/dune system.
- (7) Turtle glass shall be installed on all windows and glass doors of single or multi-story structures within line-of-sight of the beach.
- (8) Use of appropriately shielded low-pressure sodium lights and fixtures will be encouraged for high-intensity lighting applications such as lighting parking areas and roadways, providing security, and similar applications.
- (9) Temporary lighting of construction sites during the sea turtle nesting season shall be restricted to the minimal amount necessary and shall incorporate all of the standards of this section.
- (10) Before granting any building permit, the Bay County Builders Services shall determine that all proposed construction complies in all respects with the standards imposed in this section.
- (11) Utility leased lighting shall comply in all respects with the standards imposed in this

ordinance.

(12) No lighting shall be allowed on dune walkovers.

Section 4. STANDARDS FOR EXISTING LIGHTING

In order to provide the highest level of protection for nesting sea turtles and their hatchlings, the following standards for existing artificial light sources, including utility leased lighting, within the Sea Turtle Conservation Zone shall be brought into compliance by May 1, 2003:

(1) Existing artificial light fixtures shall be repositioned, modified, disconnected, or removed so that:

(a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;

(b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and

(c) Areas seaward of the frontal dune are not cumulatively illuminated.

(2) Existing artificial light fixtures that are replaced for any reason shall comply with Section 3. Standards for New Construction Activities and the following measures shall be taken:

(a) Reposition fixtures so that the point source of light or any reflective surface of the light fixture is no longer visible from the beach;

(b) Replace fixtures having an exposed light source with fixtures containing recessed light sources or shields;

(c) Replace traditional light bulbs with bug lights not exceeding 50 watts;

(d) Replace non-directional fixtures with directional fixtures that point down and away from the beach;

(e) Replace fixtures having transparent or translucent coverings with fixtures having opaque shields covering an arc of at least 180 degrees and extending an appropriate distance below the bottom edge of the fixture on the seaward side so that the light source or any reflective surface of the light fixture is not visible from the beach;

(f) Replace pole lamps with low-profile, low-level luminaries so that the light source or any reflective surface of the light fixture is not visible from the beach;

(g) Replace incandescent, fluorescent, and high intensity lighting with the lowest wattage low-pressure sodium lighting possible for the specific application;

(h) Plant or improve vegetation buffers between the light source and the beach to screen light from the beach.

(i) Permanently remove or permanently disable any fixture which cannot be brought into compliance with the provisions of these standards;

(3) One or more of these voluntary measures as applicable, shall be encouraged to reduce or eliminate the negative effects of interior light emanating from doors and windows within line-of-sight of the beach:

(a) Apply window tint or film that meets the standards of turtle glass;

(b) Rearrange lamps and other moveable fixtures away from windows;

(c) Use window treatments (i.e., blinds, curtains) to shield interior lights from the beach;

and

(d) Turn off unnecessary lights.

Section 5. ENFORCEMENT AND PENALTIES

The enforcement and penalties of this ordinance shall be the same manner as provided in Section 125.69 Florida Statutes, as may be amended from time to time. Each day of any such violation shall constitute a separate and distinct offense. In addition to the Bay County Code Enforcement Office, the Department of Environmental Protection and the Florida Fish and Wildlife Conservation Commission (Marine Patrol) shall have authority to enforce the ordinance.

The Board, by Resolution, will require property owners that remit Tourist Development Council Bed Taxes within the Sea Turtle Conservation Zone to post a sign on their property informing renters of this ordinance and the provisions within it.

Section 6. INTERPRETATION

The provisions of this ordinance shall be construed in order to effectively carry out its purpose. Where any provision of this ordinance refers to or incorporates another provision, ordinance, statute, rule, regulation, policy, official publication, or other authority, it refers to the most current version, incorporating any amendments thereto or redesignation thereof.

Section 7. SEVERABILITY

If any section, subsection, sentence, clause or provision of this ordinance is held invalid by a court of competent jurisdiction, the remainder of the ordinance shall not be affected.

Section 2. EFFECTIVE DATE

This ordinance shall take effect as provided by law.

DONE AND ADOPTED this 21st day of May, 2002.

BOARD OF COUNTY COMMISSIONERS
OF BAY COUNTY, FLORIDA

Carol Groat
CHAIRMAN

ATTEST:

Harold Buzel
CLERK OF THE COURT
by: Jimmy Hoffman
Deputy Clerk



Approved as to correctness
of form

W. S. R.
Burke & Blue, P.A.
Attorneys for Bay County



ORDINANCE 388

AN ORDINANCE REGULATING LIGHTING FOR THE PROTECTION OF
MARINE TURTLES AND AQUATIC SEA LIFE FOR THE BEACHES OF
MEXICO BEACH, ENFORCEMENT PROCEDURES AND PENALTIES
THEREOF.

I. PURPOSE AND INTENT

This ordinance is intended to protect hatchling marine turtles from the adverse effects of artificial lighting, provide overall improvement in nesting habitat degraded by light pollution, and increase successful nesting activity and production of hatchlings on the beaches of Mexico Beach, Florida.

II. DEFINITIONS.

(1) "Artificial light" or "artificial lighting" means the light emanating from any human-made device.

(2) "Beach" means the zone of unconsolidated material that extends landward from the mean low water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation, usually the effective limit of storm waves.

(3) "Bug" type bulb means any yellow colored light bulb that is marketed as being specifically treated in such a way so as to reduce the attraction of bugs to the light.

(4) "Coastal construction activities" means any work or development in the CCCL in Mexico Beach, Florida.

(5) Coastal Construction Control Line (CCCL) means the portion of the coastal construction line established pursuant to the provisions of section 161.053 Florida Statutes that lies within Mexico Beach.

(6) "Cumulatively illuminated" means illuminated by numerous artificial light sources that as a group illuminate any portion of the beach.

(7) "Directly illuminated" means illuminated as a result of glowing element(s), lamp(s), globe(s), or reflector(s) of an artificial light source which is visible to an observer on the beach.

(8) "Dune" means a mound or ridge of loose sediments, usually sand-sized, lying landward of the beach and deposited by any natural or artificial mechanism.

(9) "Frontal dune" means the first natural or man-made mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value.

(10) "Hatchling" means any species of marine turtle, within or outside of a nest, that has recently hatched from an egg.

(11) "Indirectly illuminated" means illuminated as a result of the glowing element(s), lamp(s), globe(s), or reflector(s) of an artificial light source which is not visible to an observer on the beach.

(12) Low-pressure sodium luminaire (LPS) means an electric discharge lamp containing sodium, neon, and argon, that when illuminated appears amber-yellow.

(13) "Marine turtle" means any marine-dwelling reptile of the families Cheloniidae or Dermochelyidae found in Florida waters or using the beach as nesting habitat, including the species: *Caretta caretta* (loggerhead), *Chelonia mydas* (green), *Dermochelys coriacea* (leatherback), *Eretmochelys imbricata* (hawksbill), and *Lepidochelys kempi* (Kemp's ridley). For purposes of this rule, marine turtle is synonymous with sea turtle.

(14) "Nest" means an area where marine turtle eggs have been naturally deposited or subsequently relocated.

(15) "Nesting season" means the period from May 1 through October 31.

(16) "Nighttime" means the period between sunset and sunrise.

(17) "Person" means individuals, firms, associations, joint ventures, partnerships, estates, trusts, syndicates, fiduciaries, corporations, and all other groups or combinations.

(18) Pole lighting means a light fixture set on a base or pole which raises the source of the light higher than twenty (24) inches off the ground.

(19) Shield means a non-reflective covering, canopy or other such device fitted over and extended below a light source preventing light from illuminating the beach.

(20) "Tinted glass" means any glass treated to achieve an industry-approved, inside-to-outside light transmittance value of 45% or less. Such transmittance is limited to the visible spectrum (400 to 700 nanometers) and is measured as the percentage of light that is transmitted through the glass.

III. STANDARDS FOR NEW CONSTRUCTION ACTIVITIES.

In order to provide the highest level of protection for nesting marine turtles and their hatchlings, the following standards for artificial light sources on all new coastal construction seaward of the Coastal Construction Control Line (CCCL) are adopted:

(1) Exterior artificial light fixtures shall be designed and positioned so that:

- (a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;

- (b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and

- (c) Areas seaward of the frontal dune are not cumulatively illuminated.

(2) Exterior artificial light fixtures within direct line-of-sight of the beach will be permitted only if designed and installed as follows:

- (a) Completely shielded downlight only fixtures or recessed fixtures having low wattage (i.e., 25 watts or less) "bug" type bulbs and

non-reflective interior surfaces are used. Other fixtures that have appropriate shields, louvers, or cutoff features may also be used if they are in compliance with subsection (1)(a), (b), and © above; and

(b) All fixtures are mounted as low in elevation as possible through use of low-mounted wall fixtures, low bollards, and ground-level fixtures.

(3) Floodlights, uplights or spotlights that are directly visible from the beach, or which indirectly or cumulatively illuminate the beach, are prohibited.

(4) No lighting shall be allowed on dune walkovers.

(5) Only low intensity lighting shall be used in parking areas within line-of-sight of the beach. Such lighting shall be:

(a) Set on a base which raises the source of light no higher than 48 inches off the ground; and

(b) Positioned or shielded so that the light is cast downward and the source of light or any reflective surface of the light fixture is not visible from the beach and does not directly or indirectly illuminate the beach.

(6) Tinted glass shall be installed on all windows and glass doors of single or multi-story structures within line-of-sight of the beach.

(7) Use of appropriately shielded low-pressure sodium-vapor lamps and fixtures shall be required for high-intensity lighting applications such as lighting parking areas and roadways, providing security, and similar applications.

(8) Temporary lighting of construction sites during the marine turtle nesting season shall be restricted to the minimal amount necessary and shall incorporate all of the standards of this section.

(9) Before granting any building permit, the Mexico Beach Planning and Building Department shall determine that all proposed development complies in all respects with the standards imposed in this section.

(10) Permits will not be required to install utility leased lighting, but all such lighting shall comply in all respects with the standards imposed in this ordinance.

(11) For any coastal construction completed after the effective date of this ordinance, the lighting shall not be changed without first obtaining a permit from the County. Such permits shall only be issued when the proposed lighting plan complies with this ordinance.

IV. STANDARDS FOR EXISTING LIGHTING.

In order to provide the highest level of protection for nesting marine turtles and their hatchlings, the county hereby adopts all of the following standards for existing artificial lighting sources, including utility leased lighting, seaward of the CCCL:

(1) Existing artificial light fixtures shall be repositioned or modified so that:

(a) The point source of light or any reflective surface of the light

fixture is not directly visible from the beach;

(b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and

(c) Areas seaward of the frontal dune are not cumulatively illuminated.

(2) The following measures may be taken to comply with this section:

(a) Reposition fixtures so that the point source of light or any reflective surface of the light fixture is no longer visible from the beach;

(b) Replace fixtures having an exposed light source with fixtures containing recessed light sources or shields;

(c) Replace traditional light bulbs with yellow "bug" type bulbs not exceeding 25 watts;

(d) Replace non-directional fixtures with directional fixtures that point down and away from the beach;

(e) Replace fixtures having transparent or translucent coverings with fixtures having opaque shields covering an arc of at least 180 degrees and extending an appropriate distance below the bottom edge of the fixture on the seaward side so that the light source or any reflective surface of the light fixture is not visible from the beach;

(f) Replace pole lamps with low-profile, low-level luminaries so that the light source or any reflective surface of the light fixture is not visible from the beach;

(g) Replace incandescent, fluorescent, and high intensity lighting with the lowest wattage low-pressure sodium-vapor lighting possible for the specific application;

(h) Permanently remove or permanently disable any fixture which cannot be brought into compliance with the provisions of these standards;

(i) Disconnect utility leased lighting during the marine turtle nesting season.

(3) The following measures shall be taken as applicable to reduce or eliminate the negative effects of interior light emanating from doors and windows within line-of-sight of the beach:

(a) Apply window tint or film that meets the standards for tinted glass;

(b) Rearrange lamps and other moveable fixtures away from windows;

(c) Use window treatments (e.g. blinds, curtains) to shield interior lights from the beach; and

(d) Turn off unnecessary lights.

V. PUBLIC AWARENESS.

Any person submitting an application for coastal construction activities within the jurisdictional boundaries of Mexico Beach shall be informed of the

existence of and the requirements concerning artificial lighting and marine turtle protection by the Mexico Beach Planning and Building Department.

VI ENFORCEMENT AND PENALTIES

Upon notification by law enforcement authorities, the Mexico Beach Planning and Building Department shall give notice to any person who violates this ordinance by a certified letter to the property address listed by the Bay County Tax Collectors Office. The letter shall describe the violation and shall enclose a brochure provided by Department of Environmental Protection and a copy of the ordinance. Such persons shall immediately correct any noticed violation. Failure to correct any noticed violation shall be punishable in the same manner as a misdemeanor and punishable as provided by Section 125.69, Florida Statutes (1995). Each day of any such violation shall constitute a separate and distinct offense. The Department of Environmental Protection and the Florida Marine Patrol shall have authority to enforce the ordinance.

VII. INTERPRETATION

The provisions of this Ordinance shall be liberally construed in order to effectively carry out its purpose. Where any provision of this Ordinance refers to or incorporates another provision, ordinance, statute, rule, regulation, policy, official publication, or other authority, it refers to the most current version, incorporating any amendments thereto or redesignation thereof.

VIII. SEVERABILITY

If any section, subsection, sentence, clause or provision of this ordinance is held invalid by a court of competent jurisdiction, the remainder of this ordinance shall not be affected.

IX. EFFECTIVE DATE

This ordinance shall take effect on April 2, 2002.

INTRODUCED at a Regular meeting of the City Council on September 11, 2001 and ADOPTED at a Regular meeting of the City Council on October 9, 2001

City Of Mexico Beach, Florida

BY: Cecil G. Jones
~~Kathy Kingeland Mayor~~ Councilperson
Cecil Jones Mayor Pro Tem

Attest:

By: [Signature]

Approved as to form & legality

[Signature]
CITY ATTORNEY

ORDINANCE NO. 03-40-LC

AN ORDINANCE OF THE CITY OF DESTIN, FLORIDA, RELATING TO THE REGULATION OF OUTDOOR LIGHTING TO PROTECT MARINE TURTLES NESTING IN DESTIN, FLORIDA; PROVIDING FOR AUTHORITY; PROVIDING FOR FINDINGS OF FACT; PROVIDING FOR AMENDMENTS TO ARTICLE 3, SECTION 3.00.00 DEFINITIONS; PROVIDING FOR AMENDMENTS TO THE LAND DEVELOPMENT CODE, ARTICLE 7, BY CREATING SECTION 7.17.00. OUTDOOR LIGHTING STANDARDS; PROVIDING FOR THE CREATION OF ARTICLE 7, SECTION 7.17.01. OUTDOOR LIGHTING STANDARDS FOR THE MARINE TURTLE CONSERVATION ZONE; PROVIDING FOR THE CREATION OF ARTICLE 7, SECTION 7.17.01.A. PURPOSE AND INTENT; PROVIDING FOR THE CREATION OF ARTICLE 7, SECTION 7.17.01.B. STANDARDS FOR NEW CONSTRUCTION ACTIVITIES; PROVIDING FOR THE CREATION OF ARTICLE 7, SECTION 7.17.01.C. STANDARDS FOR EXISTING LIGHTING; PROVIDING FOR THE CREATION OF ARTICLE 7, SECTION 7.17.01.D. PUBLIC AWARENESS; PROVIDING FOR THE CREATION OF ARTICLE 7, SECTION 7.17.02 ENFORCEMENT AND PENALTIES; PROVIDING FOR INCORPORATION INTO THE LAND DEVELOPMENT CODE; PROVIDING FOR INTERPRETATION; PROVIDING FOR CONFLICTING PROVISIONS; PROVIDING FOR SEVERABILITY; AND PROVIDING FOR AN EFFECTIVE DATE.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY OF DESTIN, FLORIDA AS FOLLOWS:

SECTION 1. AUTHORITY. The authority for the enactment of this Ordinance is Section 1.01(h) of the City Charter and Section 166.021, Florida Statutes.

SECTION 2: FINDINGS OF FACT.

WHEREAS, Destin, Florida is a coastal community with an extensive shoreline on the Gulf of Mexico; and

WHEREAS, Destin's beaches are a marine turtle nesting location; and

WHEREAS, Destin's shoreline is developed or will be developed with numerous structures on the shoreline in close proximity to marine turtle nests; and

WHEREAS, it is the City of Destin's intent to protect marine turtles to the fullest possible extent; and

WHEREAS, artificial lighting has been proven to adversely affect marine turtles; and

WHEREAS, it is Destin City Council's intention to ensure protection of marine turtles by regulating lighting in the Marine Turtle Conservation Zone and incorporating these regulations into the Destin Land Development Code; and

WHEREAS, a public hearing has been conducted after due public notice by the Destin Local Planning Agency and its recommendations reported to the City Council; and

WHEREAS, a public hearing has been conducted by the City Council after due public notice; and

WHEREAS, the City Council has determined that this ordinance is consistent with the adopted comprehensive plan and is in the best interests of the City and its citizens.

NOTE: Language in sections 3 and 4 of this ordinance that is ~~struck through~~ is language proposed to be deleted, underlined language is language proposed to be added, language that is not ~~struck through~~ or underlined is not to be changed, and * * * represents sections of the Land Development Code that have been skipped and remain unchanged.

SECTION 3: DEFINITIONS AMENDMENTS.

Article 3, Section 3.00.00, *Definitions*, of the City of Destin's Land Development Code is hereby amended to add the following:

3.00.00, *Definitions*.

The purpose of this article is to provide definitions applicable to the land development code. The following terms supplement those contained in the glossary of the foundation document:

* * *

Artificial light or artificial lighting: Means the light emanating from any human made device.

* * *

Beach: Means the area of white, sandy beach between the vegetation line and the waters of the Gulf of Mexico.

* * *

Bug: Type light means any yellow colored like bulb that is marketed as being specifically treated so as to reduce the attraction of bugs to the light.

* * *

Coastal construction activities: Means any work or development in the conservation zone.

* * *

Coastal construction control line (CCCL): ~~The most landward line for jurisdiction established by the department of natural resources (DNR)~~ Means the portion of the coastal construction line established pursuant to the provisions of section 161.053 Florida Statutes that lies with the City of Destin.

Cumulative illuminated: Means illuminated by numerous artificial light sources that as a group illuminate any portion of the beach.

Directly illuminated (Beach Lighting): Means illuminated as a result of glowing element(s), lamp(s), globe(s), or reflector(s), of any artificial light source, which is visible to an observer on the beach.

Dune: Means a mound or ridge of loose sediments, usually sand-sized, lying landward of the beach and deposited by any natural or artificial mechanism.

Frontal dune: Means the first natural or man-made mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value.

Ground level barrier: Means any vegetation, natural feature or artificial structure arising from the ground, which prevents beachfront lighting from shining directly onto the beach-dune system.

Hatchling: Means any species of marine turtle, within or outside of a nest, and that has recently hatched from an egg.

Indirectly illuminated (Beach Lighting): Means illuminated as a result of the glowing element(s), lamp(s), globe(s), or reflector(s), of an artificial light source that is not visible to an observer on the beach.

Low-pressure sodium luminaire (LPS): Means an electric discharge lamp containing sodium, neon, and argon, that when illuminated appears amber-yellow.

Marine turtle: Means any marine-dwelling reptile of the families Cheloniidae or Dermochelyidae found in Florida waters or using the beach as nesting habitat, including the species: *Caretta caretta* (loggerhead); *Chelonia mydas* (green); *Dermachelys coriacea* (leatherback); *Eretmochelys imbricata* (hawksbill); and *Lepidochelys Kempfi* (Kemp's ridley). For purposes of this Code, marine turtles are synonymous with sea turtles.

Marine turtle conservation zone: Includes all land abutting the "beach" within 300 feet of the Mean High Water Line starting at the tip of the south side of the entrance of the Destin Harbor south and then eastward to the Walton County line.

Nest: Means an area where marine turtle eggs have been naturally deposited or subsequently relocated.

Nesting season: Means the period from May 1 through October 31 of each year as defined by F.A.C. 62b 55.002(17) for all counties.

Nighttime: Means the locally effective time period between sunset and sunrise.

Pole lighting: Means a light fixture set on a base or pole, which raises the source of light higher than twenty four (24) inches off the ground.

Shield (Beach Lighting): Means a non-reflective covering, canopy or other such device fitted over and extended below a light source preventing light from illuminating the beach.

Tinted glass: Means any glass treated to achieve an industry-approved, inside-to-outside light transmittance value of 45% or less. Such transmittance is limited to the visible spectrum (400 to 700 nanometers) and is measured as the percentage of light that is transmitted through the glass.

SECTION 4: AMENDING LAND DEVELOPMENT CODE ARTICLE 7, BY CREATING SECTION 7.17.00 OUTDOOR LIGHTING STANDARDS.

Article 7, Land Use, Type, Density, Intensity, Zoning and Regulatory Controls, of the City of Destin's Land Development Code is hereby amended by creating Section 7.17.00., *Outdoor Lighting Standards*, as follows:

7.17.00. Outdoor lighting standards.

7.17.01. Outdoor lighting standards for the marine turtle conservation zone.

- A. Purpose and Intent. This ordinance is intended to protect marine turtle hatchlings from the adverse effects of artificial lighting to provide overall improvement in nesting habitat degraded by light pollution, and to increase successful nesting activities and production of hatchlings on the beaches located within the Marine Turtle Conservation Zone within the City Limits of the City of Destin. The provisions of section 7.17.00 apply during the nesting season as defined in Article 3, Section 3.00.00.
- B. Standards for new construction activities. In order to provide the highest level of protection for nesting marine turtles and their hatchlings, the following standards for artificial light sources on all new coastal construction seaward of the Coastal Construction Control Line (CCCL) in the Marine Turtle Conservation Zone are adopted:
1. Exterior artificial lighting fixtures shall be designed for and positioned so that:
 - a. The point source of light or any reflective surface of the light fixture is not directly visible from the beach;
 - b. Areas seaward of the frontal dune are not directly or indirectly illuminated; and
 - c. Areas seaward of the frontal dune are not cumulatively illuminated.
 2. Exterior artificial light fixtures within direct line-of-sight of the beach will be permitted only if designed and installed completely shielded down light only fixtures or recessed fixtures having low wattage (i.e., 50 watts or less), "bug" type bulbs and non-reflective interior surface. Other fixtures that have appropriate shields, louvers, or cutoff features may also be used if they are in compliance with subsection (1) (a), (b), and (c) above.
 3. Floodlights, up lights or spotlights that are directly visible from the beach, or which indirectly or cumulatively illuminate the beach are prohibited.
 4. No lighting other than approved turtle friendly lights installed appropriately shall be allowed on dune walkovers.

5. Exterior lights used expressly for safety or security purposes must comply with subsections (1) (a) and (b) above and shall be limited to the minimum number of configurations required to achieve their functional role(s). The use of motion detector switches that keep lights off except when approached and that switch lights on for the minimum duration possible are required.
 6. Only low intensity lighting shall be used in parking areas within line-of-sight of the beach. Such lighting shall be:
 - a. Set on a base which raises source of light no higher than 48 inches off the ground; and
 - b. Positioned or shielded so that the light is cast downward and the source of light or any reflective surface of light feature is not visible from the beach and does not directly or indirectly illuminate the beach.
 7. Parking area lighting shall be shielded from the beach through the use of ground-level barriers. Ground-level barriers must not interfere with marine turtle nesting or hatchling emergence, or cause short or long-term damage to the beach/dune system.
 8. Tinted glass shall be installed on all windows and glass doors on single or multi-story structures within line-of-sight of the beach.
 9. Use of appropriately shielded low-pressure sodium vapor lamps and fixtures shall be required for high-intensity lighting applications such as lighting parking areas and roadways providing security, and similar applications.
 10. Temporary lighting of construction sites during the marine turtle nesting season shall be restricted to the minimal amount necessary and shall incorporate all of the standards of this section.
 11. Before granting any building permit, the Community Development Department shall determine that all proposed development complies in all respects with the standards imposed in this section.
 12. Utility lease lighting shall comply to all respects with the standards imposed in this ordinance, with the exception that appropriated shielded, full-cut off-feature high-pressure sodium lights may be installed for utility lease lighting until the utility provider offers functional low-pressure sodium lighting.
- C. Standards for existing lighting. In order to provide the highest level of protection for nesting marine turtles and their hatchlings, the following

standards for existing artificial light sources, including utility leased lighting, within the Marine Turtle Conservation Zone shall be brought into compliance by May 1, 2005:

1. Existing artificial light fixtures shall be repositioned, modified, disconnected, or removed so that:
 - a. The point source of light or any reflected surface of the light fixture is not directly visible from the beach,
 - b. Areas seaward of the frontal dune are not directly or indirectly illuminated; and
 - c. Areas seaward of the frontal dune are not cumulatively illuminated.
2. Existing artificial light fixtures that are replaced for any reason shall comply with Sub-section B, Standards for New Construction Activities and the following measures shall be taken:
 - a. Reposition fixtures so that the point source of light or any reflected surface of the light fixture is no longer visible from the beach;
 - b. Replace fixtures having an exposed light source with fixtures containing recessed light sources or shields;
 - c. Replace traditional light bulbs with yellow "bug" type bulbs not exceeding 50 watts;
 - d. Replace non-directional fixtures with directional fixtures that point down and away from the beach;
 - e. Replace fixtures having transparent or translucent coverings with fixtures having opaque shields covering an arc of at least 180 degrees and extending an appropriate distance below the bottom edge of the fixture on the seaward sides so that the light source of any reflective surface of the light fixture is not visible from the beach;
 - f. Replace pole lamps with low profile, low-level luminaries so that the light source of any reflective surface of the light fixture is not visible from the beach;
 - g. Replace incandescent, fluorescent, and high-intensity lighting with the lowest wattage low-pressure sodium-vapor lighting possible for the specific application;
 - h. Plant or improve vegetation buffers between the light source and beach to screen light from the beach;

- i. Permanently remove or permanently disable any fixture that cannot be brought into compliance with the provisions of these standards.
3. The following measures shall be taken as applicable to reduce or eliminate the negative effects of interior light emanating from doors and windows within line-of-sight of the beach:
 - a. Apply window tint or film that meets the standards tinted glass;
 - b. Rearrange lamps and other movable fixtures away from windows;
 - c. Use window treatment (i.e., blind, curtains) to shield interior light from the beach; and
 - d. Turn off unnecessary lights.
- D. Public awareness. Any person submitting an application for coastal construction activities within a Marine Turtle Conservation Zone shall be informed of the existence of and the requirements concerning artificial lighting and marine turtle protection by the City of Destin's Community Development Department.

7.17.02 Enforcement and penalties. Any alleged violation of section 7.17.00 or any of its sub-sections shall be processed in accordance with the procedures set forth in the City's Code of Ordinances, Chapter 14, Article III Code Enforcement Board.

SECTION 5: INCORPORATION INTO LAND DEVELOPMENT CODE.

This ordinance shall be incorporated into the City of Destin's Land Development Code and any section or paragraph number or letter and any heading may be changed or modified as necessary to effectuate the foregoing.

SECTION 6. INTERPRETATION.

The provisions of this ordinance shall be liberally construed in order to effectively carry out its purpose. Where any provision of this ordinance refers to or incorporates another provision, ordinance, statute, rule, regulation, policy, official publication, or other party, it refers to the most current version, incorporating any amendments thereto or rescinded station thereof.

SECTION 7: CONFLICTING PROVISIONS.

Special Acts of the Florida Legislature applicable to the incorporated area of the City of Destin, City Ordinances and City Resolutions, or parts, thereof, in conflict with the provisions of this ordinance are hereby superceded by this ordinance to the extent of such conflict.

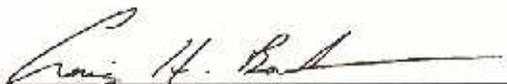
SECTION 8: SEVERABILITY.

Each separate provision of this ordinance is deemed independent of all other provisions herein so that if any portion or provision of this ordinance is declared invalid, all other provisions thereof shall remain valid and enforceable.

SECTION 9: EFFECTIVE DATE.

This ordinance shall become effective upon its adoption by the City Council and signature by the Mayor.

ADOPTED THIS 17th DAY OF FEBRUARY 2004.

By: 
Craig H. Barker, Mayor

The form and legal sufficiency of the foregoing has been reviewed and approved by the Land Use Attorney.


Scott Shirley, City Land Use Attorney

ATTEST


Dana S. Williams, City Clerk

First Reading: 2/2/04
Second Reading: 2/17/04

Lighting Ordinance for Marine Turtle Protection
of Franklin County, Florida

I. PURPOSE AND INTENT

This ordinance is intended to protect hatchling marine turtles from the adverse effects of artificial lighting, provide overall improvement in nesting habitat degraded by light pollution, and increase successful nesting activity and production of hatchlings on the beaches of Franklin County, Florida.

II. DEFINITIONS.

- (1) "Artificial light" or "artificial lighting" means the light emanating from any human-made device.
- (2) "Beach" means the zone of unconsolidated material that extends landward from the mean low water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation, usually the effective limit of storm waves.
- (3) "Bug" type bulb means any yellow colored light bulb that is marketed as being specifically treated in such a way so as to reduce the attraction of bugs to the light.
- (4) "Coastal construction activities" means any work or development on any of the barrier islands or Alligator Point in Franklin County, Florida.
- (5) Coastal Construction Control Line (CCCL) means the portion of the Coastal construction line established pursuant to the provisions of section 161.053 Florida Statutes that lies within Franklin County.
- (6) "Cumulatively illuminated" means illuminated by numerous artificial light sources that as a group illuminate any portion of the beach.
- (7) "Directly illuminated" means illuminated as a result of glowing element(s), lamp(s), globe(s), or reflector(s) of an artificial light source which is visible to an observer on the beach.
- (8) "Dune" means a mound or ridge of loose sediments, usually sand-sized, lying landward of the beach and deposited by any natural or

1
STATE OF FLORIDA COUNTY OF FRANKLIN
PLANNING AND ZONING COMMISSIONERS
BOARD OF COUNTY COMMISSIONERS
FRANKLIN COUNTY, FLORIDA
SEAL
J. W. [Signature]
[Signature]

artificial mechanism.

(9) "Frontal dune" means the first natural or man-made mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value.

(10) "Hatchling" means any species of marine turtle, within or outside of a nest, that has recently hatched from an egg.

(11) "Indirectly illuminated" means illuminated as a result of the glowing element(s), lamp(s), globe(s), or reflector(s) of an artificial light source which is not visible to an observer on the beach.

(12) Low-pressure sodium luminaire (LPS) means an electric discharge lamp containing sodium, neon, and argon, that when illuminated appears amber-yellow.

(13) "Marine turtle" means any marine-dwelling reptile of the families Cheloniidae or Dermochelyidae found in Florida waters or using the beach as nesting habitat, including the species: *Caretta caretta* (loggerhead), *Chelonia mydas* (green), *Dermochelys coriacea* (leatherback), *Eretmochelys imbricata* (hawksbill), and *Lepidochelys kemp* (Kemp's ridley). For purposes of this rule, marine turtle is synonymous with sea turtle.

(14) "Nest" means an area where marine turtle eggs have been naturally deposited or subsequently relocated.

(15) "Nesting season" means the period from May 1 through October 31.

(16) "Nighttime" means the period between sunset and sunrise.

(17) "Person" means individuals, firms, associations, joint ventures, partnerships, estates, trusts, syndicates, fiduciaries, corporations, and all other groups or combinations.

(18) Pole lighting means a light fixture set on a base or pole which raises the source of the light higher than twenty (24) inches off the ground.

(19) Shield means a non-reflective covering, canopy or other such device fitted over and extended below a light source preventing light from illuminating the beach.

(20) "Tinted glass" means any glass treated to achieve an industry-approved, inside-to-outside light transmittance value of 45% or less. Such transmittance is limited to the visible spectrum (400 to 700 nanometers) and is measured as the percentage of light that is transmitted through the glass.

III. STANDARDS FOR NEW CONSTRUCTION ACTIVITIES.

In order to provide the highest level of protection for nesting marine turtles and their hatchlings, the following standards for artificial light sources on all new coastal construction seaward of the Coastal Construction Control Line (CCCL) are adopted:

(1) Exterior artificial light fixtures shall be designed and positioned so that:

(a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;

(b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and

(c) Areas seaward of the frontal dune are not cumulatively illuminated.

(2) Exterior artificial light fixtures within direct line-of-sight of the beach will be permitted only if designed and installed as follows:

(a) Completely shielded downlight only fixtures or recessed fixtures having low wattage (i.e., 25 watts or less) "bug" type bulbs and non-reflective interior surfaces are used. Other fixtures that have appropriate shields, louvers, or cutoff features may also be used if they are in compliance with subsection (1)(a), (b), and (c) above; and

(b) All fixtures are mounted as low in elevation as possible through use of low-mounted wall fixtures, low bollards and ground-level fixtures.

(3) Floodlights, uplights or spotlights that are directly visible from the beach, or which indirectly or cumulatively illuminate the beach, are prohibited.

(4) No lighting shall be allowed on dune walkovers.

(5) Only low intensity lighting shall be used in parking areas within line-of-sight of the beach. Such lighting shall be:

(a) Set on a base which raises the source of light no higher than 48 inches off the ground; and

(b) Positioned or shielded so that the light is cast downward and the source of light or any reflective surface of the light fixture is not visible from the beach and does not directly or indirectly illuminate the beach.

(6) Tinted glass shall be installed on all windows and glass doors of single or multi-story structures within line-of-sight of the beach.

(7) Use of appropriately shielded low-pressure sodium-vapor lamps and fixtures shall be required for high-intensity lighting applications such as lighting parking areas and roadways, providing security, and similar applications.

(8) Temporary lighting of construction sites during the marine turtle nesting season shall be restricted to the minimal amount necessary and shall incorporate all of the standards of this section.

(9) Before granting any building permit, the Franklin County Planning and Building Department shall determine that all proposed development complies in all respects with the standards imposed in this section.

(10) Permits will not be required to install utility leased lighting, but all such lighting shall comply in all respects with the standards imposed in this

ordinance, with the exception that appropriately shielded high-pressure sodium lights may be installed for utility leased lighting until 2002 or until the utility provider offers low-pressure sodium lighting, whichever event occurs earlier.

(11) For any coastal construction completed after the effective date of this ordinance, the lighting shall not be changed without first obtaining a permit from the County. Such permits shall only be issued when the proposed lighting plan complies with this ordinance.

IV. STANDARDS FOR EXISTING LIGHTING.

In order to provide the highest level of protection for nesting marine turtles and their hatchlings, the county hereby adopts all of the following standards for existing artificial lighting sources, including utility leased lighting, seaward of the CCCL:

(1) Existing artificial light fixtures shall be repositioned or modified so that:

(a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;

(b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and

(c) Areas seaward of the frontal dune are not cumulatively illuminated.

(2) The following measures may be taken to comply with this section:

(a) Reposition fixtures so that the point source of light or any reflective surface of the light fixture is no longer visible from the beach;

(b) Replace fixtures having an exposed light source with fixtures containing recessed light sources or shields;

(c) Replace traditional light bulbs with yellow "bug" type bulbs not exceeding 25 watts;

(d) Replace non-directional fixtures with directional fixtures that point down and away from the beach;

(e) Replace fixtures having transparent or translucent coverings with fixtures having opaque shields covering an arc of at least 180 degrees and extending an appropriate distance below the bottom edge of the fixture on the seaward side so that the light source or any reflective surface of the light fixture is not visible from the beach;

(f) Replace pole lamps with low-profile, low-level luminaries so that the light source or any reflective surface of the light fixture is not visible from the beach;

(g) Replace incandescent, fluorescent, and high intensity lighting with the lowest wattage low-pressure sodium-vapor lighting possible for the specific application;

(h) Permanently remove or permanently disable any fixture which cannot be brought into compliance with the provisions of these standards;

(i) Disconnect utility leased lighting during the marine turtle nesting season.

(3) The following measures shall be taken as applicable to reduce or eliminate the negative effects of interior light emanating from doors and windows within line-of-sight of the beach:

(a) Apply window tint or film that meets the standards for tinted glass;

(b) Rearrange lamps and other moveable fixtures away from windows;

(c) Use window treatments (e.g., blinds, curtains) to shield interior lights from the beach; and

(d) Turn off unnecessary lights.

V. PUBLIC AWARENESS.

Any person submitting an application for coastal construction activities within the jurisdictional boundaries of Franklin County shall be informed of the existence of and the requirements concerning artificial lighting and marine turtle protection by the Franklin County Planning and Building Department.

VI. ENFORCEMENT AND PENALTIES

Upon notification by law enforcement authorities, the Franklin County Planning and Building Department shall give notice to any person who violates this ordinance by a certified letter to the property address listed by the Franklin County Tax Collector's Office. The letter shall describe the violation and shall enclose a brochure provided by Department of Environmental Protection and a copy of the ordinance. Such persons shall immediately correct any noticed violation. Failure to correct any noticed violation shall be punishable in the same manner as a misdemeanor and punishable as provided by Section 125.69, Florida Statutes (1995). Each day of any such violation shall constitute a separate and distinct offense. The Department of Environmental Protection and the Florida Marine Patrol shall have authority to enforce the ordinance.

VII. INTERPRETATION

The provisions of this Ordinance shall be liberally construed in order to effectively carry out its purpose. Where any provision of this Ordinance refers to or incorporates another provision, ordinance, statute, rule, regulation, policy,

official publication, or other authority, it refers to the most current version, incorporating any amendments thereto or redesignation thereof.

VIII. SEVERABILITY

If any section, subsection, sentence, clause or provision of this ordinance is held invalid by a court of competent jurisdiction, the remainder of this ordinance shall not be affected.

IX. EFFECTIVE DATE

This ordinance shall take effect immediately upon its adoption.

Duly adopted by the Board of County Commissioners of Franklin County, Florida, this 15th day of June, 1998.

BOARD OF COUNTY COMMISSIONERS

BY: 
RAYMOND WILLIAMS
CHAIRMAN



ORDINANCE NO. 2001-09

AN ORDINANCE OF GULF COUNTY, FLORIDA, CREATING REGULATIONS FOR THE PROTECTION OF SEA TURTLES AND OTHER ENUMERATED SPECIES WITHIN CERTAIN BEACHES OF GULF COUNTY; PROVIDING FOR THE PURPOSE AND INTENT OF SUCH ORDINANCE; PROVIDING FOR DEFINITIONS, PROHIBITED ACTIVITIES, LIGHTING STANDARDS FOR NEW CONSTRUCTION, LIGHTING STANDARDS FOR EXISTING LIGHTING, PROVIDING FOR PUBLIC AWARENESS, PROVIDING FOR ENFORCEMENT AND PENALTIES, PROVIDING AN INTERPRETATION, PROVIDING A SEVERABILITY CLAUSE AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, it has been determined that artificial lighting upon certain beaches of Gulf County adversely effects the nesting habits of the endangered and threatened marine turtle population and other enumerated species of Gulf County, and

WHEREAS, it is the policy of the Board of County Commissioners of Gulf County, Florida, that no enumerated artificial light source improperly illuminate the beaches of unincorporated Gulf County,

NOW, THEREFORE, be it ordained by the Board of County Commissioners of Gulf County, Florida, as follows:

I PURPOSE AND INTENT

This Ordinance is intended to protect state and federally listed species from the adverse effects of artificial lighting and from injury or harassment caused by such lighting and its effects. These species include all animals categorized by the United States Fish and Wildlife Service (50 CFR 17) or the Florida Fish & Wildlife Conservation Commission or the Marine Turtle Protection Act (Florida Statute 370.12, Florida Administrative Code, Rules 62-01, 62-B33, 62-B55) as either endangered, threatened, or species of special concern which utilize the beach habitat of Gulf County, Florida, specifically nesting female and hatchling marine turtles, beach mice, and shorebirds.

II DEFINITIONS

- (1) "Artificial light" or "artificial lighting" means the light emanating from any device other than natural celestial light sources.
- (2) "Beach" means the zone of unconsolidated material that extends landward from the mean low water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation, usually the effective limit of storm waves.
- (3) "Bug" type bulb means any yellow colored light bulb that is marketed as being specifically treated in such a way so as to reduce the attraction of bugs to the light.

- (4) "Coastal construction activities" means any work or development that is likely to have a material physical effect on existing coastal conditions or natural shore and inlet processes.
- (5) "Coastal Construction Control Line (CCCL)" means the portion of the Coastal Construction Control Line established pursuant to the provisions of Section 161.053 Florida Statutes that lies within Gulf County.
- (6) "Cumulatively illuminated" means illuminated by numerous artificial light sources that as a group illuminate any portion of the beach.
- (7) "Department" means the Florida Department of Environmental Protection.
- (8) "Directly illuminated" means the source of artificial light, i.e. lamps or reflectors, is visible to an observer located beyond the frontal dune.
- (9) "Dune" means a mound or ridge of loose sediments, usually sand-sized, lying landward of the beach and deposited by any natural or artificial mechanism.
- (10) "Frontal dune" means the first natural or man-made mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value.
- (11) "Ground-level barrier" means any vegetation, natural feature or artificial structure rising from the ground which prevents beachfront lighting from shining directly onto the beach-dune system.
- (12) "Gulf County Beaches" includes all beaches within Gulf County located seaward of SR30A and County Road C30B and C30E commencing at the Indian Pass public boat ramp and extending to the southern boundary of the St. Joseph Peninsula State Park and also including those boundaries lying south of Highway 98 commencing at the western boundary of the Gulf County Canal and extending to the Gulf/Bay County boundary line.
- (13) "Hatchling" means any species of marine turtle, within or outside of a nest, that has recently hatched from an egg.
- (14) "Indirectly illuminated" is the term used when the source element of an artificial light source is not visible by an observer located beyond the frontal dune, but the lumen output is.
- (15) "Listed species" includes all animals categorized by the United States Fish and Wildlife Service (50 CFR 17) or the Florida Fish & Wildlife Conservation Commission or the Marine Turtle Protection Act (Florida Statute 370-12, Florida Administrative Code, Rules 62-01, 62-B33, 62-B55) as either endangered, threatened, or species of special concern.

- (16) "Low pressure sodium luminaries (LPS)" means an electric discharge lamp containing sodium, neon, and argon, that when illuminated appears orange in color, and under which colors are indiscernible.
- (17) "Marine turtle" means any marine-dwelling reptile of the families Cheloniidae or Dermochelyidae found in Florida waters or using the beach as nesting habitat, including the species: *Caretta caretta* (loggerhead), *Chelonia mydas* (green), *Dermochelys coriacea* (leatherback), *Eretmochelys imbricata* (hawksbill), and *Lepidochelys kempji* (Kemp's ridley). For purposes of this rule, marine turtle is synonymous with sea turtle.
- (18) "Nest" means an area where marine turtle eggs have been naturally deposited or subsequently relocated.
- (19) "Nesting season" means the period from May 1 through October 31 of each year, as defined by F.A.C. 62B 55.002(17) for all counties.
- (20) "Nighttime" means the locally effective time period between sunset and sunrise.
- (21) "Person" means individuals, firms, associations, joint ventures, partnerships, estates, trusts, syndicates, fiduciaries, corporations, and all other groups or combinations.
- (22) "Pole lighting" means a light fixture set on a base or pole which raises the source of the light higher than twenty four inches (24") off the ground.
- (23) "Shield" means a covering, canopy, or other such device fitted over and extended below an artificial light source.
- (24) "Tinted glass" means any glass treated to achieve an industry-approved, inside-to-outside light transmittance value of 45% or less. Such transmittance is limited to the visible spectrum (400 to 700 nanometers) and is measured as the percentage of light that is transmitted through the glass.

III PROHIBITION OF ACTIVITIES DISRUPTIVE TO MARINE TURTLES AND OTHER LISTED SPECIES

The following activities involving direct illumination of the beach shall be prohibited at nighttime on Gulf County Beaches, as defined in Sec. II.12 above, from May 1 through October 31 of each year for the protection of listed species, specifically marine turtle nesting females, hatchlings, and nests:

- (1) The use of artificial lighting, including flashlights, to directly observe marine turtle nesting and hatching activities.
- (2) Any transient lighting which purposely or flagrantly illuminates nesting sea

turtles or hatchlings such that it disrupts their behavior patterns.

IV STANDARDS FOR UTILITY LEASED LIGHTING

A. New Construction

Utility lighting will be constructed within the following guidelines:

- (1) Distances Greater Than 300 ft. From The Mean High Water Mark: Cut-off HPS Luminaries; 150 watts or less; mounting height of 25ft or less. Where direct light source is visible by observer from beyond the frontal dune, a shield will also be installed.
- (2) Distances Up to 300 ft From the Mean High Water Mark: Cut-off HPS Luminaries; 150 watts or less with amber filtered lens, mounting height of 25 ft or less. Where direct light source is visible by observer from beyond the frontal dune, a shield will also be installed.

B. Existing Lighting

Upon failure of existing fixtures, the utility will install replacement fixtures utilizing the following guidelines:

- (1) Distances Greater Than 300 ft From The Mean High Tide Mark: Cut-off HPS Luminaries; 150 watts or less, mounting height of 25 ft or less. Where direct light source is visible by observer from beyond the frontal dune a shield will also be installed.
- (2) Distance 100 ft -300 ft From The Mean High Tide Mark: Cut-off HPS Luminaries; 150 watts or less with amber filtered lens; mounting height of 25 ft or less. Where direct light source is visible by observer from beyond the frontal dune a shield will also be installed.

Upon an agreement between the FDEP, Fish & Wildlife, local county government and the utility, that an existing fixture is posing a significant threat, replacement will occur prior to failure.

V STANDARDS FOR NEW CONSTRUCTION ACTIVITIES (EXCLUDING UTILITY LEASED LIGHTING)

In order to provide the highest level of protection for nesting marine turtles, hatchlings, and other listed species, the following standards for artificial light sources on all new coastal construction within the Beaches of Gulf County as defined in Section II.12, above:

- (1) Exterior artificial light fixtures shall be designed and positioned so that:
 - (a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach.

- (b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and
 - (c) Areas seaward of the frontal dune are not cumulatively illuminated.
- (2) Exterior artificial light fixtures within direct line-of-sight of the beach will be permitted only if designed and installed as follows:
- (a) Completely shielded down light only fixtures or recessed fixtures having low wattage type bulbs and non-reflective interior surfaces are used. Other fixtures that have appropriate shields, louvers, or cutoff features may also be used if they are in compliance with subsection (1)(a), (b), and (c) above: 25 watts or less bug lights and
 - (b) All fixtures are mounted as low in elevation as possible through use of low-mounted wall fixtures, low bollards, and ground-level fixtures.
- (3) Floodlights, up lights or spotlights for decorative and accent purposes that are directly visible from the beach, or which indirectly or cumulatively illuminate the beach, shall not be used.
- (4) Exterior lights used expressly for safety or security purposes must comply with subsections 2(a) and (b) and shall be limited to the minimum number and configuration required to achieve their functional role(s). The use of motion detector switches that keep lights off except when approached and that switch lights on for the minimum duration possible are required.
- (5) Only low intensity lighting shall be used in parking areas within line-of-sight of the beach. Such lighting shall be:
- (a) Set on a base which raises the source of light no higher than 45 inches off the ground; and
 - (b) Positioned or shielded so that the light is cast downward and the source of light or any reflective surface of the light fixture is not visible from the beach and does not directly or indirectly illuminate the beach.
- (6) Parking area lighting, and roadway lighting shall be shielded from the beach through the use of ground-level barriers. Ground-level barriers must not interfere with marine turtle nesting or hatchling emergence, or cause short or long term damage to the beach/dune system.
- (7) Tinted glass shall be installed on all windows and glass doors of single or multi-story structures within line-of-sight of the beach.
- (8) Use of appropriately shielded low-pressure sodium-vapor lamps and fixtures

shall be required for high-intensity lighting applications such as lighting parking areas and roadways, providing security, and similar applications.

- (9) Lights on dune walkovers are prohibited seaward of the CCCL. Lights on the walkovers landward of the CCCL shall utilize low profile shielded luminaries directed and positioned so that the point source of light or any reflective surface of the light fixture is not directly visible to a person on the beach.
- (10) Temporary lighting of construction sites during the marine turtle nesting season shall be required to abide by the standards of this section.

VI STANDARDS FOR EXISTING LIGHTING (EXCLUDING UTILITY LEASED LIGHTING)

In order to provide the highest level of protection for nesting marine turtles, hatchlings, and other listed species, the following standards for all existing artificial light sources, with the Gulf County Beaches as defined within Section II.12 above shall be brought into compliance by April 1, 2002.

- (1) Existing artificial light fixtures shall be repositioned, modified, disconnected, or removed so that:
 - (a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach.
 - (b) Areas seaward of the frontal dune are not directly or indirectly illuminated; and
 - (c) Areas seaward of the frontal dune are not cumulatively illuminated.
- (2) Existing artificial light fixtures that are replaced for any reason shall comply with Section IV, Standards for New Construction Activities and the following measures taken:
 - (a) Reposition fixtures so that the point source of light or any reflective surface of the light fixture is no longer visible from the beach;
 - (b) Replace fixtures having an exposed light source with fixtures containing recessed light sources or shields;
 - (c) Replace non-directional fixtures with directional fixtures that point down and away from the beach;
 - (d) Replace pole lamps with low-profile, low-level luminaries so that the light source or any reflective surface of the light fixture is not visible from the beach;

- (e) Replace incandescent, fluorescent, and high intensity lighting with the lowest wattage low-pressure sodium-vapor lighting possible for the specific application;
 - (f) Plant or improve vegetation buffers between the light source and the beach to screen light from the beach;
- (3) The following measures shall be taken as applicable to reduce or eliminate the negative effects of interior light emanating from doors and windows within line-of-sight of the beach:
- (a) Apply window tint or film that meets the standards for tinted glass;
 - (b) Rearrange lamps and other moveable fixtures away from windows;
 - (c) Use window treatments (e.g., blinds, curtains) to shield interior lights from the beach; and
 - (d) Turn off unnecessary lights.
- (4) Any and all lighting which fails to meet the requirements of Section VI as to standard for existing lighting shall be subject to termination of lighting pending full compliance.

VII PUBLIC AWARENESS

Any person submitting an application for coastal construction activities within the jurisdictional boundaries of Gulf County shall be informed of the existence of and the requirements concerning artificial lighting and marine turtle protection by the Gulf County Planning and Building Department.

VIII ENFORCEMENT AND PENALTIES

Upon notification, the Gulf County Code Enforcement Officer shall give notice to any person who violates this Ordinance by a certified letter/return receipt requested to the property owner's address listed at the Gulf County Tax Collector's Office for the location of the offending light. Such notice shall be provided within twenty-four (24) hours of the report of the disorientation event, or within forty-eight (48) hours of the report of the disorientation event if reported on the weekend. Additionally, in the event that the Code Enforcement Officer ascertains that the offending property is under the care of a rental (realty) agency or property manager, then and in that event, the Code Enforcement Officer shall provide to such rental agency a Notice of Violation letter within forty-eight (48) hours of the disorientation event. Further, in the event that the Code Enforcement Officer ascertains that the offending property is occupied, then and in that event, a copy of the Notice of Violation shall be provided to an occupant at the location of the offending light within twenty-four (24) hours of the report of the disorientation event, or within forty-eight (48) hours of the report of the disorientation event if reported on the weekend. Such letters shall describe the violation and shall enclose a brochure provided by the Department of Environmental Protection and a copy of this

Ordinance. Failure to correct any noticed violation within seven (7) days of the date of notice of such violation shall be punishable in the same manner as a misdemeanor punishable as provided by Section 125.69, Florida Statutes (2001). Each day of any such violation shall constitute a separate and distinct offense. The Florida Department of Environmental Protection, Gulf County Sheriff's Department, Florida Fish & Wildlife Conservation Commission, and Gulf County Code Enforcement officers shall have authority to enforce the Ordinance. Any person may exercise their right to report any and all violations of this Ordinance to the proper enforcement authorities. In addition to any other remedy herein set forth or otherwise provided by law, the County may restrain any violation of this Ordinance by suit in a court or administrative body of competent jurisdiction.

IX INTERPRETATION

The provisions of this Ordinance shall be liberally construed in order to effectively carry out its purpose. Where any provision of this Ordinance refers to or incorporates another provision, ordinance, statute, rule, regulation, policy, official publication, or other authority, it refers to the most current version, incorporating any amendments thereto or re-designation thereof

X SEVERABILITY

If any section, subsection, sentence, clause or provision of this Ordinance is held invalid by a court of competent jurisdiction, the remainder of this Ordinance shall not be affected.

XI EFFECTIVE DATE

This Ordinance shall take effect immediately upon its adoption.

Duly adopted by the Board of County Commissioners of Gulf County, Florida, this 11th day of September, 2001.

BOARD OF COUNTY COMMISSIONERS
GULF COUNTY, FLORIDA

By: Nathan Peters, Jr.
Nathan Peters, Jr. Chairman

ATTEST

By: Douglas Birmingham
Douglas Birmingham, Clerk

CERTIFIED TRUE COPY
DOUGLAS C. BIRMINGHAM
CLERK OF COUNTY COURT
GULF COUNTY, FLORIDA
BY: Douglas Birmingham D.C.
DATE: 9/24/01

ORDINANCE BOOK 10 PG 92

File # 200542825
 OR BK 2488 Pages 2021 - 2043
 RECORDED 08/28/05 17:09:11
 Mary M. Johnson, Clerk
 Santa Rosa County, Florida
 DEPUTY CLERK WS
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 Trans # 262274

ORDINANCE NO. 2005 - 13

AN ORDINANCE RELATING TO SANTA ROSA COUNTY, FLORIDA; AMENDING ORDINANCE 91 - 24, SANTA ROSA COUNTY LAND DEVELOPMENT CODE, AS AMENDED; AMENDING ARTICLE TWO; ESTABLISHING THE NAVARRE AREA ARCHITECTURAL REVIEW BOARD; AMENDING ARTICLE SIX; CREATING A TOWN CENTER CORE ZONING DISTRICT (TC-1); CREATING A TOWN CENTER OUTER ZONING DISTRICT (TC-2); CREATING THE HEART OF NAVARRE OVERLAY DISTRICT; ESTABLISHING ARCHITECTURAL STANDARDS, DEVELOPMENT GUIDELINES, SIGNAGE REGULATIONS AND STREETScape STANDARDS; AMENDING ARTICLE TWELVE ESTABLISHING THE MARINE TURTLE LIGHTING STANDARDS; PROVIDING FOR SEVERABILITY; AND, PROVIDING FOR AN EFFECTIVE DATE.

BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF SANTA ROSA COUNTY:

SECTION 1. Article 4 of Santa Rosa County Ordinance 91-24 as amended is amended to read as follows: (Language added is printed in type which is **bold underline** type, and language deleted is printed in ~~struck through~~-type.) Article 11 is replaced in its entirety.

ARTICLE TWO – ADMINISTRATION

2.11.00 NAVARRE AREA ARCHITECTURAL REVIEW BOARD: A Navarre Area Architectural Review Board shall be established by the Board of County Commissioners. Any new development or redevelopment requiring site plan or plat approval within the Heart of Navarre Overlay District, including the Navarre Town Center Zoning Districts, shall be presented to this Board for review and approval prior to the issuance of any County Development Orders or Building Permits.

A. Membership: The Architectural Review Board shall be composed of the following members:

- 1. Five voting members appointed by the Board of County Commissioners,**
 - (a) one of which owns property in the Town Center District,**
 - (b) one of which owns property in the Heart of Navarre District,**
 - (c) one of which resides in the Navarre Area as defined in the Navarre Town Center Plan (October 2004), and**
 - (d) two of which have architectural design or construction experience.**

All members shall be residents of Santa Rosa County.

- 2. Adviser: The County Planning and Zoning Director or the Director's designee shall be the adviser and staff to the board.**

B. Term of Office, Vacancies; Removal from Office: Members shall be appointed for a term of four (4) years except in the case of a re-appointment to fill a vacancy for the remainder of the four (4) year period in which event the appointment shall be for the unexpired term only. The initial term for two (2) members shall be three (3) years and the initial term for three (3) members shall be four (4) years. At the discretion of the Board of County Commissioners, any member may be reappointed for consecutive terms. Any member of the board may be removed from office without cause by the Board of County Commissioners.

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C. Officers: The board shall elect from among its members a chairman and vice chairman. The terms of officers shall be one year, with eligibility for re-election, and officers shall serve until their successors are selected and qualified.

D. Duties: The purpose of the board shall be to ensure that all development and redevelopment of existing sites adheres to the architectural standards outlined in this code for the Heart of Navarre Overlay district and Navarre Town Center zoning districts. It shall review based on the standards herein and the intent of the Navarre Town Center Plan. Its mission is to preserve and enhance the aesthetic integrity of the Navarre Community, thereby improving the quality of life for its residents.

E. Procedure for submission of plans: All new development and all modifications to existing development to a building located or to be located in the Town Center Districts or Heart of Navarre Overlay District shall be accompanied by plans for the proposed work. Such plans shall be submitted by the applicant to the Planning and Zoning Department at least ten (10) working days prior to the scheduled meeting for which the applicant would like the project presented.

The applicant shall be notified of the time, date and place of the meeting. The applicant or their authorized agent shall appear at the meeting in order for the request to be considered by the board.

F. Review and Decision: The board shall promptly review such plans and shall render its decision. If the board approves the plans, the applicant may then submit plans to the County for development review. If the board disapproves the plans they shall be resubmitted to the Planning and Zoning Department with the necessary changes for consideration by the board at a subsequent meeting.

G. Voting: All decisions may be rendered by a simple majority of the board members present and voting.

H. Appeals: Any person aggrieved by a decision of the board may within thirty (30) days thereafter, appeal the decision to the Board of County Commissioners. Appeals must be in writing and submitted to the Planning and Zoning Department.

ARTICLE SIX - LAND USE, TYPE, DENSITY, INTENSITY

6.05.23 Town Center District

A. General: This district is designed for the designated Town Center Area of Navarre. That area is generally described as north of US98, Laredo Street and south, east of SR87 and Granada Street and west. This district is intended to encourage pedestrian traffic, but shall allow for vehicles on all public roadways.

The district shall be characterized by slow moving vehicular traffic, lively pedestrian walkways, small-scale commercial development and varied architecture. The district is intended to function as the core town center for the Navarre Community. Public and private use areas shall be provided for within the district.

B. District Regulations

1. TC-1 Town Center Core Zoning District: This district shall be a mixed use commercial and residential district. The core area of the Town Center shall generally include that area bordered by Esplanade on the south, El Paseo on the north, Alhambra on the east and Luneta on the west.

a. The following uses shall not be permitted in the TC-1 district:

(1) Industrial uses

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- (2) Drive-through restaurants
- (3) Storage uses
- (4) Auto sales or repair
- (5) Pawn shops
- (6) Gas stations

No use deemed to be outside the character of the district shall be permitted.

b. The first floor of all developments in the TC-1 district shall be uses that generate high levels of pedestrian traffic such as retail or restaurant. Active service uses such as hair salons shall be allowed on the first floor, but no passive office uses shall be permitted. Office uses, retail, and residential loft-style uses shall be permitted on the second floor.

c. Density: Residential density within the TC-1 district shall be no more than ten (10) units per acre.

d. Setbacks: There shall be no required setbacks in the Town Center. Development is encouraged to build to front and side property lines. Vehicular alleyways to rear-of-building parking shall be considered only when no other connection exists on the affected street. Vehicular alleyway connections to Prado and Esplanade shall not be permitted.

e. No buffers will be required between uses within the Town Center District. For purposes of applying Landscape Buffers (7.01.05) between development in the Town Center and adjacent districts and uses, the TC-1 zoning district shall be considered a Residential Class II Use.

2. TC-2 Town Center Outer Zoning District: This area includes those areas of the Town Center District outside of the TC-1 District. This district shall be a mixed use residential and commercial district.

a. Uses: The following uses shall not be permitted in the TC-2 district:

- (1) Industrial uses
- (2) Drive-through restaurants
- (3) Storage uses
- (4) Auto sales or repair
- (5) Pawn shops
- (6) Gas stations

No use deemed to be outside the character of the district shall be permitted.

b. Office, restaurant, retail, service and residential and similar uses are allowed.

c. Density: Residential density within the TC-2 district shall be no more than ten (10) units per acre.

d. Setbacks: There shall be no required setbacks in the Town Center. Development is encouraged to build to front and side property lines. Vehicular alleyways to rear-of-building parking shall be considered only when no other connection exists on the affected street.

e. No buffers will be required between uses within the Town Center District. For purposes of applying Landscape Buffers (7.01.05) between development in the Town Center and adjacent districts and uses, the TC-2 zoning district shall be considered a Residential Class II Use.

C. Development Guidelines for TC-1 and TC-2 Districts

ORDINANCE BOOK 10 PG 95**1. Architectural Standards**

a. Approved Architectural Styles: The following architectural styles are permitted for use in the Town Center District. Renderings of these styles are found in the Navarre Town Center Plan (2004) and are available from the Planning and Zoning Office.

(1) Neoclassical- Center entrance with semicircular fanlight over front door; Gable pediment with a deep frieze and 2-story classical columns (Doric); vertical windows with diamond panes; porch balustrades of metal or wood; typically constructed of stucco or wood-siding with brick foundation/base.

(2) Caribbean Vernacular- Cantilevered 2nd floor porch with wood balustrade and rectangular pillars, large roof overhang; exposed rafters and joists; vertical or Bahamas-type shutters; typically constructed of wood siding or stucco.

(3) Cracker- The modern term cracker refers to the unpretentious people and architecture found on farms and in rural communities still sprinkled throughout peninsular and panhandle communities of Florida. Cracker-style structures are wood frame with wide porches, steeply pitched roofs and log or wood clapboard siding.

(4) Georgian –Center entrance with pilasters and pediment; vertical windows with multiple mullions (6 over 6); louvered shutters; hipped or side gable roofs of medium pitch, classical ornamentation including garlands, swags, dentils and bracketed cornices; typically constructed of brick, stucco or wood siding. This style shall be allowed in the TC-2 district only.

(5) French Colonial- Stucco-sided homes with expansive two-story porches and narrow wooden pillars tucked under the roofline, double pitched roof with symmetrically placed chimneys. The porch was an important passageway because traditional French Colonial homes did not have interior halls.

(6) Bungalow- Regular, rectangular floor plan, with the narrow side facing the street, typically one story, gable main roof over gable porch roof, simple ornamentation, exposed structural elements, knee braces, battered porch piers, tapered chimneys.

(7) Queen Anne (also known as Victorian)- More formal, Victorian-style structure, steeply pitched, multi-gabled roof, front facing gable, wrap-around porch, paired Doric columns, turned wood balustrades, differing wall textures, towers are typical but not imperative. This style shall be allowed in the TC-2 district only.

(8) Masonry Vernacular- Two story masonry building with wood framed shopfronts on first story and balcony above (wrought iron); columns or brackets holding up canopies; decorative brick detailing at roof line.

b. No metal, vinyl or aluminum siding or exposed cinder block shall be permitted in the Town Center

c. Fences: Fences should be lower in the front than in the rear of the structure. In addition, the following shall be required:

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(1) No chain link shall be permitted.

(2) Fence shall be in the same style as the main structure.

(3) Wrought iron or aluminum "look-alike" may be allowed.

(4) Hedges may function as fences.

d. Foundations: both on and off grade shall be allowed, off-grade shall be cosmetically concealed.

e. Columns shall be proportionate to the structure and can be constructed of the same materials as fences.

f. Porches, balconies, towers, cupolas and widows walks are strongly encouraged when appropriate to the architectural style.

g. The roof shall be consistent with the architectural.

(1) No flat roofs shall be permitted without parapet. The parapet shall feature three dimension cornice treatment. Parapet walls shall be designed and constructed in a manner to appear as a solid, three dimensional form rather than a veneer.

(2) Metal Roofing:

(a) 5V Crimp or standing seam only shall be permitted.

(b) The color of a metal roof shall conform to the color requirements of this section and shall match the architectural style of the building.

h. Doors: Combination metal and glass storefronts shall not be permitted unless a documented characteristic of the chosen architectural style. Flush doors shall not be allowed.

i. Windows

(1) No full glass front allowed.

(2) No vinyl windows shall be permitted.

(3) Windows shall be consistent with the architectural style.

j. Outbuildings shall be constructed in the same style as the primary structure.

k. Shutters, if used, shall be operable and sized for their opening.

l. Paint Colors shall be consistent with the Architectural Style. The Architectural Review Board shall adopt historic paint palettes from different manufacturers for use in the Town Center District and examples will be available at the Planning and Zoning Office. The manufacturer of the paint shall not be dictated. These shall be the only colors allowed. Applicants may petition the Architectural Review Board for permission to use other colors.

2. Parking: No dirt or gravel parking shall be allowed. Permeable pavement is allowed and encouraged in the Town Center District.

3. Mechanical units & utility connections shall be screened and located on the side or in the rear of the structure. Sites and architecture shall be designed to accommodate off main street deliveries, to locate all waste receptacles in the rear and to slow traffic.

4. Landscaping: All developers/owners/tenants shall be assessed a fee in order to maintain landscaping along the streets and sidewalks of the District.

5. Building Height

a. A building height to street width ratio of 1:2 shall be used to control height of all structures within the District.

b. A 10% encroachment above the permitted building height shall be allowed for decorative architectural elements.

6. Building Composition, Mass and Façade

a. Building mass should reinforce the definition and importance of the street. The building façades should read as a continuous street wall. Structures shall conform to the build-to lines outline in the setbacks section above.

b. Building mass should be articulated to reflect a human scale both horizontally and vertically. Elements reducing the perceived building mass can include, but are not limited to articulated façades corner elements, inset windows, highlighted entry features and prominent cornices and rooflines. However, building architecture shall conform to the architectural styles described above. In order to reduce the perceived building mass:

(1) Monotonous building elevations shall be avoided through the use of façade articulation, building angles, eaves, parapets and window and door placement.

(2) A façade greater than 100 feet in length, measured horizontally, shall incorporate wall plane projections or recesses having a depth of at least 3% of the length of the façade and extending at least 20% of the length of the façade. Architecturally integrated awnings and canopies may be counted toward façade articulation.

(3) Building forms shall be articulated as an expression of the building use. As an example, the various uses in a mixed use building should be apparent through the pattern of scale of entries and windows, and through building elements such as arcades, awnings and balconies.

c. Structures on Esplanade and Prado Streets shall have entries directly accessible and visible from those streets.

d. Building façades shall have a consistent design on all sides and should animate the street, providing visual interest to passers-by.

7. Outdoor display areas shall be directly adjacent to the building, extending no more than four (4) feet. Café seating shall not be considered a display area. In addition:

a. The total maximum height of an outdoor merchandise display shall be 12 feet.

b. Wares may only be displayed during business hours.

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- c. Displays shall not block emergency lanes, sight distance, handicapped access, doorways, pedestrian walkways etc.
- d. Displays shall not encroach on permitted parking areas.
- e. Displays shall be permitted on hardscape only (not in landscaped areas).
- f. Displays may have one sign describing the items and price. This sign may be no larger than the display. No lighting of the display shall be permitted.
- g. Displays are not permitted on vacant property.
- h. Displays with itinerant vendor or tent permits are excepted.
- i. The merchandise to be sold must be directly related to the retail establishment or be decorative items that relate to or complement the business.

8. Lighting

- a. Lighting styles on public rights of way shall be uniform to create an overall look.
- b. All site plans for commercial or multi-family developments shall require a review of all exterior lighting, including landscape lighting.
- c. Light Trespass- The maximum illumination at five feet inside an adjoining single-family residential parcel from an artificial light source is 0.50 footcandles.
- d. Parking Lot Lighting:
 - (1) All lighting in parking lots shall be direct lighting (downlighting). Gas lamps are excepted.
 - (2) All light fixtures shall be full cut off fixtures where the element is recessed in the fixture with a flat lens. Gas lamps are excepted.
 - (3) Mounting heights of lighting fixtures shall not exceed 20 feet.
- e. Building Lighting:
 - (1) All lighting attached to a structure shall be direct lighting. Gas lamps are excepted.
 - (2) All wall pack fixtures shall be full cut off fixtures where the element is recessed in the fixture with a horizontal flat lens.
- f. Lighting of Walkways/Bikeways and Parks: When special lighting is to be provided for walkways, bikeways or parks, the following requirements shall apply.
 - (1) The walkway, pathway or ground area shall be illuminated to a level of no more than 0.5 footcandles.
 - (2) The vertical illumination levels at a height of five (5) feet above grade shall be no more than 0.5 footcandles.
 - (3) Lighting fixtures shall be designed to direct light downward.
- g. Wherever practicable, lighting installations shall include timers, dimmers and/or sensors to reduce overall energy consumption and eliminate unneeded lighting.

ORDINANCE BOOK 10 PG 99**9. Signage**

Signage shall be consistent with the requirements of Article 8, except as specified below.

- a. No on premise (freestanding) signs shall be permitted.**
- b. No neon, flashing or animated signs allowed.**
- c. Sign construction shall be compatible with the Architectural Style in terms of both construction materials and design.**
- d. No temporary or portable signs shall be permitted; menu boards are excepted. These boards should not impede pedestrian or vehicular traffic and should not cause any safety hazard. Menu Boards shall be no more than 32 inches in height and no more than 24 inches wide.**
- e. No freestanding signs, arcade, façade or freestanding signs, shall be internally illuminated, but backlighting of letters may be allowed.**
- f. Wall signage shall be limited to 5% of the building frontage, not to exceed 24 square feet. This will not apply to businesses fronting US98.**
- g. The only electronic message boards allowed in the Town Center shall be Time and Temperature signs.**
- h. Building owners will be required to take down signs if there is not a business occupying the space**
- i. No flagging or pennants will be allowed except for civic events and grand openings. Grand openings shall be limited to 30 days.**
- j. No billboards shall be permitted in the Town Center**

10. Streetscapes in the Town Center District shall be designed as follows:

- a. Two 11 foot lanes with a minimum of 10 foot wide parallel parking and a center median if applicable.**
- b. Twelve foot wide landscape strips between parallel parking and the sidewalk.**
- c. Café seating will be allowed.**
- d. Sidewalks will be 18 feet wide on Prado & Esplanade and 12 feet wide on all other streets.**
- e. Administrative variances will be allowed for courtyards and additional seating if:**
 - (1) The linear street frontage of the setback request, in aggregate with other requests and existing setback areas, does not exceed 33% of the total street frontage on the block,**
 - (2) There exist no impedances that would restrict free flow of pedestrian traffic between the café seating and the edge of pavement or landscape strip, and**
 - (3) There exist no other hazards to public safety.**
- f. Crosswalks will be accented in pavers and paver accents shall be in appropriate sections of the sidewalk.**

ORDINANCE BOOK 10 PG 100

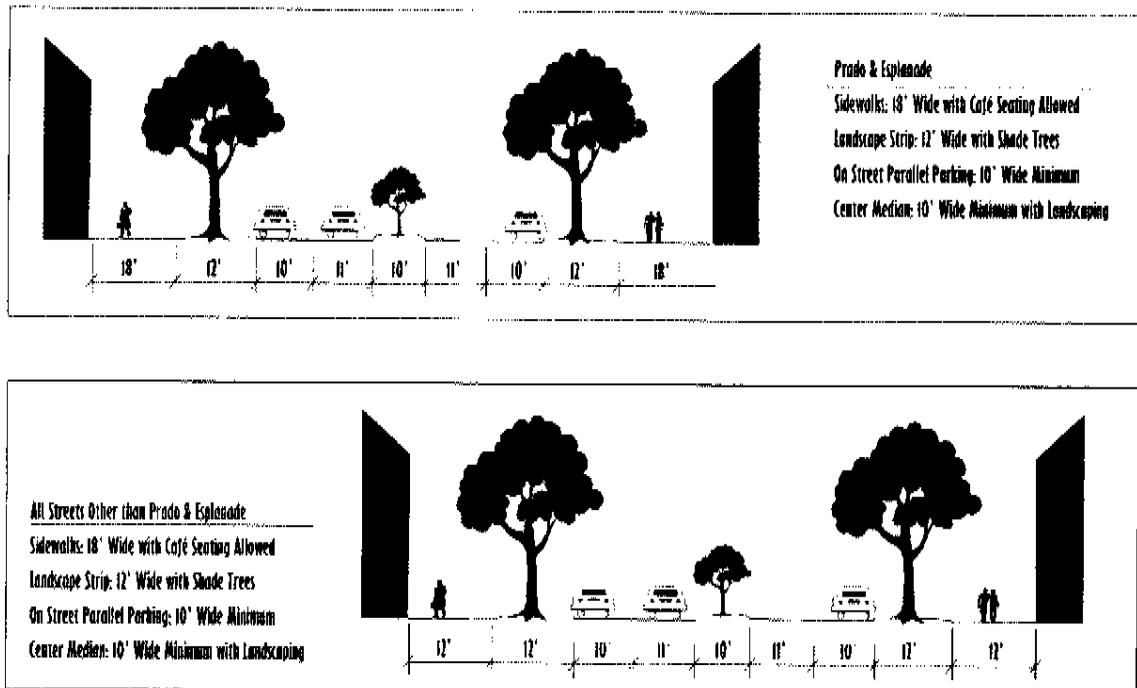
g. Benches should not be constructed of material that will rust, but of more indigenous materials such as cedar or cypress; their construction should be consistent with the chosen architectural styles and should contain no advertising.

h. Alleyways should be narrower with no pedestrian amenities.

i. A consistent design element shall be incorporated in the streetscape design (in benches, payers, planter boxes, street signs etc...). This element should reflect the nautical heritage of the area, but not be "beachy."

A depiction of the streetscape requirements appears on the below:

Navarre Town Center Plan
Streetscape Requirements in the Town Center District



Purpose of Streetscape Standards:

- Maintain Clear Street Edge
- Enhance the Street as an inviting place for pedestrians (windows, display cases, wall art, landscaping, required retail on first floor)
- Relate the Street to traditional buildings in the corridor
- Provide a sense of scale.

D. Any new development or redevelopment of existing sites within the TC-1 or TC-2 District shall be presented to the Navarre Architectural Review Board for review and approval prior to the issuance of any County Development Orders or Building Permits. The Architectural Review Board shall ensure adherence to the architectural and site design standards of this section.

6.05.24 Heart of Navarre Overlay District

A. General: This district, which is identified in the Navarre Town Center Plan (2004) and shown on Exhibit "A" is designed for the commercial and residential core area of the Community of Navarre. It is intended to improve and preserve the aesthetic integrity of commercial and multi-family development and encourage a lively, walkable community while still allowing development to flourish on the major arterials in the Community.

ORDINANCE BOOK 10 PG 101

B. Land Uses shall be restricted. Permitted and conditional uses are determined by the underlying zoning district, except that the following uses shall not be permitted within the Heart of Navarre District.

1. Industrial uses

2. Storage uses

3. Auto sales or repair

4. Pawn shops

Marine sales and repair shall be permitted by conditional use only.

C. Development Guidelines for the Heart of Navarre Overlay District

1. Outdoor display areas shall be restricted:

a. The merchandise to be sold must be directly related to the retail establishment or be decorative items that relate to or complement the business.

b. The size of the display area shall be limited to 50% of the width of the building frontage.

c. The total maximum height of an outdoor merchandise display shall be 12 feet

d. Wares may only be displayed during business hours

e. Displays shall not block emergency lanes, sight distance, handicapped access, doorways, pedestrian walkways or other throughways necessary for safe and convenient access to the site or for proper internal circulation.

f. Displays may not encroach on permitted parking areas.

g. Displays shall be permitted on hardscape only (not in landscaped areas).

h. Displays may have one sign describing the items and price. This sign may be no larger than the display. No lighting of the display shall be permitted.

i. Displays shall not be permitted on vacant property

j. Displays with itinerant vendor or tent permits are excepted.

2. Architectural Requirements

a. Metal and vinyl buildings and siding are prohibited in the Heart of Navarre District

b. Barbed wire, razor wire and exposed cinder block fences and walls are prohibited. Chain link fencing shall be allowed if it is not visible from a public right-of-way, including navigable waterways and bridges.

c. Off grade foundations shall be concealed, cinder block should not be exposed

d. Columns, Porches & Railings, Balconies shall be consistent with the architectural style and proportional to the overall structure.

ORDINANCE BOOK 10 PG 1-02

e. Towers, Cupolas & Widows Walks shall be consistent with the architectural style and may encroach up to 10% above the height limit of habitable space.

f. Roofs: Metal, tiles, asphalt shingle, built-up roof and single-ply membrane all shall be permitted. Flat roofs should not be visible from any right-of-way, including navigable waterways and bridges. The roof shall be consistent with the architectural style. For metal roofs, 5V Crimp or standing seam only shall be permitted. The color of a metal roof shall conform to the color requirements of this section and shall match the architectural style of the building.

g. Doors and Windows shall be consistent with the architectural style.

h. Outbuildings shall be consistent with the architectural style if visible from the right-of-way, including navigable waterways and bridges.

i. Paint Colors: Paint colors listed the Sherwin-Williams Color Options Palette as energetic brights shall not be allowed. Colors in the first and second tier of the chips should be allowed for trim only. Colors on pages 79-85 and 97-120 of that palette shall also be disallowed. Colors from another manufacturer that resemble the permitted colors shall be allowed.

k. Parking

(1) No gravel or dirt parking lots shall be permitted.

(2) Landscaped planter strips shall be required between alternating parking rows in parking lots of developments 50,000 square feet or more. A graphic appears below.

(a) These strips shall be contiguous with planter islands at the terminus of parking rows.

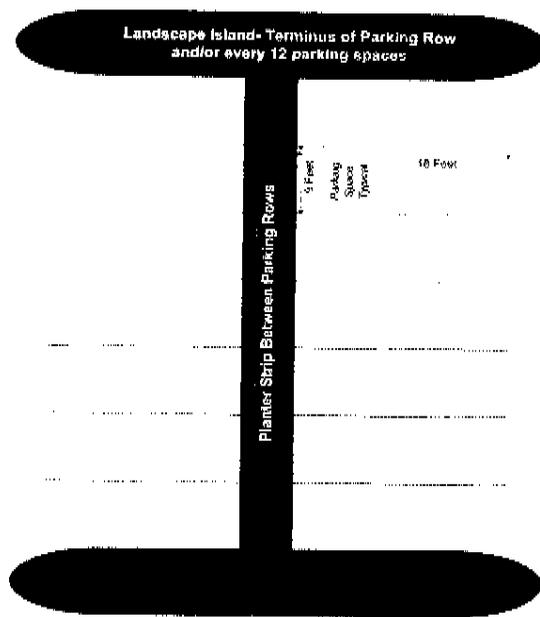
(b) These strips shall be a minimum of four (4) feet wide.

(c) The required number of shrubs in the planter strips shall be equal to one shrub every 36 inches. The number of required understory trees shall be equal to one tree every 30 linear feet. The species of shrubs and understory trees shall conform to those listed in this section.

(d) Within the planter strips, shrubs shall not be at linear intervals on center, but arranged in clumps to create logical pedestrian routes through the island.

(e) Openings in these strips, if necessary, shall be permitted for stormwater control.

(f) Administrative variances to the 18' long parking stall requirement shall be allowed to a minimum length of 16' to allow overhang of the front bumper on the landscape strip when the landscape strip is wider than the minimum required.



10. All mechanical units shall be screened from public view, including views from navigable waterways and bridges.

11. Landscaping: The Landscaping standards of Article 7 shall apply in the Heart of Navarre District except in cases where the standards below are more stringent.

a. A Registered Landscape Architect shall be required on commercial or multi-family projects totaling 50,000 square feet or more. Contiguous projects under single ownership shall be deemed one project for the purposes of this section.

b. Permitted Species:

(1) Canopy Trees:

- Red Maple (Acer rubrum)
- Silver Maple (Acer saccharum)
- American Hornbeam (Carpinus caroliniana)
- Southern Red Cedar (Juniperus silicicola)
- Leyland Cypress (Cupressocyparis leylandii)
- River Birch (Betula nigra)
- Pignut Hickory (Carya glabra)
- Green Ash (Fraxinus pennsylvanica)
- Sweetgum (Liquidambar styraciflua)
- Southern Magnolia (Magnolia grandiflora)
- Tupelo/Sour Gum (Nyssa sylvatica)
- Sycamore (Plantanus occidentalis)
- White Oak (Quercus alba)
- Live Oak (Quercus virginiana)
- Sand Live Oak (Quercus virginiana var. geminata)
- Shumard Oak (Quercus shumardii)
- Southern Red Oak (Quercus falcate)

(2) Understory Trees:

- Flowering Dogwood (Cornus florida)

ORDINANCE BOOK 10 PG 104

Loblolly Bay (Fordonia lasianthus)
American Holly (Ilex opaca)
Dahoon Holly (Ilex cassine)
Crape Myrtle (Lagerstroemia indica)
Glossy Privet (Ligustrum lucidum)
Saucer Magnolia (Magnolia x soulangiana)
Sweetbay Magnolia (Magnolia virginiana)
Wax Myrtle (Myrica cerifera)
Yaupon Holly (Ilex vomitoria)
Loquat (Eriobotrya japonica)
Eastern Redbud (Cercis Canadensis)
E fringe Tree (Chionanthus virginicus)
Hawthorn (Crateagus spp.)
Silverbell (Halesia caroliniana)
Sweet Bay (Laurus nobilis)

(3) Shrubs and Hedges:

Glossy abelia (Abelia grandiflora)
Aucuba (Aucuba japonica)
Japanese Boxwood (Buxus microphylla)
Japanese Plum-Yew (Cephalotaxus harringtonia)
Elaeagnus (Elaeagnus pungens)
Gardenia (Gardenia jasminoides)
Buford Holly (Ilex cornuta)
Privet (Ligustrum japonicum)
Southern Wax Myrtle (Myrica cerifera)
Firethorn (Pyracantha coccinea)
Dwarf Yaupon Holly (Ilex vomitoria 'Nana')
Chinese Juniper (Juniperus chinensis)
Indian Hawthorn (Raphiolepis sp.)
Red-Tip Photinia (Photinia)
Rhododendron/Azalea (Rhododendron sp.)

c. Permitted Size of Landscape Elements:

(1) Canopy Trees shall be a have a minimum of 2" caliper at 4.5' above grade and shall be a minimum of 8' in height.

(2) Understory Trees shall have a minimum 2" caliper at 4.5' above grade and shall be a minimum of 6' in height.

(3) Shrubs shall be a minimum of 18" off finished grade.

d. Requirements for Perimeter Landscaping in the Heart of Navarre District shall be as follows:

(1) The required number of canopy trees to be planted in the required perimeter planting shall be equal to one canopy tree every 30 linear feet or fraction thereof.

(2) The required number of shrubs to be planted in the required perimeter planting shall be equal to one shrub every 36 inches or fraction thereof.

e. Requirements for Parking Lot Landscape Islands shall be as follows:

(1) One canopy tree per 90 square feet of island.

(2) Six shrubs per 90 square feet of island.

ORDINANCE BOOK 10 PG 105**12. Building Height: Within the Heart of Navarre District, there shall be three height districts:**

a. North of Laredo/Fortworth, the existing height limits of 50 feet for commercial and multi-family and 35 feet for residential shall remain.

b. South of Laredo/Fortworth the building height limit shall be 75 feet for commercial and multi-family, except within the Town Center District and the area designated in Section 12.c. below.

c. South of US98 between the eastern boundary of Parcel Number 21-2S-26-0780-00A04-0000 and the eastern boundary of Parcel Numbers 20-2S-26-0000-02100-0000; 20-2S-26-0000-02102-0000; and 20-2S-26-0292-00000-0130(as shown in Exhibit "B") the building height limit shall be 100' for commercial and multi-family buildings, provided all of the following compatibility standards are met. No density increases within the boundaries of this height district shall be allowed.

(1) When a proposed structure height is 100 feet, a side yard setback of 50 feet shall be required.

(2) When the height of a proposed structure is less than or equal to 50 feet, the minimum side yard setbacks required by the underlying zoning district, not to exceed 30 feet, will apply.

(3) When the height of a proposed structure is greater than 50 feet but less than 100 feet, the side yard setback shall be equal to 50% of the overall height of the building.

When a proposed structure is greater than 50' and located adjacent to a residential zoning district, a minimum side setback of 30' shall be required.

(4) To ensure that viewsheds are protected, the side yard setback of the principle structure must be maintained from the front property line to the rear of the property.

For master planned projects consisting of two or more primary structures, the side setback from the property line will be determined based upon the height of the primary structure closest to that property line. Parking garages and other accessory structures will not be considered primary structures for the purposes of determining side yard setbacks.

Surface parking, swimming pools and similar uses may encroach into the side yard setbacks (but not into any required buffer zone); however, such uses may not include view-obstructing components such as solid walls or fences.

(5) For master planned projects consisting of two or more buildings, the distance between two buildings shall be equal to 50% of the overall height of the taller of the two buildings.

(6) To encourage architectural interest and reduction of the physical bulk of proposed structures with varied height, minimum side yard setback and building separation requirements may be reduced 10' for each 25' reduction in building height. Minimum building width of each reduction must be 25'.

ORDINANCE BOOK 10 PG 106

13. Architectural styles approved for the Town Center District shall also be approved for the Heart of Navarre District. Queen Anne and Masonry vernacular shall also be permitted in the Heart of Navarre District. No other architectural styles shall be permitted. Renderings of these styles are available from the Planning and Zoning Office.

a. Georgian –Center entrance with pilasters and pediment; vertical windows with multiple mullions (6 over 6); louvered shutters; hipped or side gable roofs of medium pitch, classical ornamentation including garlands, swags, dentils and bracketed cornices; typically constructed of brick, stucco or wood siding.

b. Queen Anne (also known as Victorian)- more formal, Victorian-style structure, steeply pitched, multi-gabled roof, front facing gable, wrap-around porch, paired Doric columns, turned wood balustrades, differing wall textures, towers are typical but not imperative.

14. Lighting

a. All site plans for commercial or mutli-family developments shall require a review of all exterior lighting, including landscape lighting.

b. Light Trespass- The maximum illumination at five feet inside an adjoining residential parcel or public right of way or beyond from an artificial light source is 0.5 footcandles.

c. Parking Lot Lighting:

(1) All lighting in parking lots shall be direct lighting (downlighting). Gas lamps are excepted.

(2) All light fixtures shall be full cut off fixtures where the element is recessed in the fixture with a flat lens. Gas lamps are excepted.

(3) Mounting heights of lighting fixtures shall not exceed 25 feet.

(4) Lighting of outdoor display areas shall be subject to these same regulations.

d. Building Lighting:

(1) All lighting attached to a structure shall be direct lighting. Gas lamps are excepted.

(2) All wall pack fixtures shall be full cut off fixtures where the element is recessed in the fixture with a horizontal flat lens.

e. Lighting of Walkways/Bikeways and Parks: When special lighting is to be provided for walkways, bikeways or parks, the following requirements shall apply.

(1) The walkway, pathway or ground area shall be illuminated to a level of no more than 0.5 footcandles.

(2) The vertical illumination levels at a height of five (5) feet above grade shall be no more than 0.5 footcandles.

(3) Lighting fixtures shall be designed to direct light downward.

g. Lighting of Gasoline Station/Convenience Store Aprons and Canopies:

ORDINANCE BOOK 10 PG 107

(1) Areas on the apron away from the gasoline pump islands used for parking or vehicle storage shall be illuminated in accordance with the requirements for parking areas set forth in this section. If no gasoline pumps are provided, the entire apron shall be treated as a parking area.

(2) Light fixtures mounted on canopies shall be recessed so that the lens cover is recessed or flush with the bottom surface of the canopy and/or shielded by the fixture or the edge of the canopy.

(3) Lights shall not be mounted on the top of sides of the canopy, and the sides of the canopy shall not be illuminated.

h. Wherever practicable, lighting installations shall include timers, dimmers and/or sensors to reduce overall energy consumption and eliminate unneeded lighting.

15. Signage

a. Sign construction shall be compatible with the Architectural Style in terms of both construction materials and design.

b. No signs shall be internally illuminated, but backlighting of letters should be allowed.

c. No signage lighting should be neon or flashing.

d. Landscaping shall be required around the base of the sign.

e. Signs shall be limited to 20 feet in height.

f. The exposed posts of a sign must be architecturally appropriate to the design of the overall sign and will not be more than half the height of the sign.

g. Addresses shall be required on signs.

h. No new billboards shall be permitted in the Heart of Navarre.

D. Any new development or redevelopment of existing sites within the Heart of Navarre shall be presented to the Navarre Architectural Review Board for review and approval prior to the issuance of any County Development Orders or Building Permits. The Architectural Review Board shall ensure adherence to the architectural and site design standards of this section.

E. Viewshed Protection

In recognition of the importance of the water, Santa Rosa Sound, East Bay and East Bay River, to the identity of Navarre, viewsheds allowing views from public rights of way, and access where feasible, shall be protected.

1. In order to encourage uses along the waterfront that take advantage of the water view and provide residents with an opportunity to enjoy that view, the following uses shall be encouraged by a 25% reduction in site plan review fees:

a. Restaurants designed with a water view.

b. Recreational businesses including, but not limited to kayak, sailboat or personal

ORDINANCE BOOK 10 PG 108

watercraft rentals, eco-tourism businesses, bicycle rentals and SCUBA diving shops. The buildings housing these uses must be designed so that the water can be viewed from inside the structure.

c. Marinas

d. Any commercial or multi-family project that provides public access to the water on its site. This is especially encouraged contiguous to the Navarre Naturewalk/ Boardwalk.

Structures with doors opening to the water side and with amenities on the water side shall be given special consideration. If the project is mixed use, only the site plan review fees for the qualifying use shall be reduced.

Qualifying projects requiring a rezoning or conditional use to be permitted on site shall have all BOA and LPB fees waived.

2. Design shall allow view of or access to water from public property or rights of way.

3. The minimum width of the viewshed shall be 20% of the lot width, including the setbacks. This means that the viewshed will be allowed to be contiguous with the setbacks. The minimum width of any viewshed shall not be less than 15 feet, regardless of the lot width.

4. Shrubbery within the required viewshed shall be trimmed to heights no greater than three (3) feet and trees shall be trimmed to heights no less than eight (8) feet.

F. Land Preservation Required

In recognition of the Navarre community's desire to protect open space, Land Preservation shall be required if an applicant is granted a rezoning resulting in higher density by the Santa Rosa County Board of Commissioners. This is an additional requirement if the Board of County Commissioners approve a rezoning to a higher density. All rezoning requests should be considered based on their impact to the community regardless of the possibility of land preservation as a result.

The following options are provided to developers who receive rezonings to higher densities in the Heart of Navarre Area.

1. Option 1: Set aside 15% of the developable acreage on site as usable open space. Required building setbacks, parking, landscaping, and stormwater may not count toward this open space.

2. Option 2: Set aside the same amount of land elsewhere in the Navarre Area

3. Option 3: Pay a fee into a fund for property acquisition within the Heart of Navarre Overlay District equal to 5% of the appraised value of the property to be rezoned.

G. Density and Use Transfer

1. To encourage mixed use development within the Heart of Navarre Overlay District multiple parcels with mixed zoning designations may be designed as one project with permitted uses transferable among the included parcels subject to the following:

(a) Mixed use projects must be designed and approved as one site plan consistent with Section 4.04.00 of this code;

ORDINANCE BOOK 10 PG 109

(b) The permitted and conditional uses of the combined parcels shall be limited to those allowed by the underlying zoning and reflect the acreage covered by each district;

(c) The residential density and commercial intensity of mixed use projects is limited to the density and intensity that would be allowed if the parcels were developed separately;

(d) The overall project shall be designed to ensure that uses on the perimeter of a project abutting a residential zone are not more intensive than the uses currently allowed by the underlying zoning district.

(d) Joint access shall be required with access points onto US98 and SR87 limited to the minimum number necessary to allow reasonable access; and

(f) All performance standards of this code shall be met.

2. To encourage additional views of Santa Rosa Sound, development south of US98 within the area designated for 100' maximum building height may transfer residential density from one parcel to another parcel, subject to the following:

(a) Both the sending and receiving parcels must be located south of US98 within the area designated for 100' maximum building height;

(b) The sending parcel must remain undeveloped except for minor improvements necessary to support public enjoyment of the waterfront; and

(c) All other requirements of this code must be met.

EXHIBIT "A"

HEART OF NAVARRE OVERLAY DISTRICT MAP

EXHIBIT "B"

100' MAXIMUM HEIGHT LIMIT AREA MAP

ARTICLE TWELVE

12.14.00 MARINE TURTLE PROTECTION LIGHTING

12.14.01 Purpose: The Santa Rosa County Board of County Commissioners finds that Navarre Beach serves as a nesting habitat for endangered and threatened sea turtles. Improper lighting along the shoreline can negatively impact sea turtle nesting activity and cause disorientation of turtle hatchlings. The purpose of the Marine Turtle Protection Lighting Ordinance is to protect the threatened and endangered sea turtles that nest along Navarre Beach by safeguarding nesting turtles and emerging hatchlings from sources of artificial light along the shoreline. This ordinance is intended to reduce and where possible eliminate the impact of nearshore lighting on nesting turtles from existing structures and facilities and future development along Navarre Beach during the turtle nesting season, which extends from May 1 to October 31 each year.

For purposes of this section, "shoreline zone" shall include all areas seaward of Gulf Drive extending from the Gulf Shores National Seashore boundary eastward to include Navarre Beach State Park. Lighting located within the shoreline shall comply with all provisions of this section.

In implementing this section, the county will adhere to state and federal guidelines for the protection of sea turtles.

ORDINANCE BOOK 10 PG 112

12.14.02 General Requirement: All outdoor lighting shall be installed in such a manner and be shielded so that the light will not be visible from the any portion of the beach where sea turtles are likely to nest. In general, artificial light shall be installed or modified such that the light will fall, substantially, within the perimeter of the property through the use of shielding, limiting light intensity or wattage, or selection of lighting designs or locations that are not visible from the beach. Lighting shall be reduced to the greatest extent possible without unduly jeopardizing public safety or security of property or persons.

12.14.03 New Development: For new development within the shoreline zone, construction and building and electrical plans for construction of single-family or multifamily dwellings, commercial or other structures including electrical plans associated with parking lots, dune walkovers or other outdoor lighting for real property including any light sources or any reflective surfaces illuminated by such sources that will be visible from the beach, such lighting shall be in compliance with the following:

a. Outdoor lighting shall be held to the minimum necessary for security and safety. Floodlights and landscape or accent lighting shall be prohibited.

b. All lighting including wall-mounted fixtures, pole lighting, lights on balconies, and any other type of lighting not specifically referenced by this section, shall be of low intensity and shall be fitted with hoods or positioned so that the light sources or any reflective surfaces illuminated by such sources are not visible from the beach.

c. Low profile luminaries shall be used in parking lots and such lighting shall be fitted with hoods or positioned so that the light sources or any reflective surfaces illuminated by such sources are not visible from the beach.

d. Dune crosswalks shall utilize low profile shielded luminaries directed and positioned so that light sources or any reflective surfaces illuminated by such sources are not visible from the beach. Dune crossover lighting shall be limited to the area landward of the primary dune. Compliance with this provision is assured if mushroom-type light fixtures, which direct the light downward are used and installed (a) at least twenty-five (25) feet apart and not more than one (1) foot above the surface of the walkover; and (b) limited to twenty-five-watt yellow bulb.

e. If high intensity lighting is necessary, low pressure sodium vapor luminaries shall be used and fitted with a hood or positioned so that the light sources or any reflective surfaces illuminated by such sources shall not be visible from the beach.

f. Plates of tinted glass are required for windows that are visible from the beach. The tinted glass shall be any window or glazing that has an industry-approved light transmittance value of 45 percent or less. Such transmittance shall be limited to the visible spectrum (400 to 700 nanometers) and shall be measured as the percentage of light that is transmitted through the glass, inside to outside.

g. Temporary security lights at construction sites shall not be mounted more than 15 feet above the ground. Light sources or any reflective surfaces illuminated by such sources shall not be visible from the beach.

12.14.04 Existing Development: For existing development, within six months of the effective date of this section, existing structures with any light sources or reflective surfaces illuminated by such sources that are visible from the beach, shall be in compliance with the following:

a. All lights shall be turned off after 9:00 p.m. between May 1 and October 31, of each year, or fitted with a hood or positioned so that the light sources or any reflective surfaces illuminated by such sources are not visible from the beach.

b. Lights illuminating dune crosswalks shall be turned off after 9:00 p.m. between May 1 and October 31, of each year, and must be modified to conform to the

requirements for new development in accordance with section 12.14.03(d), of this section.

c. Existing security and emergency exit lighting shall meet the same requirements stated in this section, unless modification of the emergency lighting is demonstrated by the property owner to create an unreasonable risk to public safety, persons or property. If high intensity lighting is necessary, low pressure sodium vapor luminaries shall be used and fitted with a hood or positioned so that the light sources or any reflective surfaces illuminated by such sources are not visible from the beach.

d. Where interior lights currently illuminate or are visible on the beach, at least one of the following measures shall be taken to reduce or eliminate the negative effects of interior light emanating from doors or windows within line of sight of the beach.:

1. In windows facing and/or visible from the beach, tinted window treatments are required so that indoor lights do not illuminate or are not visible from the beach. The tinted glass shall be any window or glazing that has an industry-approved light transmittance value of 45 percent or less. Such transmittance shall be limited to the visible spectrum (400 to 700 nanometers) and shall be measured as the percentage of light that is transmitted through the glass, inside to outside.

2. Rearrange lamps and other movable fixtures away from windows.

3. Use window treatments, including but not limited to blinds and curtains, to shield interior lights from the beach.

4. Turn off unnecessary lights after 9:00 p.m. between May 1 and October 31.

12.14.05 Publicly-Owned Lighting: All publicly owned lighting that is visible from the beach or that illuminates reflective surfaces that are visible from the beach, shall be turned off after 9:00 p.m. between May 1 and October 31, of each year, or shall be fitted with a hood or positioned so that the light sources or any reflective surfaces illuminated by such sources are not visible from the beach. For public parking areas, low intensity lighting shall be used in parking areas within line-of-sight of the shoreline. Parking area lighting and any roadway lighting shall be shielded from the shoreline through the use of ground-level barriers or fitted with a hood or positioned so that the light sources or any reflective surfaces illuminated by such sources are not visible from the beach. Ground-level barriers shall not interfere with marine turtle nesting or hatchling emergence.

12.14.06 Penalties: Violation of the provisions of this section or failure to comply with any of its requirements shall constitute violation of the Santa Rosa County Land Development Code and is subject to fines and enforcement in accordance with Santa enforcement procedures contained therein.

12.14.07 Variance: After written notification to and consultation with appropriate state and federal agencies, the County may grant a variance from any of the provisions or requirements of this section if affirmative findings, supported by the record and reviewed and approved by the appropriate state and Federal agencies, can be made that:

- (1) The minimum lighting adequate for the intended purpose is used;
- (2) There are special circumstances relating to the property or use that specifically and directly prevent compliance with the provisions in this section and the property owner has demonstrated to the satisfaction of the County and the appropriate state and Federal agencies that there are no viable alternatives to the variance; and
- (3) Granting of the request would not negatively impact any adjoining property, or sea turtle nesting or hatchling success or any threatened or endangered species.

ORDINANCE BOOK 10 PG 112

SECTION 3. CODIFICATION. The provisions of this ordinance shall become and be made a part of the code of laws and ordinances of the County of Santa Rosa. The sections of this ordinance may be renumbered or relettered to accomplish such, and the word "ordinance" may be changed to "section", "article", or any other appropriate word.

SECTION 4. EFFECTIVE DATE. This Ordinance shall take effect upon filing of a certified copy of this Ordinance with the Department of State within ten (10) days after enactment.

PASSED AND ADOPTED by a vote of 5 yeas and 0 nays and 0 absent of the Board of County Commissioners of Santa Rosa County, Florida, on the 6th day of June, 2005.

**BOARD OF COUNTY COMMISSIONERS
SANTA ROSA COUNTY, FLORIDA**

By: [Signature]
Chairman

ATTEST:

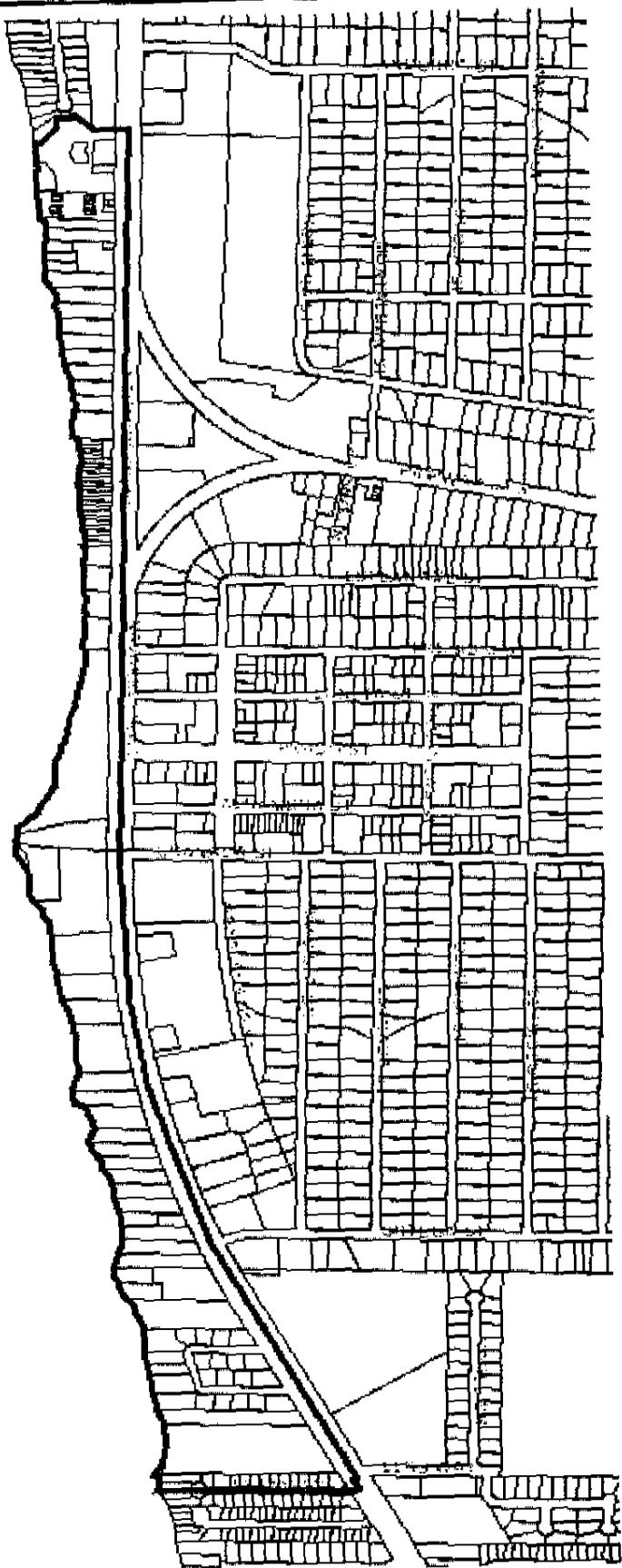
[Signature]
Clerk of Court

I, Mary Johnson, Clerk of Court of Santa Rosa County, Florida, do hereby certify that the same was adopted and filed of record and a copy deposited in the Postal Department of the United States of America, for delivery by registered mail to the Secretary of the State of Florida, on this 17th day of June, 2005.

[Signature]
Clerk of Court

ORDINANCE BOOK 10 PG 114

100' Maximum Height Limit Map



Legend

Parcel Lines

Height Limitations

100' Commercial & Multi-Family/35' Residential

Revised 6-8-05

UNIVERSITY DRIVE

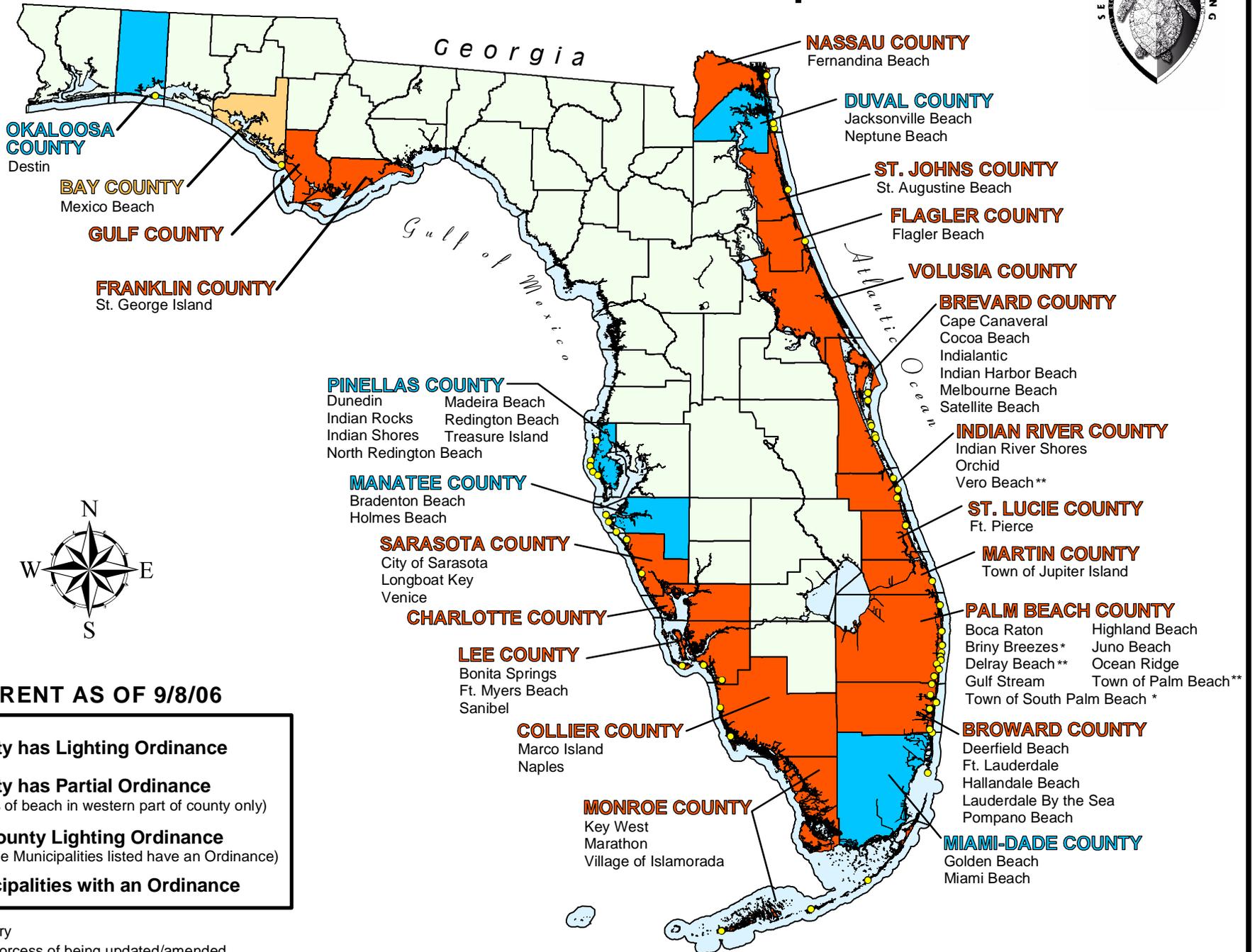
Disclaimer:
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1 inch equals 1,000 feet



Map Prepared by:
 Community Planning, Zoning
 & Development Division
 June 8, 2005

Sea Turtle Lighting Ordinances for Florida Counties and Municipalities



CURRENT AS OF 9/8/06

- County has Lighting Ordinance
- County has Partial Ordinance
(5 miles of beach in western part of county only)
- NO County Lighting Ordinance
(Only the Municipalities listed have an Ordinance)
- Municipalities with an Ordinance

* Voluntary
** In the process of being updated/amended



Florida Fish and Wildlife Conservation Commission

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SEA TURTLE PROTECTION ORDINANCES ADOPTED BY COUNTIES AND MUNICIPALITIES (as of 12/5/06)

COUNTY/ MUNICIPALITY	DATE ADOPTED/ UPDATED	ORDINANCE # / LOCATION IN CODE	CODE ENFORCEMENT/ CONTACT
BAY	2004	Ord 02-07	John Wray (850) 784-4038
Mexico Beach	2001	Ord 339	John Grantland (850) 648-5700
BREVARD	1985/1990/1993	Chapter 46, Article III	Paula Bernston (321) 633-2016
Cape Canaveral	1990	Chapter 14, Article III	Duree Alexander (321) 868-1222
Cocoa Beach	1986	LDC, Chapter IV, Article XI	Robin Reiland (321) 868-3217
Indialantic	1986	Chapter 5, Division 3	Ron Cassidy (321) 984-5224
Indian Harbor Beach	1987	Ord 87-8	Jackie Burns (321) 773-3181
Melbourne Beach	1986	Ord 86-5	James Bursick (321) 724-5860
Satellite Beach	1990/1993	Chapter 66, Article II, Division 3 / Chapter 30, Article V, Division 8, Sec 30-546	Robert Allgood (321) 773-4409
BROWARD	1989	Chapter 39, Article IX, Sec 39-107	Susan Pierce (954) 468-3551
Deerfield Beach	2000	Chapter 34, Article V, Sec 34-96	Jenny Walsh (954) 480-4241
Ft. Lauderdale	2003	Chapter 6, Article II	Al Lovingshimer (954) 828-5118
Hallandale Beach	2001	Ch. 6, Art. I	Corinne Yoder (954) 457-1394
Lauderdale By The Sea	2002		Bill Mason (954) 776-0576
Pompano Beach	1999	Ords 99-18, 2000-64	Richard Kirby (954) 786-4361
CHARLOTTE	1989/1998	Chapter 3-5, Article XII	Missy Christie (941) 743-1919
COLLIER	1988/1992	LDC, Chapter 3, 3.04.02, Part B	Maura Kraus (239) 732-2505
Marco Island	1998	Ord 99-7	Nancy Richie (239) 389-5000
Naples	1982/1995	Chapter 52, Article IV, Sec 52-61	Maura Kraus (239) 732-2505

DADE	No ordinance		
Golden Beach	1997	Chapter 58, Article III	Dan Kissinger (305)932-0744 ext.15
Miami Beach	2006		TBA
DUVAL	No ordinance		
Jacksonville Beach	2000	Chapter 6, Article I, Sec 6-8	Debbie White (904)247-6232
Neptune Beach	1999	Chapter 8, Division III	Dan Arlington (904) 270-2430, SunCom: 852-2400
ESCAMBIA	No ordinance		
FLAGLER	2001	Appendix C, Article VI, 6.05.55	Walter Fufidio (386) 437-7487
Flagler Beach	1987/2000	Appendix A, Article IV, Sec 4.04.00	Elaine Cowart (386) 517-2005
FRANKLIN	1998	Ord 98-11	(850) 653-9783
St. George Island			Lauren Wright (850)670-4783ext.114
GULF	2001	Ord 2001-09	Anthony Varona (850)229-8944
HILLSBOROUGH	No ordinance		
INDIAN RIVER	1987/1994	Title IX, Chapter 932, Section 932.09	Roland DeBlois (772)567-8000 ext.258
Indian River Shores	1986/2000	Ord 460	Robert Bradshaw (772) 231-1771
Orchid	1993	Chapter 58, Sec 58-8 / Chapter 78, Sec 78-12 part (e)	Maria T. Aguilar (772) 569-7686
Vero Beach	1990 / 1993	Chapter 46, Article IV, Division 2	Susan Clifton and David Checchi (772) 978-4561
LEE	1989/1998	LDC, Chapter 14, Article II, Division 2	Carol Lis (239) 479-8353, SunCom: 726-8353
Bonita Springs	2001	Ord 01-06	Audrey Vance (239) 390-1000
Ft. Myers Beach	1989/1998	Ord 98-3	Pam Houck (239) 765-0202
Sanibel	1997/2000	Chapter 126, Article XIV, Division 4	James Evans (239) 472-3700 ext. 377
MANATEE	No Ordinance		
Anna Maria Island	2003	Chapter 14, Article II	Gerry Rathvon (941) 708-6130
Bradenton Beach	1998/2005	Chapter 10, Article II	Gail Garneau (941) 778-1005
Holmes Beach	1987	Part II, Chapter 66, Article II, Division 2	Nancy Hall (941)708-5800 ext. 2
MARTIN	1988	LDC, Article 4, Division 4, Sec 4.111	Riley Jackson or Ross Wilcox (772) 288-5105

		SEC. 4.111	(772) 200-5493
Town of Jupiter Island	1992	Ord 208	Joe Connolly (772) 546-0100
MONROE	1994/1998	Chapter 13, Article IV	Julie Malko (305) 289-2537
Key West	1995	Chapter 10, Article VI	Cassandra Butler (305) 292-8128
Marathon	1994/1998	Ord 31198	Susie Thomas/Lindy Dyer (305)743-0033
Village of Islamorada	1998/2002	Chapter 30, Article VII, Division 3	Sonia Tavano (305) 664-2345
NASSAU	1988	Chapter 7, Article XII	Capt. Johnson, Sheriff's Department (904) 321-5750
Fernandina Beach	1987/1995	Chapter 126, Article V, Sec 146-422	Fred Lindies (904) 277-7325
OKALOOSA	No ordinance		
Destin	2004	LDC, Article 7, 7.17.00 through 7.17.02	TBA
PALM BEACH	1987/1996/1999	LDC, Article 14, Chapter A	Jacey Biery (561) 233-2461
Boca Raton	1986/1996/2002	Chapter 23, Article IV, Division 7	Dawn Sinka (561) 393-7786
Briny Breezes**	1988	Ord 2-87	Rita Taylor (561) 276-7405
Delray Beach	1987/2001	Title 9, Chapter 91, Sea Turtles	Richard Bauer (561) 243-7219
Gulf Stream**	1987	Division 2	Rita Taylor (561) 276-5116
Highland Beach	1987/1999	Chapter 4, Sec 4-8	Bob Dawson (561) 278-4548
Juno Beach	1998	5.125	Lynn Hamil (561) 627-0818
Ocean Ridge	1987/1993	Chapter 66, Article I, Sec 66-2	Ken Schenck (561) 732-2635
Town of Palm Beach	1987/1995	Chapter 74, Article II, Division 4	Rob Walton (561) 227-6423
Town of South Palm Beach	1988/1999/2004	Chapter 26, Article X, Division 3	(561) 588-8889
PINELLAS	No Ordinance		
Dunedin	1991	Chapter 134, Article IX, Division 4	Debra King (727) 298-3194
Indian Rocks	1991/1999	Chapter 86, Article III, Division 2	John Ouimette (727) 517-0404
Indian Shores	1994	Chapter 14, Article III	Police Department (727) 595-5414
Madeira Beach	1990/1992/2000	Chapter 110, Article VI, Division 5	Marty Chambers: (727) 391-9951
North Redington Beach	1990/2000	Chapter 18, Article VIII	Sharon Proehl (727) 391-4848
Redington Beach	1987/2001	Chapter 4, Sec 4-9	Mark Davis (727) 709-2097
Treasure Island	1999	Chapter 72, Article V	Carol Kits (727) 547-4575 ext.

			239
ST. JOHNS	1996/1999	Ord 99-33	Billy Zeits (904) 209-0333 or (904) 814-1299
St. Augustine Beach	1995/1996	Chapter 5, Article I, Sec 5-15	(904) 471-3600
ST. LUCIE	1986/1991/1997	Chapter VI, Sec 6.04.02	Amy Mott (772) 462-2526
Ft. Pierce	1990/1993	Chapter 4, Article IV	Pauline Stewart (772) 460-2200 ext.269
SANTA ROSA	2005	Appendix C, Article 12, 12.14.00	TBA
SARASOTA	1997/1999/ 2000/2004	Chapter 54, Article XXIII	Kenya Leonard (941) 378-6142
City of Sarasota	1999	Zoning Code, Article VII, Division 14, Sec VII-1402	Kenya Leonard (941) 861-6240
Longboat Key	1987/1992/1993	Ord 87-16	Tony Sapuppo (941) 316-1966
Venice	1988/1995	Ord 95-07	John Patek (941) 486-2626 ext. 2064
VOLUSIA	1986/1989/ 1990/1999	Chapter 50, Article III, Division 6: Sea Turtles / Appendix A, Article XII	Steve Kintner (386) 736-5927 ext. 5851 / SunCom: 377-5851 or Michelle Leigh (386) 736-5927 SunCom: 377-5927
New Smyrna Beach	1999	Ord 52-99	
WALTON	No ordinance		

LDC = Land Development Code

** Indicates that compliance is voluntary

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INTERNATIONAL DARK-SKY ASSOCIATION

3545 N. Stewart, Tucson AZ 85716 U.S.A.

Recommendations about Effective Outdoor Lighting

In order to carry out astronomical and other space related research, a dark nighttime sky is essential. Contributions of light from the earth, both direct emissions and reflected light, tend to brighten the night sky background. The same brightening ruins the view of the heavens for amateur astronomers and the general public. Many people have never seen the Milky Way, much less other interesting objects.

The type of light emission is also important because some types may be filtered at the telescope more efficiently than others, low pressure sodium being the most preferred source. The following gives suggested uses, by light source type:

Low Pressure Sodium (LPS)

- Roadways, Walkways, and Parking Areas
- Outdoor areas needing security lighting
- Residential security lighting
- Any area where color rendering is not critical

High Pressure Sodium (HPS)

- Sport parks, and Tennis Courts
- Security areas where color rendering is critical

Metal Halide (MH)

- Display lighting where color rendering is critical
- Some sports lighting, where color rendering is critical

Mercury Vapor (MV, or HG)

- Not an energy efficient source, not recommended. Use MH instead.
- Older installations, where shielding is good, can remain in use, of course.

Incandescent, including Quartz

- Not energy efficient, but OK for low wattage applications.
- Low wattage lamps for porch lights, and other low wattage usages. Should be well shielded.

In general: All outdoor fixtures should be fully shielded and installed in such a way that no light is emitted above a horizontal plane running through the lowest part of the fixture. Thus glare, light trespass, and light pollution will be minimized, and energy savings will be maximized. Low pressure sodium should be used wherever possible (where color rendering is not critical). Use time controls or motion sensors to turn lamps off when not needed. (Relative to use as security lighting: LPS has the ability to restrike immediately after a momentary power failure, while HPS must cool before restriking.)

Definitions and Discussion Points:

1. We use 4100 hours as typical of the operating time of a street light or any other fixture controlled by a photosensor to come on at dusk and go off at dawn. $4100 / 365 = 11.23$ hours per night. A sampling of several cities indicates that 4100 hours is typical of the hours that their street lighting system is operating.
2. The U.S.A. national average for electrical utility rates is close to 8 cents per kilowatt-hour. One can and should use a rate that is representative of local utility rates. The range is from a low of about 4 cents (wouldn't that be nice in your own area?!) to a high of 18 cents or more. Any spreadsheet program makes such comparisons easy. One should also allow for future rate changes, which seem to be mostly always upward.
3. Kilowatt-hour is a measure of the amount of energy used. Kilowatts measure energy. A kilowatt is 1000 watts, of course. A KWH is one kilowatt used for one hour.
4. Initial lumens is a measure of how much light the lamp is emitting near the beginning of its life. Most light sources (except LPS) decline in light output with time. The LPS and HPS both have a lifetime of about four years, while the mercury almost never "burns out"; it just keeps getting fainter and fainter. You can estimate the relative effects by looking at the row titled "mean lumens." These are at approximately a two year period after being put into use.
5. Mean lumens is a measure of how much light the lamp is putting out after about two years of usage. We assume a four year lifetime for LPS and HPS and Mercury, either due to burnout of the lamps or to group replacement. Many communities replace lamps as a group, so as to minimize any outages due to lamp burnout. The cost of a lamp is much less than the cost of an accident or a law suit due to a lamp having burned out. The issue of half life and replacement strategy is complicated, and few agree on all aspects.
6. Circuit wattage takes into account the other energy uses besides just that of the lamp. The major other such use is by the ballast, a unit needed to start and operate the lamp under conditions that it is designed for. There are many different kinds of ballasts, and what is good for one lamp is usually not good for another. LPS should be used with a ballast designed for efficient LPS use, for example. The ratio of lamp wattage to circuit wattage is not a constant, even for one type lamp. See the table for examples.
7. All these entries have been taken from either lamp manufacturers catalogs or actual operating experience in different communities. The figures given in the table are sort of an average of all that, and as such should be typical of what holds in any specific location.
8. Lumens/watt is a measure of operating efficiency: total amount of light from the lamp per energy used.
9. Annual KWH use is also a measure of operating efficiency, as it tells how much energy is used per year. Naturally, don't use more light than one needs (more light is not always better!) as that uses more energy.
10. Typical wattages for major highways or streets would be 180 or 135 watt LPS, or 400 or 250 watt HPS, or 1000 or 400 watt Mercury. Typical values for residential streets might be 90 or 55 watt LPS, or 200 or 150 watt HPS, or 250 or 175 watt mercury. Typical home security lighting might be 35 or 18 watt LPS, 70 or 50 watt HPS; please don't use mercury. Please always use full cut off fixtures for all applications!
11. Annual operating cost is another measure of operating efficiency, of course. It tells how much one must pay for energy costs in order to operate one given fixture for one year. In some cases, the cost of the fixture is much less than the annual operating cost! Payoff periods to replace such fixtures with energy efficient fixtures can be very short.
12. Of course, there are other costs for any given installation. Maintenance, lamp replacement, replacements due to accidents and breakages, depreciation, whatever. Generally these are a "wash" as all systems have similar costs.
13. As stated in the "Note," the columns in italics and bold face give values for lamps with similar light output, and hence make good comparisons to efficiency of different type lamps. For example, the 55 watt LPS, the 100 watt HPS, and the 175 watt mercury give similar mean lumen outputs. Such comparisons can offer guidance to what savings might be obtained with more efficient fixtures.
14. There are other overall considerations as well. For example, not all fixtures are equally efficient at getting the light produced by the lamp out of the fixture and onto the area needing light. One should always use efficient fixtures as well as efficient lamps. Many old fixtures are not efficient, as they were "designed" in a time when energy was cheap and efficiency was low on the priority list. For example, "globes" throw more than half their light output upwards. Today, there is no excuse to use any such inefficient fixtures. Please help stamp them out. Use efficient full cut off fixtures for all applications. Install as recommended, of course, to insure that the light output is used, not wasted nor producing glare.

INTERNATIONAL DARK-SKY ASSOCIATION

3545 N. Stewart, Tucson AZ 85716 U.S.A.

OPERATING DATA AND THE ECONOMICS OF DIFFERENT LAMPS:

Assume the following, as realistic input information:
 4100 hours of use per year (average nighttime hours, dusk-to-dawn).
 0.08 as the current cost per KWH (Kilowatt-hour, the power rate).
 The circuit wattage includes the ballast losses.
 Lumens/Watt or the Annual Operating Cost measure the efficiency of the source.

*** LOW PRESSURE SODIUM ***

	<u>180W</u>	<u>135W</u>	<u>90W</u>	<u>55W</u>	<u>35W</u>	<u>18W</u>
Initial Lumens	33000	22500	13500	8000	4800	1800
Mean Lumens	33000	22500	13500	8000	4800	1800
Lamp Wattage	180	135	90	55	35	18
Circuit Wattage	220	180	125	80	60	30
Initial Lum/Watt	150	125	108	100	80	60
Mean Lum/Watt	150	125	108	100	80	60
Annual KWH Use	902	738	513	328	246	123
Annual Oper Cost	\$72.16	59.04	41.00	26.24	19.68	9.84

*** HIGH PRESSURE SODIUM ***

	<u>400W</u>	<u>250W</u>	<u>200W</u>	<u>150W</u>	<u>100W</u>	<u>50W</u>
Initial Lumens	50000	27500	22000	16000	9500	3900
Mean Lumens	45000	24750	19800	14400	8550	3500
Lamp Wattage	400	250	200	150	100	50
Circuit Wattage	465	294	246	193	130	66
Initial Lum/Watt	108	94	89	83	73	59
Mean Lum/Watt	97	84	80	75	66	53
Annual KWH Use	1907	1205	1009	791	533	271
Annual Oper Cost	\$152.52	96.43	80.69	63.30	42.64	21.65

*** MERCURY VAPOR ***

* INCAND *

	<u>400W</u>	<u>250W</u>	<u>175W</u>	<u>100W</u>	<u>150W</u>
Initial Lumens	21500	11500	8150	4000	2880
Mean Lumens	17200	9400	7000	3160	2600
Lamp Wattage	400	250	175	100	150
Circuit Wattage	455	295	208	120	150
Initial Lum/Watt	47	39	39	33	19
Mean Lum/Watt	38	32	34	26	17
Annual KWH Use	1866	1210	853	492	615
Annual Oper Cost	\$149.28	96.76	68.22	39.36	\$49.20

[Note: The columns in italics and in bold show the relative values for lamps of approximately the same light output, showing the potential savings resulting from using more efficient light sources.]

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62B-55.001 Purpose and Intent.

The purpose of this rule is to implement Section 161.163, Florida Statutes, which requires the department to designate coastal areas utilized, or likely to be utilized, by sea turtles for nesting, and to establish guidelines for local government regulations that control beachfront lighting to protect hatching sea turtles. This rule is intended to guide local governments in developing ordinances which will protect hatchling marine turtles from the adverse effects of artificial lighting, provide overall improvement in nesting habitat degraded by light pollution, and increase successful nesting activity and production of hatchlings.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.001.

62B-55.002 Definitions.

(1) "Artificial light" or "artificial lighting" means the light emanating from any human-made device.

(2) "Beach" means the zone of unconsolidated material that extends landward from the mean-low water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation, usually the effective limit of storm waves.

(3) "Bug" type bulb means any yellow colored light bulb that is marketed as being specifically treated in such a way so as to reduce the attraction of bugs to the light.

(4) "Coastal construction activities" means any work or activity that is likely to have a material physical effect on existing coastal conditions or natural shore and inlet processes.

(5) "County" means Bay, Brevard, Broward, Charlotte, Citrus, Collier, Dade, Dixie, Duval, Escambia, Flagler, Franklin, Gulf, Hernando, Indian River, Jefferson, Lee, Levy, Manatee, Martin, Monroe, Nassau, Okaloosa, Palm Beach, Pasco, Pinellas, St. Johns, St. Lucie, Santa Rosa, Sarasota, Suwanee, Taylor, Volusia, Wakulla, and Walton Counties.

(6) "Cumulatively illuminated" means illuminated by numerous artificial light sources that as a group illuminate any portion of the beach.

(7) "Department" means the Florida Department of Environmental Protection.

(8) "Directly illuminated" means illuminated as a result of glowing element(s), lamp(s), globe(s), or reflector(s) of an artificial light source which is visible to an observer on the beach.

(9) "Dune" means a mound or ridge of loose sediments, usually sand-sized, lying landward of the beach and deposited by any natural or artificial mechanism.

CHAPTER 62B-55
MODEL LIGHTING ORDINANCE FOR MARINE TURTLE PROTECTION
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(10) "Frontal dune" means the first natural or man-made mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value.

(11) "Ground-level barrier" means any vegetation, natural feature or artificial structure rising from the ground which prevents beachfront lighting from shining directly onto the beach-dune system.

(12) "Hatchling" means any species of marine turtle, within or outside of a nest, that has recently hatched from an egg.

(13) "Indirectly illuminated" means illuminated as a result of the glowing element(s), lamp(s), globe(s), or reflector(s) of an artificial light source which is not visible to an observer on the beach.

(14) "Local government" means any county listed in (4) above and any municipality, community development district, or special taxing district within those counties.

(15) "Marine turtle" means any marine-dwelling reptile of the families Cheloniidae or Dermochelyidae found in Florida waters or using the beach as nesting habitat, including the species: *Caretta caretta* (loggerhead), *Chelonia mydas* (green), *Dermochelys coriacea* (leatherback), *Eretmochelys imbricata* (hawksbill), and *Lepidochelys kemp* (Kemp's ridley). For purposes of this rule, marine turtle is synonymous with sea turtle.

(16) "Nest" means an area where marine turtle eggs have been naturally deposited or subsequently relocated.

(17) "Nesting season" means the period from May 1 through October 31 of each year for all counties except Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward. Nesting season for Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties means the period from March 1 through October 31 of each year.

(18) "Nighttime" means the locally effective time period between sunset and sunrise.

(19) "Person" means individuals, firms, associations, joint ventures, partnerships, estates, trusts, syndicates, fiduciaries, corporations, and all other groups or combinations.

(20) "Tinted glass" means any glass treated to achieve an industry-approved, inside-to-outside light transmittance value of 45% or less. Such transmittance is limited to the visible spectrum (400 to 700 nanometers) and is measured as the percentage of light that is transmitted through the glass.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.002.

62B-55.003 Marine Turtle Nesting Areas.

Scientific investigations have demonstrated that marine turtles can nest along the entire coastline of the state. Historical data are not sufficient to exclude any county as an area utilized by marine turtles for nesting. For the purposes of this rule, however, the coastal areas of the state utilized, or likely to be utilized, by marine turtles for nesting include all beaches adjoining the waters of the Atlantic Ocean, the Gulf of Mexico, and the Straits of Florida and located within Bay, Brevard, Broward, Charlotte, Collier, Dade, Duval, Escambia, Flagler, Franklin, Gulf, Indian River, Lee, Manatee, Martin, Monroe, Nassau, Okaloosa, Palm Beach, Pinellas, St. Johns, St. Lucie, Santa Rosa, Sarasota, Volusia, and Walton Counties; and all inlet shorelines of those beaches.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.003.

62B-55.004 General Guidance to Local Governments.

(1) The responsibility for protecting nesting female and hatchling marine turtles should be a joint responsibility of local government and the department. Local governments are encouraged to adopt, implement, and enforce the guidelines provided herein to assist in that responsibility. Local governments that have adopted less stringent regulations should consider amending existing ordinances to provide greater protection to nesting marine turtles and hatchlings. In the process of implementing these guidelines, the following management goals should also be considered by local governments:

(a) Public Awareness. Any person submitting an application for coastal construction activities within the jurisdictional boundaries of the local government should be informed of the existence of and requirements within the local government's ordinances concerning artificial lighting and marine turtle protection.

(b) Local Government -- Department Communication. Upon adoption of these guidelines, a system of communication between the local government and the department should be developed if it does not already exist. Protection of marine turtle nesting habitat, nesting females, and hatchlings is greatly enhanced when local governments manage their beaches and coastal activities in a manner consistent with prudent marine turtle conservation strategies. The department is ready to assist local governments by providing such conservation information and other technical assistance.

(c) Inter-Governmental Cooperation. Upon adoption of these guidelines, local governments should develop a system for receiving copies of permits issued by the department, the Department of Environmental Protection, or the United States Army

Corps of Engineers for any coastal construction within the local government's jurisdiction. Activities permitted by these agencies should be assessed for compliance with the local government's lighting ordinance.

(d) Enforcement. Local governments should develop a process for the consistent and effective enforcement of adopted guidelines. This process should include at least one compliance inspection of the beach conducted at night prior to the commencement of the main portion of the marine turtle nesting season and one compliance inspection conducted during the marine turtle nesting season.

(2) The department considers the provisions of this Chapter to be minimum guidelines for the protection of nesting habitat, nesting females, and hatchling marine turtles from the negative effects of artificial lighting. More stringent standards for marine turtle protection may be adopted by local governments. Prior to adoption of any additional standards, local governments are encouraged to consult with the department to ensure that the proposed standards are consistent with the guidelines set forth herein and with all other applicable department rules.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.004.

62B-55.005 Prohibition of Activities Disruptive to Marine Turtles.

The following activities involving direct illumination of portions of the beach should be prohibited on the beach at nighttime during the nesting season for the protection of nesting females, nests, and hatchling marine turtles:

(1) The operation of all motorized vehicles, except emergency and law enforcement vehicles or those permitted on the beach for marine turtle conservation or research.

(2) The building of campfires or bonfires.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.005.

62B-55.006 Model Standards for New Beachfront Lighting.

In order to provide the highest level of protection for nesting marine turtles and their hatchlings, local governments should adopt all of the following standards for artificial light sources on all new coastal construction:

(1) Exterior artificial light fixtures shall be designed and positioned so that:

(a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;

(b) Areas seaward of the frontal dune are not directly or indirectly illuminated;

and

(c) Areas seaward of the frontal dune are not cumulatively illuminated.

(2) Exterior artificial light fixtures within direct line-of-sight of the beach are considered appropriately designed if:

(a) Completely shielded downlight only fixtures or recessed fixtures having low wattage (i.e., 50 watts or less) "bug" type bulbs and non-reflective interior surfaces are used. Other fixtures that have appropriate shields, louvers, or cut-off features may also be used if they are in compliance with subsection (1)(a), (b), and (c) above; and

(b) All fixtures are mounted as low in elevation as possible through use of low-mounted wall fixtures, low bollards, and ground-level fixtures.

(3) Floodlights, uplights or spotlights for decorative and accent purposes that are directly visible from the beach, or which indirectly or cumulatively illuminate the beach, shall not be used.

(4) Exterior lights used expressly for safety or security purposes shall be limited to the minimum number and configuration required to achieve their functional role(s). The use of motion detector switches that keep lights off except when approached and that switch lights on for the minimum duration possible are preferred.

(5) Only low intensity lighting shall be used in parking areas within line-of-sight of the beach. Such lighting shall be:

(a) Set on a base which raises the source of light no higher than 48 inches off the ground; and

(b) Positioned or shielded so that the light is cast downward and the source of light or any reflective surface of the light fixture is not visible from the beach and does not directly or indirectly illuminate the beach.

(6) Parking areas and roadways, including any paved or unpaved areas upon which motorized vehicles will park or operate, shall be designed and located to prevent vehicular headlights from directly or indirectly illuminating the beach.

(7) Vehicular lighting, parking area lighting, and roadway lighting shall be shielded from the beach through the use of ground-level barriers. Ground-level barriers must not interfere with marine turtle nesting or hatchling emergence, or cause short- or long-term damage to the beach/dune system.

(8) Tinted glass shall be installed on all windows and glass doors of single or multi-story structures within line-of-sight of the beach.

(9) Use of appropriately shielded low pressure sodium vapor lamps and fixtures shall be preferred for high-intensity lighting applications such as lighting parking areas and roadways, providing security, and similar applications.

(10) Temporary lighting of construction sites during the marine turtle nesting season shall be restricted to the minimal amount necessary and shall incorporate all of the standards of this section.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.006.

62B-55.007 Model Standards for Existing Beachfront Lighting.

In order to provide the highest level of protection for nesting marine turtles and their hatchlings, local governments should adopt all of the following standards for existing artificial beachfront lighting sources:

- (1) Existing artificial light fixtures shall be repositioned, modified, or removed so that:
 - (a) The point source of light or any reflective surface of the light fixture is not directly visible from the beach;
 - (b) Areas seaward of the frontal dune are not directly or indirectly illuminated, and
 - (c) Areas seaward of the frontal dune are not cumulatively illuminated.
 - (2) The following measures shall be taken to reduce or eliminate the negative effects of existing exterior artificial lighting:
 - (a) Reposition fixtures so that the point source of light or any reflective surface of the light fixture is no longer visible from the beach;
 - (b) Replace fixtures having an exposed light source with fixtures containing recessed light sources or shields;
 - (c) Replace traditional light bulbs with yellow "bug" type bulbs not exceeding 50 watts;
 - (d) Replace non-directional fixtures with directional fixtures that point down and away from the beach;
 - (e) Replace fixtures having transparent or translucent coverings with fixtures having opaque shields covering an arc of at least 180 degrees and extending an appropriate distance below the bottom edge of the fixture on the seaward side so that the light source or any reflective surface of the light fixture is not visible from the beach;
 - (f) Replace pole lamps with low-profile, low-level luminaries so that the light source or any reflective surface of the light fixture is not visible from the beach;
 - (g) Replace incandescent, fluorescent, and high intensity lighting with the lowest wattage low pressure sodium vapor lighting possible for the specific application;
 - (h) Plant or improve vegetation buffers between the light source and the beach to screen light from the beach;
 - (i) Construct a ground level barrier to shield light sources from the beach. Ground-level barriers must not interfere with marine turtle nesting or hatchling emergence, or cause short- or long- term damage to the beach/dune system;
 - (j) Permanently remove or permanently disable any fixture which cannot be
-

Effective 3-30-93

brought into compliance with the provisions of these standards.

(3) The following measures shall be taken to reduce or eliminate the negative effects of interior light emanating from doors and windows within line-of-sight of the beach:

- (a) Apply window tint or film that meets the standards for tinted glass;
- (b) Rearrange lamps and other moveable fixtures away from windows;
- (c) Use window treatments (e.g., blinds, curtains) to shield interior lights from the beach; and
- (d) Turn off unnecessary lights.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.007.

62B-55.008 Proposed Enforcement and Penalties.

Enforcement, appeal, and remedy of matters related to this Chapter should be regulated pursuant to procedures established under local ordinances. Penalties for non-compliance should be established and should be sufficient to discourage violations. Enforcement capability should be adequate to respond to possible violations within the timeframe necessary to prevent continued and prolonged impacts to marine turtles and hatchlings.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.008.

62B-55.009 Monitoring and Reporting Guidance.

The following information should be compiled on an annual basis and submitted to the department.

- (1) Number of lighting applications reviewed;
- (2) Number of potential violations reported;
- (3) Number of potential violations investigated;
- (4) Disposition of all potential violations including results of enforcement actions and amounts of penalties assessed;
- (5) Results of compliance checks conducted prior to and during the marine turtle nesting season; and
- (6) Status of local lighting ordinances and any amendments to those ordinances.

Specific Authority 161.163 FS. Law Implemented 161.163 FS. History--New 3-30-93, Formerly 16B-55.009.

Sea Turtle Lighting, Glass, & Window Tint Vendors, Installers, Consultants, and Websites*

*Provision of this list does not imply endorsement by the U. S. Fish and Wildlife Service

Custom Glass
Callaway, FL 32404
(850) 763-6842
(window tint)

Dillon Electric
Eastpoint, Florida
(850) 670-4223

Evans Lighting & Design
1017 Harrison Ave
Panama City, FL 32401
(850) 784-0757

Harbor Electric
P.O. Box 39
(850) 653-3232
Apalachicola, FL 32329

Panama Glass
Panama City, FL 32405
(850) 763-7638
(turtle glass -windows/doors)

Rachel's Lighting & Home Accessories
416 W. 15th Street
Panama City, FL 32401
(850) 769-2348

Speedy's Window Tint
531 East 6th Street
Panama City, FL 32401
(850) 785-3M3M
1-888-83M-TINT

Speedy Edwards
Apalachicola, FL
(850) 653-8090

Key Lighting
1418 Harrison Avenue
Panama City, FL 32401
(850) 769-3276

Lighting the Way Enterprises, Inc.
812 NW 8th Avenue
Ft. Lauderdale, FL 33311
(954) 522-1765
1 (800) 658-1829
(neon lights)

J B Enterprises
P.O. Box 5006
Niceville, FL 32578
(850) 897-4922

Tommy's Glass & Mirror Co.
2817 Hwy 77
Panama City, FL
(850) 769-3325

Lighting Unlimited
914 W 26th St
Lynn Haven, FL 265-6834
(850) 265-6834
(800) 861-5171

SPF (Solar Protection Film)
3847 East Bus. 98
Panama City, FL 32401
(850) 819-8468 or (850) 819-TINT

Kenny Seymour
Alternative Electric. Co.
P.O. Box 1028
Eastpoint, FL 32328
(850) 927-4610

Sea Turtle Lighting, Glass, & Window Tint Vendors, Installers, Consultants, and Websites*

*Provision of this list does not imply endorsement by the U. S. Fish and Wildlife Service

Guy Grimes
AMA Lighting
813 Downtowner Blvd.
Mobile, AL 36609
Cell (850) 572-3253
(251) 460-4328
guy@amalighting.com

Connie Bryars
Stuart C. Irby Co., Inc.
Irby Electric Express
Cell- 251-370-8140
Fax- 251-968-6514
bryars@irby.com
www.irby.com

<http://www.darksky.org/fixtures/fixtures.html>

<http://www.starrynightlights.com/>

<http://store.lsgc.com/R30-AMBER-FLOODLIGHT-BUG-LIGHT-P1C0.aspx>

<http://www.thomaslighting.com/catalog/proddetail.asp?cno=SL9270-8>

http://www.outdoorltg.com/ola_026.htm

<http://www.electroelf.com/>

<http://www.wfharris.com/turtlelights.htm>

Other wildlife:

http://news.nationalgeographic.com/news/2003/04/0417_030417_tvlightpollution.html

<http://www.urbanwildlands.org/>

http://www2.nature.nps.gov/YearInReview/yir2001/05_risks/05_1_duriscoe.html

Sea Turtle Lighting, Glass, & Window Tint Vendors, Installers, Consultants, and Websites*

*Provision of this list does not imply endorsement by the U. S. Fish and Wildlife Service

December 2006

Panama City FO:L.Patrick:lap:lp:12-14-06:

850-769-0552x229:c:lorna1t&e\seaturtle\lighting
guide\vendors

Window decals

SEA TURTLES NEED YOUR HELP
**PLEASE CLOSE WINDOW COVERINGS &
TURN OFF EXTERIOR LIGHTS &
ANY UNNECESSARY INDOOR LIGHTS
FROM DUSK TO DAWN
MAY 1 - OCTOBER 31**

BE AWARE!



**If You See These Tracks:
Read Below!**

This is the tell-tale sign that a female sea turtle has come onto the beach to nest. Female sea turtles emerge on our beaches between May and August. They deposit approximately 100 eggs in a nest cavity about 12 inches deep, usually near the dune line.
If you see a crawl or hatchlings, please call us.

LIGHTS OUT!



GIVE A MOTHER A BREAK:
Please turn off all exterior lights and close window coverings after dark.

Threatened loggerhead sea turtles nest on St. George Island. Starting in mid-July, for the next three months, nests will hatch at night and baby turtles will scramble to the sea, guided by light reflected from Gulf waters.
Any light on land can confuse the baby turtles causing them to turn away from the sea.
If you are fortunate enough to see a hatch take place, please do not help the babies to the water. They must get oriented to their future nesting beach.

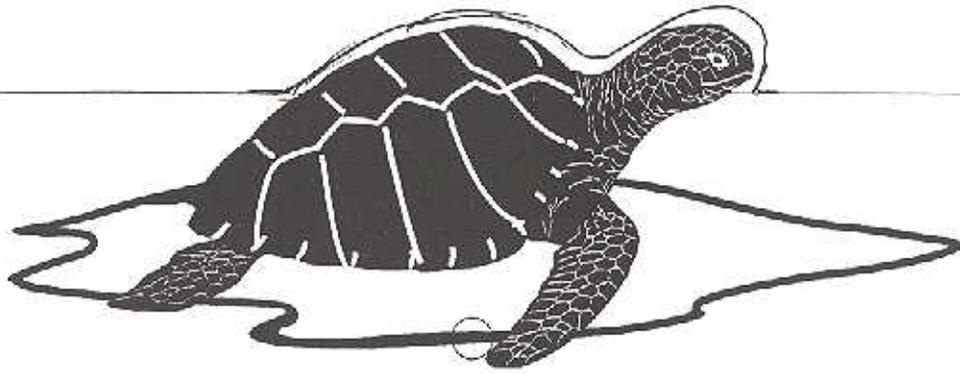
Please call the Apalachicola National Estuarine Research Reserve @
(850) 670-4783
OR APALACHICOLA BAY & RIVER KEEPER, INC. @
850-670-5470



This magnet was developed with funds from the Florida Fish & Wildlife Conservation Commission Marine Turtle Grants Program based on the sale of Sea Turtle License Plates.



Refrigerator magnets



Do not use flashlights or flash photography during turtle season.



Remember to fill in holes and remove personal belongings.



**Put all trash in waste containers
* ESPECIALLY PLASTIC BAGS***



Never touch, harass, or disturb nesting sea turtles or hatchlings.



**If you see a sea turtle PLEASE call:
Florida Fish and Wildlife Conservation Commission
1-888-404-3922**

15.25" X 16"

BOARDWALK
Signs & Graphics Inc.
2500 MINNESOTA AVENUE
LYNN HAVEN, FLORIDA 32444
850-265-0988 OFFICE
850-271-5153 FAX

CLIENT	RMA TURTLE WATCH - NANCY EVOU	DATE	02/06/02
JOB	TURTLE.CDR		
MATERIAL		SIZE	
ALL DRAWINGS/DESIGNS/DERIVATIVES: © 2002 BOARDWALK SIGNS & GRAPHICS INC., ALL RIGHTS RESERVED			

ABOVE PROOF REVIEWED AND ACCEPTED BY _____ DATED _____

BOARDWALK
Signs & Graphics, Inc.

2500 Minnesota Ave., Lynn Haven, Florida 32444
(850) 265-0988 • (888) 603-7271 • Fax: (850) 271-5153 • boardwalksigns@knology.net

PROPOSAL

NAME : Nancy Evou
St. Andrews Bay Resource Management Assoc.
ADDRESS : Panama City, FL

DATE: February 7, 2002
FILE NAME: TURTLE1

DESCRIPTION : Turtle Watch Signs

15.25" Wide x 16.0" Tall Single-Sided White PVC Silkscreened Turtle Watch Signs (cut to shape).
Quantity / Cost breakdown as follows:

PVC material

1-Color	50 - 99	100 - 499	500
Price each :	\$7.90	\$6.25	\$5.00
	395.	1,250.	2,500.

2-Color	50 - 99	100 - 499	500
Price each :	\$11.98	\$6.95	\$6.00
	599.	1,390.	3,000.

Artwork / Film Charge: \$50.00

All material is guaranteed to be as specified, and the above work to be performed in accordance with the drawings and specifications submitted for the above work and completed in a substantial workmanlike manner, for the sum of \$ _____ plus sales tax with a payment of 50% down (\$ _____) and the balance due upon completion (to include tax). Boardwalk Signs & Graphics, Inc. retains ownership of all custom signage until the contract is paid in full, and reserves the right of recovery through removal and/or binding arbitration.

Respectfully submitted by : *SPafford*

ACCEPTANCE OF PROPOSAL

The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above.

Signature: _____

Date: _____

For more information

For more information about sea turtles, contact the Florida Department of Environmental Protection, Division of Marine Resources, Florida Marine Research Institute, 100 Eighth Avenue, S.E., St. Petersburg, Florida 33701, 813-896-8626, or Florida Power & Light Company, Environmental Services.

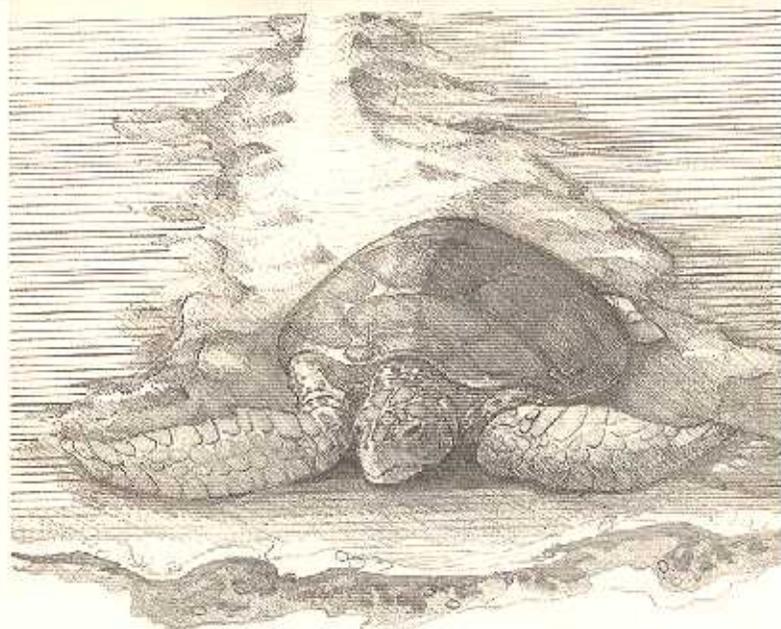
A manual summarizing guidelines for minimizing the impact of roadway lighting on turtles, has been developed in a collaborative effort by FPL, the DEP and other regulatory agencies. A copy of the document will be posted on the DEP internet site at <http://www.dep.state.fl.us> in mid 1998.

The Florida Marine Research Institute of the Department of Environmental Protection conducts research necessary for marine resource management decisions. The Institute has responsibilities for marine fisheries, marine habitat research, endangered and threatened species recovery programs, and a marine fish stock enhancement research program.

People wishing to help Florida's sea turtles can purchase a sea turtle license plate at their local tag office. Proceeds go to the Marine Turtle Protection Trust Fund and support marine turtle research and protection in Florida. Additional contributions can be made to the Marine Turtle Protection Trust Fund, Bureau of Protected Species Management, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399. A beautiful color sticker or poster depicting a hawksbill turtle is available for each donation of five dollars or more.

Visit our web site at: <http://www.fpl.com>

Sea Turtles and Lights



Florida's endangered sea turtles need your help

Each summer, Florida beaches host the largest gathering of nesting sea turtles in the United States. Female sea turtles emerge from the surf to deposit eggs in sand nests and later, tiny hatchlings struggle from their nests and scramble to the ocean. Nearly all of this activity takes place under cover of darkness and relies upon natural light environment too often disrupted by the addition of artificial lighting.



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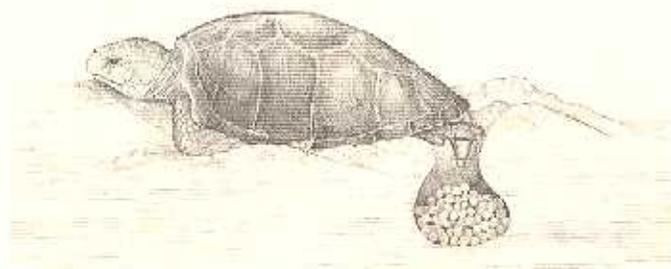
FPL

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Florida Power & Light Company
2575M

With this pamphlet, Florida Power & Light Company and the Florida Department of Environmental Protection would like to inform beach residents and visitors to the adverse effects of beach lighting on sea turtles and offer solutions that will aid in conserving sea turtles that nest on developed beaches.

The nocturnal trek of hatching sea turtles

Fifty to sixty-five days after eggs were placed in the nest, hatchling sea turtles tear themselves free of their papery eggshells beneath the sand and with periodic bouts of thrashing, make their way to the surface. At nightfall, as many as 100 hatchlings burst together from the sand and immediately scramble toward the ocean. Moving quickly from the nest to sea is critical for the survival of hatchling sea turtles.



The problem with lights

On beaches where artificial lighting is visible, the hatchlings' important journey to the sea is disrupted. Hatchling sea turtles emerging from nests at night are strongly attracted to light sources along the beach. Consequently, hatchlings move toward streetlights, porchlights or interior lighting visible through windows, and away from the relative sanctuary of the ocean. Hatchlings so misled fail to find their way to the sea, having succumbed to attacks by predators, exhaustion, drying in the morning sun, or strikes by automobiles on nearby parking lots and roads. Quite literally, a single light left on near a sea turtle nesting beach can misdirect and kill

hundreds of hatchlings. Cases where hatchlings have been led to their death into flames of unattended fires are testimony to the strong attraction hatchlings have for light.

Artificial lighting also affects the nesting of female sea turtles. Studies have shown that brightly lighted beaches are less frequently used as nesting sites. In addition, females attempting to return to the sea after nesting, like hatchlings, also can be led astray by nearby lighting.

Solutions — You can help

Solving the problems created by artificial lighting on sea turtle nesting beaches requires the understanding of citizens within coastal communities. Reducing the effects of beach lighting requires little inconvenience or compromise of human safety.

Simply put, the most direct and complete way to resolve problems for sea turtles caused by artificial beachfront lighting is to eliminate all artificial sources that emit light visible from the nesting beach. Light visible from the beach may include light emitted directly from sources, light reflected by buildings and other objects, light from interior sources shining through windows, and light scattered by sea mist.

Unfortunately, eliminating all beachfront lighting is not always practical. Human safety concerns and the magnitude of some lighting problems require some compromise. The following are a few techniques designed to reduce the effects of artificial lighting on sea turtles.

1. Keep beachfront lighting turned off during the nesting and hatching season. In Florida, this season extends from March 1 - October 31 in Brevard, Indian River St. Lucie, Martin, Palm Beach and Broward counties and from May 1 - October 31 in all other coastal counties. Ideally, lighting should remain off throughout the night during this period. Light sources remaining on until 11 PM will still affect about one third of the hatchlings emerging from nests on a given night.

Some common questions about sea turtles and lighting

When do hatchling sea turtles emerge from nests?

Hatchlings emerge from nests throughout the months of June, July, August, September, and October. The date of nest emergence depends on the date the eggs were laid and the incubation period of the nest (typically 50-65 days). It is a myth that hatchlings emerge only around the time of the full moon. Hatchlings ready to emerge wait just beneath the sand surface until conditions become cool. This temperature cue prompts hatchlings to emerge primarily at night, although some late-afternoon and early-morning emergences are known.

How do hatchling sea turtles know the direction of the ocean when they emerge from their nests?

Hatchlings possess an inborn tendency to move in the brightest direction. On a natural beach, this brightest direction is most often the open view of the night sky over, and reflected by, the ocean. Hatchlings also tend to move away from darkly silhouetted objects associated with the dune profile and vegetation. Hatchlings emerge and locate the sea at all phases and positions of the moon; it is a myth that hatchlings depend on the moon to lead them seaward.

Why do artificial light sources attract hatchling sea turtles?

Hatchlings that crawl toward artificial light sources follow the same instinctive response that leads them seaward on naturally lighted beaches. It is the glaring light of artificial sources that leads hatchlings astray. At night, artificial light sources appear bright and glaring because they are close by, producing light that appears intense but is not bright enough to illuminate the ocean.

As a result, light from an artificial source appears many times brighter than light from any other direction including the ocean. Natural light sources like the sun and moon are extremely bright, but are also quite distant. Their light brightens the sky, ocean, and dune, allowing hatchlings to correctly assess the visual cues that lead them to the sea.

There are other lights near my beachfront property that are visible from the beach. How can lights on my property contribute to the problem?

Any reduction in the amount of artificial light reaching the nesting beach helps sea turtles. As lighting is reduced, hatchlings emerging on moonlit nights and at locations far from the lighted property will have a better chance at entering the sea.

What should be done with misdirected hatchlings found on the beach?

Hatchling sea turtles found wandering away from the ocean should be taken to a darkened portion of beach and allowed to walk into the surf on their own. Hatchlings that do not crawl vigorously can be placed in the ocean and allowed to swim away. In all cases, the Florida Department of Environmental Protection (east coast office, 561-575-5455; west coast office, 813-896-8626) or the Florida Marine Patrol (1-800-DIAL-FMP) should be notified during regular business hours.

Whom should I notify about a light that is visible from a sea turtle nesting beach?

Many coastal communities in Florida have ordinances that restrict or prohibit beachfront lighting during the nesting season. Check with your county or city to see if they have adopted a sea turtle lighting ordinance. Lighting problems should then be reported to the local code enforcement board or police.



FLORIDA FISH & WILDLIFE CONSERVATION COMMISSION
FLORIDA MARINE RESEARCH INSTITUTE

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FEATURES

Artificial Lighting and Sea Turtle Hatchling Behavior

Artificial lighting on marine turtle nesting beaches disrupts the ability of hatchlings to find their nest, an effect termed "hatchling disorientation".



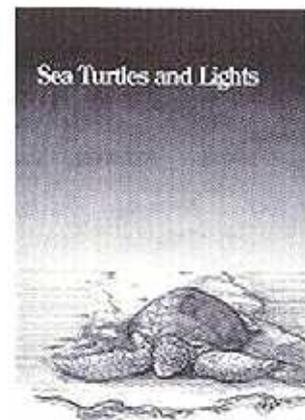
Disorientation from artificial lighting causes a significant number of hatchling deaths each year in Florida and is a significant marine turtle conservation problem. Long-term monitoring of this threat involves a statewide effort to gather information from reports, to use this information in facilitating management on nesting beaches and to recommend additional remedies for the threats caused.



Disorientation reports made to the Florida Fish and Wildlife Conservation Commission are collected on standardized data forms that include information on the location, nature and extent of disorientation events recognized by permitted marine turtle surveyors. The surveyors are part of a coordinated network of private conservation groups, volunteers, consultants, academic institutions, state and local governments and the Florida Park Service.

FLORIDA MARINE RESEARCH INSTITUTE
TECHNICAL REPORTS

Understanding, Assessing, and Resolving
 Light-Pollution Problems
 on Sea Turtle Nesting Beaches



Florida's
 endangered sea turtles
 need your help

A primary goal of this project is to help manage the use of artificial light so that it does not reach areas that are critical to sea turtles on nesting beaches.

You can help by reporting about the light pollution problems you see on sea turtles and the current status of the problem. This document

- Use shielded motion detector lights for lighting, and set them on the shortest time setting.
- To reduce spillover from indoor lighting move light fixtures away from windows, apply window tint to your windows that meets the 45% inside to outside transmittance standards for tinted glass (you'll save on air conditioning costs too!), or use window treatments (blinds, curtains) to shield interior lights from the beach.

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[Sea Turtle Lighting](#)

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NEWS RELEASE



Florida Fish and Wildlife Conservation Commission

620 South Meridian Street • Tallahassee, FL • 32399-1600 • 850-488-4676 • FAX 850-488-1961

August 22, 2001

SEA TURTLE HATCHLINGS NEED LIGHTS OUT

CONTACT: Robbin Trindell (850) 922-4330

Brevard County's beach nourishment last spring created a wide beach along a shoreline where loggerhead sea turtles nest more densely than almost anywhere else in the continental United States.

While sea turtles, including loggerheads, greens, and leatherbacks, continued to nest even when the beach was much narrower, the restored beach may provide additional nesting areas on beaches where wet sand met seawalls and no sandy beach remained. Unfortunately, the new beach berm also exposes sea turtles and their nests to lights that were less visible, or not at all visible, from nesting areas before the beach nourishment.

Sea turtles, both nesting females and hatchlings, usually emerge onto the beach at night, and their instincts compel them to proceed towards the brighter horizon over the ocean. Bright lights on the landward side of the beach can confuse them and lead them away from the ocean.

"Many of these disoriented hatchlings fall prey to ghost crabs, raccoons, and other predators," said Robbin Trindell, Ph.D., a biologist with the Florida Fish and Wildlife Conservation Commission (FWC). "Others may become trapped and perish on the beach. Some probably do make it to the water, most likely towards dawn when the influence of lights is lessened."

Dr. Trindell said hatchlings, once weakened by crawling on the beach for hours, might not have sufficient energy to complete the swim to their Gulf Stream nursery.

M O R E

www.state.fl.us/fwc/

“To date, many (up to 70% or more) of the nests hatching from the restored beach have become disoriented this nesting season,” she said. “The fate of these hatchlings is unknown. An additional 215 nests remain on the 9.5-mile project site -- 195 nests in Cocoa Beach and 20 in Cape Canaveral.”

During the next few months, up to 20,000 hatchlings could be at risk from unnecessary lights along the restored beach. Citizens and businesses in these areas can help ensure hatchlings’ safety by turning off outside lights and closing drapes to minimize light visible to the beach. Hatchlings emerge from their nests between 9 p.m. and early morning. Many outside lights blaze all night, even when no people are present. Most businesses close by 10 p.m., and outside lights left burning after that time have little benefit for their customers but may prove lethal for Brevard’s sea turtles.

The FWC and Brevard County officials are asking news media to remind residents and businesses on or by the beach to help protect these threatened and endangered sea turtles. They are appealing to persons on the beach to turn off all outside lights when not necessary for human safety. Also, they are asking businesses to inform guests and patrons about Brevard County’s importance as a sea turtle nesting area and the need to minimize lights at this time to help protect the hatchlings. For more information about sea turtles and lights and what to do to help, interested persons can contact the Florida Fish and Wildlife Conservation Commission at 850-922-4330, the Sea Turtle Preservation Society at 321-676-1701, or Brevard County Code Enforcement at 321-633-2086.

Currently, there are remaining 215 nests on Brevard County’s restored beach.



NEWS RELEASE



Florida Fish and Wildlife Conservation Commission

620 South Meridian Street • Tallahassee, FL • 32399-1600 • 850-488-4676 • FAX 850-488-1961

June 21, 2002

CONTACT: Robbin Trindell (850) 922-4330

TURN THE LIGHTS DOWN LOW FOR SEA TURTLE HATCHLINGS

All along Florida's coastline, sea turtle eggs are hatching, and baby turtles are emerging from their sandy nests to make a mad dash across the beach. Hatchlings need to reach their ocean home as soon as possible, and they could use a little help from their human friends. Homeowners, business owners and hotel guests along the Gulf of Mexico and the Atlantic Ocean can help hatchlings survive by keeping shoreline lights dimmed during hatching season. Hatching will continue all summer and into the early fall.

For more than 100 million years, sea turtle instinct has prompted hatchlings to emerge in the cool of the night and aim for the safety of the ocean. On a natural beach, the brightness of the night sky over the ocean orients them toward the water. But modern times have brought new problems for turtles that their ancient instincts cannot handle. Bright artificial lights on the landward side of the beach can confuse them and lead them away from the ocean.

"Many of these disoriented hatchlings fall prey to ghost crabs, raccoons and other predators," said Robbin Trindell, Ph.D., a biologist with the Florida Fish and Wildlife Conservation Commission (FWC). "Others may become trapped and perish on the beach."

M O R E

www.floridaconservation.org

TURN THE LIGHTS DOWN LOW
FOR SEA TURTLE HATCHLINGS

PAGE 3

Citizens and businesses can help ensure hatchlings' safety by turning off all outside lights that are not necessary for public safety, and by closing drapes to minimize indoor light visible to the beach.

More information about sea turtles and details about appropriate beach lighting is on the FWC Web site at <http://floridaconservation.org/psm/turtles/turtle.htm>.

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Sea Turtle Lighting



General Information about Sea Turtles and Lights

For millions of years female sea turtles have been coming ashore to lay their eggs on beaches. In the past the hatchling turtles were guided to the ocean by an instinct to travel away from the dark silhouettes of the dune vegetation and toward the brightest horizon which was the light from the sky reflecting off the ocean. In present times however, many coastal areas are highly populated. There are many artificial lights near the beach that can deter females from nesting and disorient hatchling sea turtles. The hatchlings travel inland, toward the artificial lights, where they often die from dehydration, are preyed upon by fire ants and ghost crabs, or sometimes crawl onto the road where they are run over by cars.

[Disorientation Events in Florida](#)

For years 1998, 1999, 2000, and through November 2001

[Sea Turtle Protection Ordinances](#)

Adopted by Counties and Municipalities

[Laws and Regulations Protecting Sea Turtles](#)

[Solutions to Decrease Light-Pollution Affecting Sea Turtles](#)

[Other Resources](#)

[Kid's Corner](#)

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Article: [Experimental Project on Embedded Roadway Lights in Boca Raton](#)

[Sea Turtles](#)



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Other Resources

The [Florida Marine Research Institute](#) produces a Technical Report titled "[Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches](#)" written by Blair Witherington and Erik Martin. This Technical Report provides background information on sea turtles and lights and discusses many solutions to lighting problems.

The [Coastal Roadway Lighting Manual](#) was prepared by Ecological Associates, Inc. for the Florida Power and Light Company. It provides solutions for lighting on coastal roadways.

The following links lead to lighting manufacturers that produce some sea turtle friendly fixtures. Please be aware that although some of their lighting fixtures may be usable near sea turtle nesting beaches, not all of their fixtures are. Before installing any lights near a sea turtle nesting beach, local and state authorities should be contacted to provide guidance and also to gain information for necessary permits and lighting reviews.

Hydrel/Lithonia Lighting - <http://209.134.41.123/>

Thomas Lighting - <http://www.thomasc-i.com/>

Hubbell Lighting - <http://www.hubbell-ltg.com/>

For an example of what one county is doing to help control the light problem, try the Collier County web page at <http://www.co.collier.fl.us/natresources/turtle/lights.html>

The Florida Power and Light web site has information about sea turtles and lights that is geared toward kids. http://www.fpl.com/html/kid_turtlelights.html

Light pollution isn't just a problem for sea turtles, many astronomers are also trying to control light pollution all over the world so they can get a good view of the night sky. Many of the light applications they support can be used near turtle beaches as well.

<http://www.darksky.org/~ida>

Migratory birds also have problems with light pollution. Information about this subject can be found at the Fatal Light Awareness Program (FLAP) web site <http://www.flap.org/GIF%20Free/home1.htm>

The US National Park Service also has concerns about light pollution. Their web site has an executive summary regarding the Vanishing Night Skies at <http://www.nps.org/readaboutit/executivesummary.html>

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Solutions to Decrease Light-Pollution Affecting Sea Turtles



There are ways that beach front property owners can modify their lights to prevent them from being seen from the beach. The following is a list of suggestions (**these solutions may need to be used in conjunction with one another in order to prevent sea turtle disorientation**).

- Turn off unnecessary lights. Don't use decorative lighting (such as runner lights or uplighting of vegetation) in areas that are visible from the beach and permanently remove, disable, or turn off fixtures that cannot be modified in any other way.
- For lights that can be repositioned, face them away from the beach so that the light source is no longer visible.
- Shield the light source. Materials such as aluminum flashing can be used as a shield to direct light and keep it off the beach. When shielding lights, it is important to make sure they are shielded from all areas on the beach (including from either side and on top), and not just from the beach directly in front of the light. Black oven paint may be used as a temporary solution.
- Light sockets with an exposed light source (such as plain bulbs) should be replaced with fixtures that are specially made to recess and/or the light source should be shielded.
- Replace fixtures that scatter light in all directions (such as globe lights or carriage lights) with directional fixtures that point down and away from the beach.
- Replace lights on poles with low profile, low-level lamps so that the light source and reflected light are not visible from the beach.
- Replace incandescent, fluorescent, and high intensity lighting with the lowest wattage low-pressure sodium vapor lighting or replace white incandescent bulbs with "bug" lights of 50 watts or less.
- Plant or improve vegetation buffers (such as sea grapes and other native beach vegetation) between the light source and the beach to screen light from the beach.

to downlo

[Download This PDF File: Understanding, Assessing, and Resolving Light-Pollution f
Sea Turtle Nesting Beaches](#)

[Download This PDF File: Coastal Roadway Lighting Manual](#)

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QUICK LINKS:



HEADQUARTERS:

Florida Marine Research Institute
100 Eighth Avenue SE
St. Petersburg, Florida 33701-5010
PH: 727-896-8626

For More Information

For more information on individual animals and plants, check references at your local library.

For additional information on the U.S. Fish and Wildlife Service's endangered species program, write to:

Division of Endangered Species
U.S. Fish and Wildlife Service
452 Arlington Square
Washington, DC 20240

For information on endangered species permits and CITES international conservation programs, write to:

Office of Management Authority
U.S. Fish and Wildlife Service
432 Arlington Square
Washington, DC 20240

For information about protection of whales, seals, and other marine species, write to:

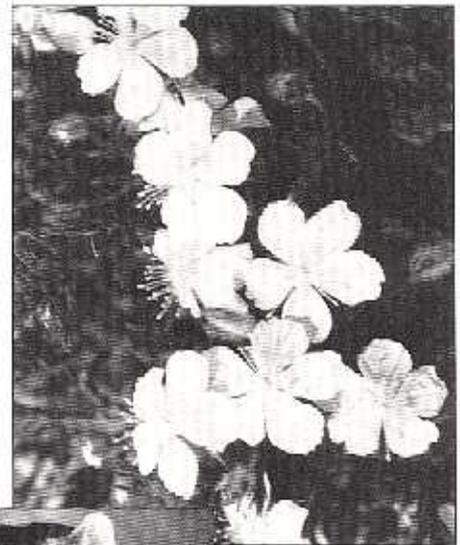
National Marine Fisheries Service
Department of Commerce
1335 East-West Highway
Silver Spring, MD 20910

For information about importing or exporting pets, birds, and Federally regulated plants, write to:

Department of Agriculture
Animal and Plant Health Inspection Service
Washington, DC 20250



Endangered Species



Endangered Means There's Still Time

**U.S. Department
of the Interior**
U.S. Fish and
Wildlife Service

Since life began on this planet, countless creatures have come and gone—rendered extinct by naturally changing ecological conditions, and more recently by humans and their activities.

If extinction is part of the natural order, and if many species still remain, some people ask, “Why save endangered species? What makes a relatively few animals and plants so special that effort and money should be spent to preserve them?”

Why Save Endangered Species?

Saving species is important to many people for a variety of reasons. People care about saving species for their beauty and the thrill of seeing them, for scientific and educational purposes, and for their ecological, historic, and cultural values.

A compelling reason to preserve species is that each one plays an important role in an ecosystem—an intricate network of plant and animal communities and the associated environment. When a species becomes endangered, it indicates that something is wrong with the ecosystems we all depend on. Like the canaries used in coal mines whose deaths warned miners of bad air, the increasing numbers of endangered species warn us that the health of our environment has declined. The measures we take to save endangered species will help ensure that the planet we leave for our children is as healthy as the planet our parents left for us.

Some species provide more immediate value to humans. For example, cancer fighting drugs have been derived from the bark of a yew that is native to the Pacific Northwest. Chemicals used to treat diseases of nerve tissue were found in an endangered plant in Hawaii. Valuable resources such as these could be lost forever if species go extinct.

Causes of Decline

We can no longer attribute the accelerating loss of our wild animals and plants to “natural” processes. Habitat destruction is the single most serious worldwide threat to wildlife and plants, followed by exploitation for commercial or other purposes. Disease, predation, inadequate conservation laws, pollution, and introduction of non-native species, or a combination of these, can contribute to a species’ decline.



U.S. Fish and Wildlife Service

Habitat destruction is the most serious threat to wildlife.

The Endangered Species Act

Recognizing the importance of preserving a diversity of wildlife species, Congress set the course for a new direction in wildlife conservation with passage of the Endangered Species Act of 1973, the most far-reaching law ever enacted by any nation for the preservation of endangered species. It holds that endangered and threatened species of animals and plants “are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people.”

The Act created an international program involving the support of both the public and private sectors. It provides a framework whereby the Federal Government, the States, conservation organizations, individual citizens, businesses and industry, and foreign governments can all work together to conserve endangered plants and wildlife throughout the world.

Under the Act, the Secretary of the Interior, acting through the U.S. Fish and Wildlife Service, oversees the protection and conservation of all forms of fish, wildlife, and plants found to be in serious jeopardy. The Secretary of Commerce, acting through the National Marine Fisheries Service, is given similar authority for most marine life.

The U.S. Fish and Wildlife Service

Protecting endangered and threatened species and restoring them to a secure status in the wild is the primary objective of the endangered species program of the U.S. Fish and Wildlife Service, an agency of the Department of the Interior. The Service’s endangered species responsibilities include the following:

- Listing, reclassifying, and delisting species under the Endangered Species Act

- Providing biological opinions to federal agencies on their activities that may affect listed species
- Enforcing species protection under the Act
- Overseeing recovery activities for listed species
- Providing for the protection of important habitat
- Providing grants to States to assist with their endangered species conservation efforts

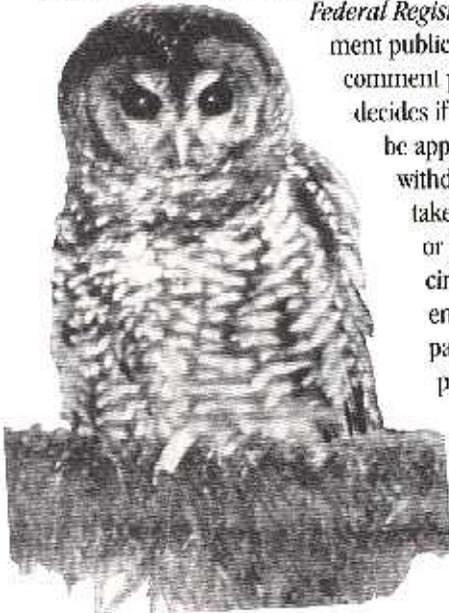
The Listing Process

The U.S. Fish and Wildlife Service maintains the List of Endangered and Threatened Wildlife and Plants, which identifies species protected under the Endangered Species Act. The Act defines an "endangered" species as one that is in danger of extinction throughout all or a significant portion of its range. A "threatened" species is one likely to become endangered within the foreseeable future.

More than 600 mammals, birds, reptiles, fishes, mollusks, plants, and other life forms native to the United States were officially protected as endangered or threatened species as of 1991. In addition, more than 500 foreign species have been listed.

The Service follows a formal "rulemaking" procedure to determine which species should be placed on the list, reclassified, or taken off the list. The rule is first proposed in the

Federal Register, a daily government publication. After a public comment period, the Service decides if the rule should be approved, revised, or withdrawn. The process takes up to a year—or longer in unusual circumstances—and encourages the participation of all interested parties, including the general public, the scientific community, other government agencies, and foreign governments.



The loss of old growth forest habitat in the Pacific Northwest has caused declines in the population of the northern spotted owl, listed as a threatened species in 1990.
Handy Wilk, U.S. Fish and Wildlife Service

In emergency situations, there is a procedure to immediately list a species for up to 240 days while the normal listing process takes place. By law, all listing decisions must be made solely on the basis of the species' biological status.

Currently, between 50 and 100 species are added to the list every year. The Fish and Wildlife Service uses a priority system intended to address additions in order of the greatest need. There are currently thousands of species for which there is some evidence of vulnerability. For many of these "candidates," however, the Service lacks enough information to determine whether they actually warrant listing. In order to solicit information, each year the Service publishes a "notice of review" in the *Federal Register* listing animal candidate species one year and plant candidates the next year. Sometimes, the Service may receive a petition from an outside source to list a species. When that happens, the Service evaluates the petition to determine whether or not a listing may be warranted.

Legal Protection

Once a species is officially listed as endangered or threatened, it is given full legal protection under the Endangered Species Act. The Act forbids the import, export, or interstate or foreign sale of protected animals and plants (including their parts and products) without a special permit. It is also illegal to kill, harm, harass, possess, or remove protected animals from the wild. Listed plants may not be taken from Federal lands without a permit or removed from other lands if the taking violates any State law.

The penalties may be heavy. Violators can be fined up to \$100,000 and/or sentenced to a year in jail; organizations found in violation may be fined up to \$200,000. Moreover, any illegally held wildlife specimens and products are subject to seizure and forfeiture.

In addition, Section 7 of the Endangered Species Act requires all Federal agencies to conserve listed species on their lands, and to ensure that any activity they fund, authorize, or carry out will not jeopardize the survival of a listed species. Through consultation with the Fish and Wildlife Service, Federal agencies have been able to proceed with their activities while ensuring the survival of listed species in over 99 percent of cases.

Recovery

Recovering an endangered species requires stopping and reversing its decline, and then ensuring its long-term survival in nature. This is often a gradual and very complicated process. "Recovery plans," which are drafted by a knowledgeable individual or by a team of experts, serve as a guide for activities to be undertaken by Federal, State, and/or private entities. Recovery plan recommendations can call for habitat protection, new research, captive breeding and reintroduction, or special wildlife and habitat management techniques.

Depending on the particular species involved, some recovery efforts may be more complex than others. But through the years, it has been demonstrated that recovery plans can work, as shown in the examples below.

The American Bald Eagle

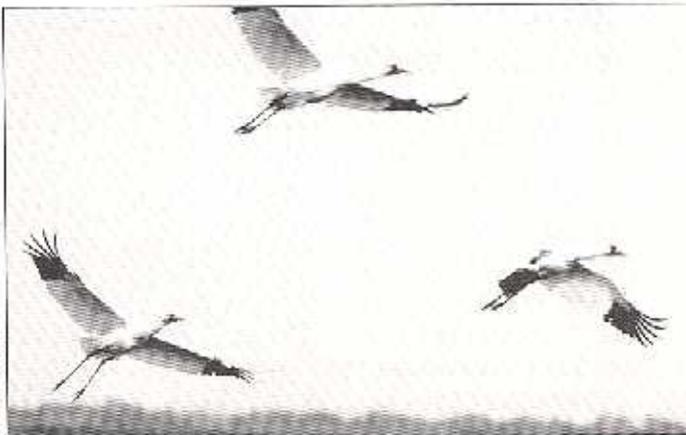
Perhaps the most well known endangered species is the bald eagle, our Nation's symbol. Populations of this majestic bird suffered dramatic declines in the contiguous United States. At one point, they reached an estimated low of 400 nesting pairs in the 1960s. Since that time, Federal protection and tremendous public and private support have led to a significant increase in the range and population of this species through stricter law enforcement, protection of important habitat, reintroduction, a strong public education program, and the banning of the harmful pesticide DDT, a chemical that interfered with normal eggshell production. As of 1991, nesting pairs of bald eagles in the contiguous United States numbered over 3,000. There are also healthy populations of bald eagles in Alaska and Canada, where they have never been in danger of extinction.



Raymond Gehman

The bald eagle is making a remarkable comeback. Habitat loss is the greatest threat to the species right now.

The new Shearlin|Bob Reinhardt/STON & LOCK ALC ASSOCIATES



Although never very numerous, whooping cranes almost disappeared in the 1940s.

The Whooping Crane

Once flourishing in grassy marshlands and bogs, the beautiful, graceful whooping crane almost disappeared as croplands and cities replaced its natural habitat. In the late 1940s, only one flock of fewer than 20 birds was left in the world. Efforts were undertaken to protect the crane's habitat, from its Canadian nesting grounds, through key stopover points along its migration route, to its wintering grounds at the Aransas National Wildlife Refuge on the gulf coast of Texas, 2,600 perilous miles away. In 1967, a captive breeding flock of whooping cranes was established by biologists from Canada and the United States at the Fish and Wildlife Service's Patuxent Wildlife Research Center in Maryland. Part of this flock is now managed by a private group in cooperation with the Service.

These efforts and a continuing combination of international cooperation, strict protection, public education, and intensive research are now bringing the cranes even closer to recovery. With the total number of whooping cranes currently exceeding 200, its future looks brighter indeed.

Captive Breeding

For several species, like the California condor, Florida panther, or black footed ferret, captive breeding may offer the greatest hope for survival. The goal of breeding endangered animals in captivity is to eventually return the species to the wild. The red wolf is a well-known species that recently has been reintroduced into the wild as a result of an intensive captive breeding program.

The Red Wolf

Once common throughout the southeastern United States, the red wolf was squeezed out of its habitat by agricultural and other development. By the early 1970s, this small shy wolf existed only in a few remote areas. In 1973, it was listed as endangered, and all 40 remaining wolves were taken from the wild and put into a captive breeding program at the Point Defiance Zoological Park in Tacoma, Washington. In 1987, following a successful captive breeding effort, reintroduction began with the release of four pairs of red wolves at the 120,000-acre Alligator River National Wildlife Refuge in North Carolina. Red wolves are now successfully breeding on the refuge. Due to tremendous public support, intensive management, and additional reintroduction and propagation projects, there are now more than 100 red wolves located in 22 captive breeding facilities and more than 20 red wolves in the wild. While far from recovered, the red wolf is certainly making encouraging progress.



Steve Milesowski, U.S. Fish and Wildlife Service

Red wolf

Lesser Known Endangered Species

The lesser known species on the list, such as insects, reptiles and crustaceans, are just as important as the popular or well-known species. Recovery efforts for these animals are also paying off. For instance, a new population of the endangered American burying beetle introduced on an island off the coast of Massachusetts is showing early signs of successful reproduction. Once widespread, this beetle occurred in only two natural populations, one in Rhode Island and the other in Oklahoma, when the species was listed in 1989.



J.A. Powell

Lange's metalmark butterfly

The endangered Lange's metalmark butterfly has benefitted greatly from an active management and habitat improvement plan at the Antioch Dunes National Wildlife Refuge in California. Wildlife biologists planted the wild buckwheat on which the larvae depend, and crucial habitat was restored and fenced for protection. Surveys that typically had yielded sightings of 20–30 butterflies before improvements were made counted over 1,200 by 1990.

Plant Recovery

Almost half of all listed species in the United States are plants, many of which are victims of land and agricultural development. In addition, rare, showy, or unusual plants are often illegally sought by collectors or unscrupulous dealers. Recovery efforts for listed plant species are under way in almost every State. Botanical gardens often assist in complex propagation and reintroduction programs. Also, many private landowners have shown their willingness to support conservation measures for endangered plants on their lands.

Some recovery plans for plants can be fairly simple, calling for fencing or for steering activities away from a site. Other recovery efforts are more complex. For example, biologists spent years studying why a rare wildflower in Virginia, the Peter's Mountain mallow, failed to reproduce. They discovered the seeds needed intense heat in order to germinate. In nature, this heat was provided by wild fires, but these were suppressed as people began to settle the area. With the mystery solved, specific management techniques to promote the plant's recovery, including prescribed burning, are now being planned.



Judy Jacobs, U.S. Fish and Wildlife Service

The recovery effort for the endangered Peter's Mountain mallow includes prescribed burning to promote germination.

Other Recovery Efforts

Sometimes a species is crowded out of its habitat through competition with non-native species. This is what happened to the greenback cutthroat trout in Colorado. Biologists, however, were able to clear its native Colorado streams of introduced fish species and release captive-bred wild greenbacks in their old habitat. Today, the population of greenbacks is on the rise.

Introduced predators can also threaten native species. The Aleutian Canada goose, once found nesting throughout the Aleutian Islands in Alaska, proved easy prey for the non-native foxes brought in by commercial fox farmers in the early 1900s. When the goose was listed as endangered in 1967, only 200 were thought to remain. Ensuring fox-free nesting grounds and protecting wintering grounds in Oregon and California has resulted in a dramatic comeback of the species in recent years. That led to the reclassification of the species from endangered to the less critical category of threatened in 1990, as the population approached 6,000.

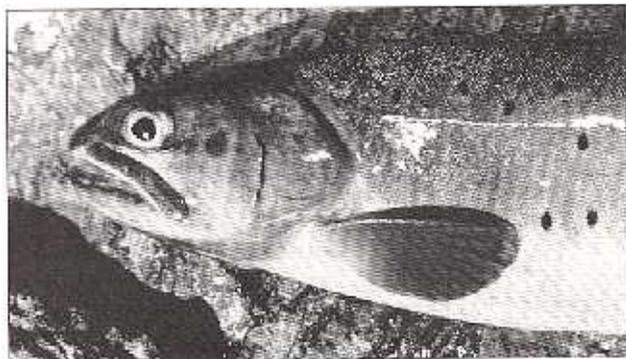


Photo: SWIFTLOW & NIX AND ASSOCIATES



Photo: Luther Gallman, U.S. Fish and Wildlife Service

Top: Greenback cutthroat trout populations are on the rise. Bottom: The Aleutian Canada goose was reclassified from endangered to threatened in 1990.

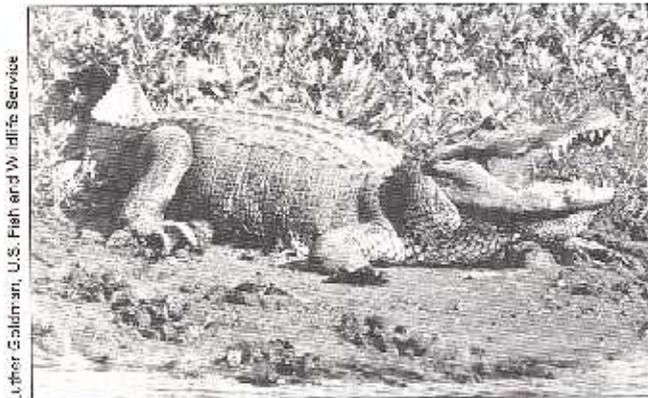


Photo: Luther Gallman, U.S. Fish and Wildlife Service

The American alligator, pronounced fully recovered in 1987, no longer requires Endangered Species Act protection.

For a few species, strict legal protection alone may be the key to recovery. Exploitation for the exotic leather trade once threatened the American alligator. When it was listed as endangered in 1967 under the first endangered species legislation, strict enforcement of commercial harvest prohibitions went into effect. As a result, the species rebounded to such an extent that it no longer requires protection under the Endangered Species Act.

Multi-species Approach

When several species are declining in one area because of habitat loss, sometimes the best approach is to plan the recovery of the entire group of declining species together, focusing attention on the habitat. Protecting the ecosystem containing several endangered or threatened species can also prevent the decline of additional species in the future.

This approach is being used in several States, including Hawaii, Texas, Florida, California, and Nevada. One example can be found in the area containing Ash Meadows National Wildlife Refuge, a spring-fed oasis in the Mojave Desert about 90 miles northwest of Las Vegas, Nevada, that contains at least 32 animal and plant species of special concern, including 12 that are endangered or



Photo: Susan C. Cochrane

The Ash Meadows sunray is one of 12 listed species covered under the Ash Meadows Species Recovery Plan. The plan covers four fish species, an insect, and several plant species.

threatened. One recovery plan was written to address all of these species together, focusing on preserving the unique ecosystem that supports them.

Not Always Easy

For hundreds of species threatened with extensive habitat destruction or alteration, recovery may not be simple. For example, many species of freshwater mussels, once abundant in the United States, are now declining primarily because of water pollution and siltation. These declines are indicators of a larger problem, the general decline of water quality in many U.S. rivers. Further complicating this is the accidental introduction of exotic species that compete with the native mussels.

Development, recreation, industrial, and agricultural practices have taken their toll on numerous plant and wildlife species over the years. For many endangered and threatened species to attain full and sustained recovery, the larger issue of general environmental quality will have to be addressed.



Donal Schlessner



Robert C. Mueser/TUMBUK AND ASSOCIATES

Top: Introduction of exotic species can have a devastating effect on wildlife. Here, a native freshwater mussel is encrusted with exotic zebra mussels from Europe.

Bottom: Recreation and development take their toll on wildlife. Piping plovers are threatened by human disturbance of their nesting habitat along beaches and sandbars.

For Some, Protection Came Too Late

Some plants and animals have vanished in spite of efforts to preserve them. The last dusky seaside sparrow, for example, died in 1987. The dusky was one of several subspecies of seaside sparrows that have suffered from extensive loss of coastal salt marsh habitat. Ensuring suitable habitat for the thousands of plants and animals whose future is uncertain holds the greatest hope for their survival.



Dusky seaside sparrow

P. W. Sykes, U.S. Fish and Wildlife Service

Cooperation With the States

The States play a very important role in conserving endangered and threatened species. All 50 State natural resource agencies have entered into cooperative agreements with the Service, making them eligible to receive Federal financial assistance for their own endangered species conservation programs. Under this matching funds program, the States have been able to greatly increase their efforts to conserve endangered and threatened species—stepping up habitat protection, research, enforcement, and other activities.

Permits

The Service's Office of Management Authority can issue permits for certain activities involving endangered or threatened species. By law, permits for endangered species are issued only for conservation purposes or for "incidental take" in connection with otherwise lawful activities. In addition to these purposes, permits for threatened species may be issued for educational activities, zoo exhibition, and other special purposes.

The Service also works with more than 100 nations that are party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to foster cooperation in international conservation programs.

Commercial trade in wildlife products is regulated among CITES member nations through a permit system which seeks



Steve H. Hebrant, U.S. Fish and Wildlife Service

Confiscated endangered species products.

to eliminate illegal trade in products made from endangered or CITES-listed species.

What You Can Do To Help

You can help brighten the future for animals and plants by learning more about endangered and threatened species and how they are protected:

- Find out which species in your area are endangered or threatened by writing your State wildlife or conservation department. Be informed about other wildlife and conservation issues in your area and tell others about what you have learned.
- Visit one of the more than 470 National Wildlife Refuges. Become a volunteer or help out on special projects at a refuge near your home.
- Join a conservation group; many have local chapters.
- Check the law before buying wildlife products. Before traveling overseas, write the U.S. Fish and Wildlife Service, Publications, 130 Arlington Square, Washington, DC 20240, for a copy of *Buyer Beware* and *Facts About Federal Wildlife Laws*.
- Report violations of wildlife laws to your local game warden. Many States have a special "hotline" number for this. Sometimes, providing information leading to a conviction can result in a cash reward.
- Set an example by recycling and being careful not to litter. Some kinds of litter such as balloons, discarded fishing line, and plastic 6-pack rings can suffocate, entrap or strangle wildlife. Participate in clean-up projects, or start your own.

- Avoid using unnecessary lawn and garden chemicals, improper disposal of household chemicals, and causing water pollution or erosion of any kind.

- Buy a Federal Duck Stamp at your local post office. By law, money from Duck Stamp sales goes directly into a special fund used only to buy prime wetland habitat. A great variety of wildlife, including many endangered species, depends on wetlands.

- Plan a vacation around observing wildlife in its natural habitat, such as a marsh or forest. Look for State, Federal, or private wildlife conservation areas near your destination.
- Please do not throw this publication away! If you do not intend to keep it, give it to a friend, or donate it to a school or library.



U.S. Fish and Wildlife Service

The Migratory Bird Hunting and Conservation Stamp, popularly known as the Duck Stamp, is available at most U.S. Post Offices. Stamp revenue is used to buy prime wetland habitat.

Front Cover Photographs



Brown pelican: The southeastern population of the brown pelican was taken off the list of endangered and threatened species in 1985 due to recovery. Other populations of the species remain endangered. (U.S. Fish and Wildlife Service photo)



Mountain golden heather: This North Carolina plant was considered extinct until it was rediscovered in 1978. It was listed as threatened in 1980. (U.S. Fish and Wildlife Service photo)



Black-footed ferret: Once considered the rarest mammal in the country, this endangered species has benefitted from a captive breeding program. With captive populations exceeding 200, reintroduction plans are now under way. (Franz Camenzind)

How You Can Help Protect Sea Turtles During Nesting Season

- Minimize beachfront lighting during the sea turtle nesting season by turning off, shielding, or redirecting lights away from the beach.
- Close blinds and draperies in oceanfront rooms at night to keep indoor lighting from reaching the beach.
- Remove recreational equipment, such as lounge chairs, cabanas, umbrellas, and boats, from the beach at night. These items can deter nesting attempts and prevent hatchlings from reaching the ocean.
- Do not to construct beach campfires during nesting season. Sea turtle hatchlings are attracted to the light and may crawl into fires and die.
- Use your natural vision and moonlight when walking on the beach at night.
- If you encounter a turtle on the beach at night, remain quiet, still and at a distance. Flash photography and human disturbance may prevent her from nesting successfully.
- Leave the tracks left by turtles undisturbed. Researchers use the tracks to identify the species of turtle that nested and to find and mark the nests for protection. If you encounter a sea turtle nest or hatchlings, leave the eggs and baby turtles alone.
- Properly dispose of your garbage. Turtles may mistake plastic bags, styrofoam, and trash floating in the water as food and die when this trash blocks their intestines.
- Celebrate events without the use of helium balloon releases. Like plastic trash, balloons end up in the ocean, especially when released near the coast. Sea turtles mistakenly eat the balloons and die.

All six sea turtle species nesting on U.S. beaches or found in U.S. waters are designated as threatened or endangered under the U.S. Endangered Species Act (ESA).

How You Can Help Protect Sea Turtles All Year Long

- Avoid trampling beach vegetation. Use boardwalks when available instead of walking over dunes. Natural vegetation stabilizes sand and reduces beach erosion.
- When boating, stay alert and avoid sea turtles. Propeller and collision impacts from boats and ships can result in injury and death of sea turtles. Also, stay in channels and avoid running in seagrass beds to protect this important habitat from prop scarring and damage.
- Avoid anchoring boats in seagrass beds and coral reefs which serve as important feeding and resting habitats for sea turtles.

For more information about sea turtles contact:

National Sea Turtle Coordinator
U.S. Fish and Wildlife Service
6620 Southpoint Drive South
Suite 810
Jacksonville, FL 32216
904/292-2580



Protection Under the Endangered Species Act

All six sea turtles nesting on U.S. beaches or found in U.S. waters are designated as threatened or endangered under the U.S. Endangered Species Act (ESA). Endangered status means a species is considered in danger of extinction throughout all or a significant portion of its range. Threatened means that a species is likely to become endangered. The ESA provides penalties for taking, harassing or harming sea turtles and affords some protection for their habitat.

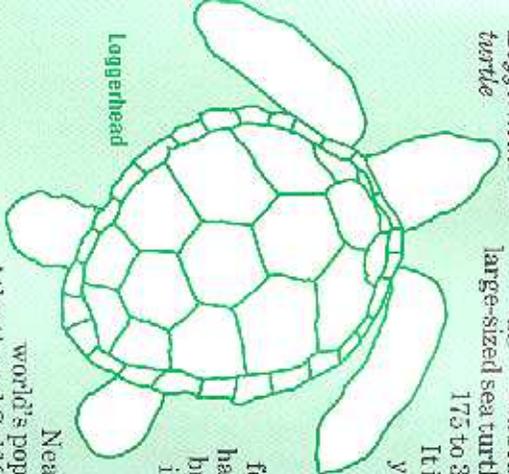
You Can Help Protect Sea Turtles



Sea turtles are among the largest living reptiles. Most species have scales and a bony shell and all species are cold-blooded, breathe air, and lay their eggs on land. Sea turtles are found throughout the world in temperate and tropical waters. Six species of sea turtles nest on U.S. beaches or are found in U.S. waters.

Loggerhead sea turtle

The loggerhead sea turtle is a medium to large-sized sea turtle usually weighing 175 to 300 pounds as adults.

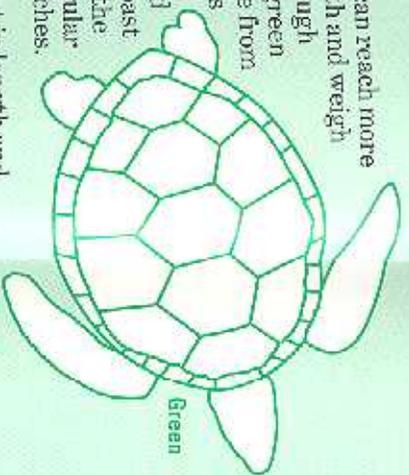


Loggerhead

It is reddish brown to yellow in color and has a large head. An adult loggerhead is two and one-half to three and one-half feet long. Loggerhead hatchlings are dull brown to rusty brown in color. Loggerheads are the most common sea turtles in U.S. waters. Nearly a third of the world's population nests along Atlantic and Gulf Coast beaches.

Green sea turtle

An adult green turtle can reach more than three feet in length and weigh 300 to 400 pounds. Though brownish in color, the green sea turtle gets its name from the greenish color of its fat, called carapine.



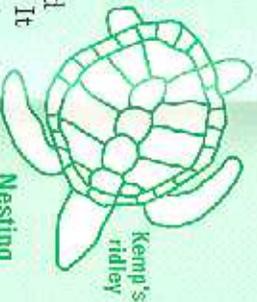
Green

Green turtles are found along both the East Coast and the West Coast of the United States with regular nesting on Florida beaches.

Leatherback sea turtle

Growing up to eight feet in length and weighing up to 2,000 pounds, the leatherback is the largest living turtle.

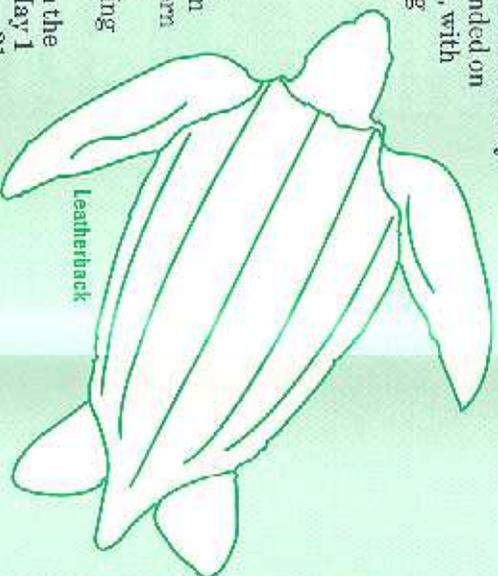
This turtle is unique in that its shell lacks scales. Instead it is composed of a mosaic of small bones covered by firm, rubbery skin with seven longitudinal ridges or keels. Leatherbacks are seen along the East Coast, and occasionally are found stranded on the Gulf Coast, with regular nesting on Florida beaches.



Kemp's ridley

Nesting and Hatching Habits

Loggerheads are the most common species of sea turtle to nest in the southeastern United States. The peak nesting season for loggerheads in the Southeast is May 1 through October 31.



Leatherback

During the nesting season, adult loggerhead females come ashore to lay their eggs. Females excavate pits using their fore and rear flippers to remove the upper layer of dry sand. Then they use their rear flippers to dig egg chambers in moist sand. Females lay from 100 to 126 white ping-pong ball-sized eggs per nest. They cover the eggs with sand, and return to the water.

Loggerhead sea turtle eggs incubate for about 60 days. Hatchlings then emerge

Kemp's ridley turtle

The Kemp's ridley is a small turtle with adults reaching two to two and one-half feet in length and weighing 80 to 100 pounds. The Kemp's ridley has an oval shell and is usually an olive-gray color.

The Kemp's ridley is the rarest and most endangered of all sea turtles. It occurs mainly in coastal areas of the Gulf of Mexico and along the East Coast.

Olive ridley sea turtle

The olive ridley is a bit larger than the Kemp's but is still a small turtle. Adult olive ridleys may reach three feet in length and will weigh 100 to 110 pounds. The olive ridley is threatened except for the Mexican nesting population which is endangered. Non-nesting individuals are occasionally found in the waters along the Pacific coast of the United States. Nesting populations occur in the eastern Pacific near Mexico.



Hawkshill

Hawkshill sea turtle

The hawkshill turtle is a small to medium-sized turtle. As an adult, it may reach up to three feet in length and weigh 100 to 200 pounds. It gets its name from its distinctive hawk-like beak. Hawkshills have a patterned top shell with overlapping scales. Most U.S. sightings are around Florida and Texas.

Turtles in Trouble

from the nests and scurry toward the water. They spend several days swimming offshore until they reach safety within the protective masses of floating seaweed in areas where ocean currents meet. They eat, sleep and grow there for perhaps up to ten years until they reach a certain size or age at which time they return to coastal waters. As adults, female sea turtles return to the same beaches where they hatched to lay their eggs, often navigating across great expanses of water.

The number of sea turtles worldwide has declined. Human activity is the primary cause. From the time a sea turtle begins life as an egg buried in the sand to a grown adult swimming in the ocean, our human activities are impacting sea turtle survival. Scientists estimate that only one out of 1000 sea turtle hatchlings will make it to adulthood.

In many cases, prime sea turtle nesting sites are also prime real estate. Beaches used for nesting are lost to beachfront development or are disturbed by beach maintenance and recreation. Sea turtle reproduction is reduced when adult female sea turtles are unable to nest, nest in poor habitat, or when eggs and hatchlings die from human beach activity.

Activities in the ocean also threaten sea turtles. Sea turtles lose their lives when they become trapped or tangled in fishing nets, seines and lines. Some are injured or die when they are hit by ships, boats, and jet skis. Plastic bags, styrofoam pieces, balloons, and other trash that floats on the ocean are often mistaken for food and eaten by sea turtles. Ingested trash blocks digestion and can cause death.

At night, both adult female sea turtles and hatching sea turtles are disturbed by artificial light, including street lights, flashlights, flash cameras, and even campfires. Females may not nest and hatchlings may become disoriented heading inland instead of toward the ocean.

Public Service Announcements

Television stations are no longer required to provide a certain amount of free air time for PSAs. However, they will sometimes air PSAs for free during non-prime time hours. The U.S. Fish and Wildlife Service has produced PSAs for sea turtles in VHS format that can be given to the television stations. If you have contacts at a station you may request them to air the PSAs. Call Lorna Patrick or Sandy MacPherson for copies of the PSAs.

You may also want to consider paying for the PSAs to be aired. This is not a cheap proposition but may be needed in some areas. For example: A PSA run 66 times during prime time in Palm Beach County cost \$5,260 in 1999. Another alternative is to seek grant funding to help pay for the PSA air time.

Public Service Announcement (PSA) Text

1. Introduction

Sound: "Sea Turtles Dig the Dark" song (Video South Productions has the song rights)

"Sea turtles dig the dark,
Sea turtles dig the dark,
Turn out the lights,
Turn up your heart,
Sea turtles dig the dark."

Footage: Adult turtle covering her nest (flinging sand with front flippers)

2. Message

Voice Over: Beach lighting confuses sea turtles during the nesting season. Do your part by minimizing lighting near the beach from now through October. Help protect our sea turtles.

Footage: Interior shot of someone turning off a light or pulling drapes closed
Exterior shot of beachfront house/condo with outdoor lights being turned off
Exterior shot of a shield being put on a jelly jar light on a beachfront balcony

3. Closing and Credits

Sound: "Sea Turtles Dig the Dark" song

"Turn out the lights,
Turn up your heart,
Sea turtles dig the dark."

Footage: Hatchlings crawling to the ocean
Fish and Wildlife Service logo



Sea Turtles

Of the six sea turtle species that are found in U.S. waters or that nest on U.S. beaches, all are designated as either threatened or endangered under the Endangered Species Act. *Endangered* status means a species is considered in danger of extinction throughout all or a significant portion of its range; *threatened* means it is likely to become endangered.

Six of the seven sea turtle species are listed as endangered or threatened: green, Kemp's ridley, olive ridley, hawksbill, loggerhead and leatherback sea turtles. Only one species, the flatback sea turtle, is not considered threatened with extinction at this time. Overharvest of eggs for food, intentional killing of adults and immature turtles for their shells and skin, and accidental drowning in commercial fishing gear are primarily responsible for the worldwide decline in sea turtle populations. In addition, coastal residential and resort development has degraded nesting habitat, and pollution of oceans threatens foraging habitat.

Sea turtles are among the largest living reptiles. They have scales and a bony shell, are cold-blooded, breathe air, and lay their eggs on land. Sea turtles are long-lived, although scientists are uncertain exactly how long they live because there is no known way to determine their age.

Unlike the land turtles from which they evolved more than 150 million years ago, sea turtles spend almost their entire lives in the sea. They glide gracefully through the water with flipper-like forelimbs and a streamlined shell. Sea turtles frequently come to the surface to breathe when active, but they can remain underwater for several hours while resting. Leatherbacks can dive to more than 3,000 feet below sea level.

Though most sea turtles live in warm tropical and subtropical waters, leatherbacks are the exception. They travel as far north as Labrador, Canada, and Alaska and as far south as the Cape of Good Hope in Africa and southern New Zealand.

Adult green turtles are *herbivores* (plant-eaters), while all other sea turtles are

carnivores (meat-eaters) or *omnivores* (plant and meat-eaters). Sea turtles do not have teeth; instead, they use their powerful jaws to tear and crush their food. Each species prefers certain food items.

During the nesting season, which in the continental United States occurs between March and October, female sea turtles come ashore to lay their eggs. Females excavate pits using their fore and rear flippers to remove the upper layer of dry sand. Then, with their bodies in the pit, they use their rear flippers to dig egg chambers in moist sand. Females lay from 50 to 160 white eggs, about the size of ping-pong balls, cover the eggs with sand, and return to the water.

The eggs incubate for about 50 to 70 days before hatching at night. The sea turtle hatchlings make their way up through the sand to the surface and then scurry toward the water. Hatchlings spend several days swimming offshore until they reach safety within the protective masses of floating seaweed in areas where ocean currents meet. These areas, called *driftlines*, are rich in food and provide hiding places that conceal juvenile turtles from predators. They drift there for a year or more until they reach a certain size or age at which time they return to nearshore waters. As adults, female sea turtles return to the same beaches where they hatched to lay their eggs, often navigating across great expanses of water.

Today there are still many threats to sea turtles. Sea turtle nests can be destroyed by natural events, such as tidal surges or hurricanes, and the eggs can be lost to predation by raccoons, ghost crabs, and other animals. Although adult sea turtles have few natural predators, sharks and killer whales are known to prey on them. Unlike land turtles, sea turtles cannot protect themselves by pulling their head inside their shell.

Human activity is the primary cause of the decline in sea turtles. Modification to nesting areas can have a devastating effect on sea turtle populations. In many cases, prime sea turtle nesting sites also are prime real

estate. If a nesting site has been disturbed or destroyed, female turtles may nest in inferior locations where the hatchlings are less likely to survive, or they may not lay any eggs at all.

Artificial lighting from developed beachfront areas often disorients nesting females and hatchling sea turtles, causing them to head inland by mistake. This leaves them vulnerable to predation, exhaustion, desiccation or being crushed by vehicles. Adult females also may avoid brightly lit areas that would otherwise provide suitable nesting sites.

Beach driving is another major threat to sea turtles. Headlights and movement of vehicles on the beach at night can deter female turtles from coming ashore to nest. Often, vehicles collide with turtles at night. Also, vehicles on the beach can leave tire tracks in the sand deep enough to prevent hatchlings from taking a direct route from the beach to the ocean and leaving them vulnerable to depredation, desiccation and exhaustion. Vehicles running over nests may harm egg development.

Activities in the open water also threaten sea turtles. Sea turtles may become entrapped in commercial fishing nets and shrimp trawls and caught on hook and line fishing gear. Although turtles can hold their breath for long periods, stress and activity from trying to escape from fishing gear shortens this time and often results in death. Sea turtles surfacing to breathe may be killed or injured by ships, small boats and jet skis.

Commercial exploitation of sea turtles for food and leather products has led to the collapse of many populations. International trade in sea turtle shells has been a major factor in the decline of hawksbill populations around the world. Between 1970 and 1989, more than 1.2 million hawksbills were killed for their shells, which are used to make combs, brushes, jewelry and other ornamental items.

Sea turtles often mistake balloons, plastic pieces and other debris for food they normally eat. Consuming this marine debris

can lead to nutritional problems and death. Many sea turtles, particularly those in Florida and Hawaii, are afflicted with a disease called *fibropapillomatosis*. This disease can cause large tumors on the turtle's skin, eyes and mouth, and sometimes affects internal organs. Turtles with heavy tumor burdens become debilitated and die. Although the disease primarily affects green turtles, it is emerging as a serious threat to loggerheads and has been documented in several other sea turtle species as well. Scientists believe that the environmental alteration of sea turtle foraging habitat by pollution and contaminants may also play a role in this disease.

The 1973 Convention on International Trade in Endangered Species regulates the import and export of endangered and threatened species. More than 100 CITES member nations pledged to monitor and reduce trade in sea turtle products.

To protect sea turtles in the southeastern United States, Congress established the Archie Carr National Wildlife Refuge in 1989. Located on two barrier islands off

Florida's eastern shore, the 500-acre refuge includes more than 9 miles of beach. Large numbers of loggerhead and green sea turtle nests are laid in this area, and it also provides nesting habitat for leatherbacks.

The U.S. Fish and Wildlife Service, with the assistance of state conservation agencies, educates beachfront property owners about the threats to sea turtles and their nesting sites and some communities now restrict or prohibit beachfront lighting during sea turtle nesting season.

Since many sea turtle species swim through international waters and nest on beaches outside the U.S., sea turtle conservation requires global cooperation. For example, Kemp's ridleys and loggerheads often are caught in shrimp trawls in the Gulf of Mexico. Currently, U.S. and Mexican regulations require all shrimpers to use turtle excluder devices, which provide an escape hatch for trapped turtles.

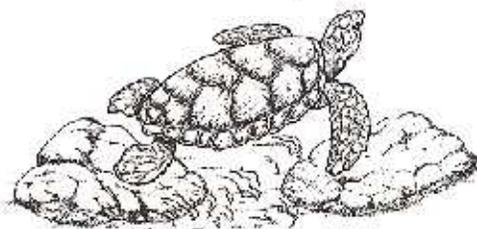
Cooperation between the U.S. Fish and Wildlife Service, National Marine Fisheries Service and the Mexican government now

protects the only major Kemp's ridley nesting site in the world. This beach is located along the Gulf of Mexico near the village of Rancho Nuevo. While nearly 40,000 female Kemp's ridley sea turtles came ashore on this beach in 1947, only 200 were observed nesting by 1978. Today, because of protection of nesting females and their nests and the use of turtle excluder devices in the shrimp fisheries of both Mexico and the United States, there are an estimated 1,500 nesting females.

Biologists once relied on tagging as a means to determine where and how far sea turtles migrate. Metal or plastic tags, placed on a flipper or on the shell, included instructions for reporting the date and location of a sighting. Today, researchers use satellite tracking devices to study migration. Sea turtles are outfitted with a small transmitter that sends a signal to a satellite orbiting the earth. Computers on board the satellite calculate the location of the turtle and send the data back to the earth for researchers to study.

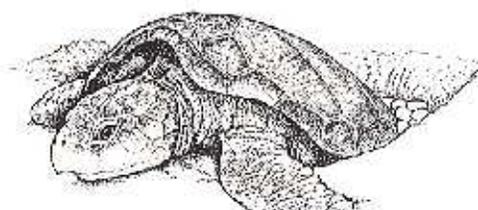
Loggerhead turtle

The loggerhead turtle is the most abundant nesting sea turtle in the southeastern U.S. It is reddish brown to yellow in color and has a large head. The adult loggerhead is 2½ to 3½ feet long and weighs 150 to 400 pounds. Loggerheads feed primarily on mollusks and crustaceans.



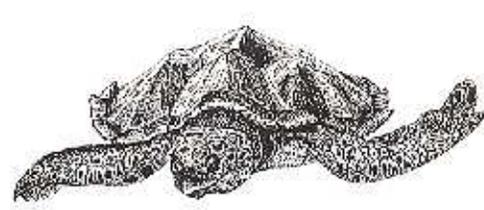
Kemp's ridley turtle

The Kemp's ridley turtle, the rarest and most endangered of all sea turtles, is also the smallest with adults reaching 2 to 2½ feet in length and weighing 80 to 100 pounds. The Kemp's ridley has an oval shell and is usually olive-gray in color. Its diet consists primarily of crabs. Unlike most other sea turtle species, the Kemp's ridley nests primarily during the daytime.



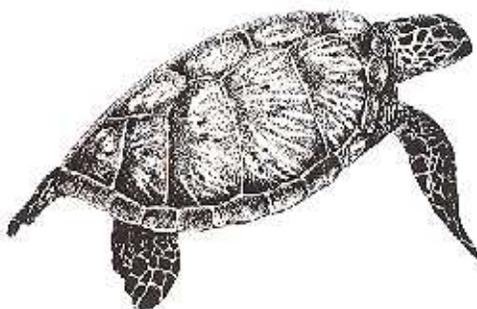
Hawksbill turtle

The hawksbill turtle has a distinctive hawk-like beak and a pattered top shell with overlapping scales. As an adult, it may reach up to 3 feet in length and weigh 100 to 200 pounds. It is able to climb over reefs and rocks to nest in beach vegetation. The hawksbill feeds primarily on sponges and is most often associated with the coral reef community.



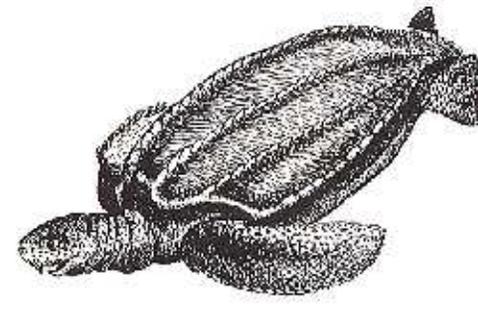
Green turtle

The green turtle can reach more than 3 feet in length and weigh 300 to 400 pounds as an adult. Though brownish in color, its name comes from the greenish color of its fat, called calipee, which was used to make turtle soup. Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and algae.



Leatherback turtle

The leatherback, at 4 to 8 feet in length and 700 to 2,000 pounds as an adult, is the largest of the sea turtles. Its shell is composed of a mosaic of small bones covered by firm, rubbery skin with seven longitudinal ridges or keels. Jellyfish are the main staple of its diet.



Why Save Endangered Species?



Cover: The peregrine falcon, a magnificent raptor that can dive for its prey at speeds up to 200 miles per hour, pointed out the dangers of DDT when the poison brought two subspecies to the brink of extinction.



Dr. Keller

**Department
of the Interior
U.S. Fish
and Wildlife
Service**

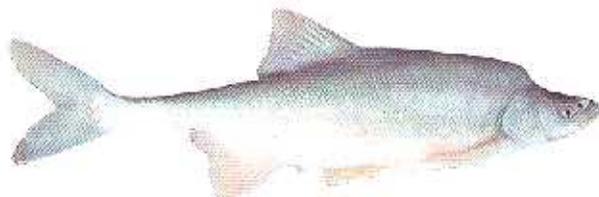
Why Save Endangered Species?

Since life began on this planet, countless creatures have come and gone—rendered extinct by naturally changing physical and biological conditions.

If extinction is sometimes part of the natural order, and if many other species remain, some people ask: "Why save endangered species? What makes these animals and plants so special that money and effort should be spent to conserve them?"

Congress addressed these questions in the preamble to the Endangered Species Act of 1973, recognizing that endangered species of fish, wildlife, and plants "are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people." In this statement, Congress was summarizing a number of convincing arguments advanced by scientists, conservationists, and others who are greatly concerned by the disappearance of unique creatures.

Unfortunately, we can no longer attribute the accelerating decline of our wild animals and plants to "natural" processes. Biologists know that today's danger to wildlife most often results from habitat



The Colorado River system once contained some of the most turbulent waters on earth, and fishes like the humpback chub evolved unique shapes to gain stability in the rough currents. Today, after construction of over 20 dams, only a few short stretches of this unique habitat remains, and this fish is endangered.

degradation, environmental pollution, the introduction of exotic (non-native) organisms, and exploitation—all generally as a direct result of human activities.

Although conservation efforts have begun in recent years, mankind is still exterminating entire species at an ever-increasing rate. Since the Pilgrims landed at Plymouth Rock in 1620, more than 500 species, subspecies, and varieties of our Nation's plants and animals have become extinct—lost forever. (By contrast, during the 3,000 years of the Pleistocene Ice Age, all of North America lost only about three species every 100 years.) The situation today is even worse in other parts of the world.

The Benefits of Natural Diversity

No creature exists in a vacuum. All living things are part of a complex, delicately balanced network called the biosphere. It is composed of ecosystems, the study of which includes the set of interrelationships between plants and animals and their physical environment. The removal of a single species can set off a chain reaction affecting many others. It has been estimated, for example, that a disappearing plant can take with it up to 30 other species, including insects, higher animals, and even other plants. The full significance of an



Freshwater mollusks like this endangered Higgin's Eye mussel feed by filtering particles out of the water. Toxic substances accumulate in the body tissues, making these animals valuable as natural monitors of water quality.

extinction is not always readily apparent; much remains to be learned, and the full long-term impacts are difficult to predict.

Medicine. Each living thing contains a unique reservoir of genetic material that has evolved over eons of time, and cannot be retrieved or duplicated if lost. Scientists have partially investigated so far only a small fraction of the world's species and have begun to unravel a few of their chemical secrets to determine possible benefits to mankind. No matter how small or obscure a species, it could one day be of direct aid to all of us. It was "only" a fungus that gave us penicillin, and certain plants have yielded substances used in drugs to treat heart disease, cancer, and a variety of other serious illnesses. At least a quarter of all prescriptions written annually in the United States contain chemicals discovered in plants and animals. If these organisms had been destroyed before their chemistries were known, their secrets would have died with them.

Agriculture. Many seemingly insignificant forms of life are beginning to show important utilitarian benefits in areas such as agriculture. Some farmers are beginning to use insects and other animals that compete with or prey on certain crop pests, as well as using plants containing natural-toxin compounds that repel harmful insects. These are called "biological controls," and in many cases they are a safe, effective, and less expensive alternative to synthetic chemicals.

Thomas Jefferson once wrote that "the greatest service which can be rendered any country is to add a useful plant to its culture, especially a breadgrain." It has been estimated that there are almost 80,000 species of edible plants, of which fewer than 20 produce 90 percent of the world's food. If under-utilized species are conserved, they could help to feed growing populations. One grain native to the Great Lakes States, Indian wild rice, is superior in protein to most domesticated rice, and

its increasing commercial production is earning millions of dollars annually. Crossing it with a related but endangered species, Texas wild-rice, could perhaps result in a strain adaptable to other regions. Plant collectors are now seeking out remaining wild strains of many common crops, such as wheat and corn, for work on new hybrids more resistant to crop diseases, pests, and marginal climatic conditions.

Industry is also increasingly making use of wild plants. Two species in particular that show important potential are the jojoba and the guayule. The jojoba produces an oil with many unique properties that are suitable for a variety of industrial processes. In the past, the only comparable oil was derived from the sperm whale, but over harvesting has brought this great marine mammal to the brink of extinction. The guayule is a shrub containing high amounts of natural rubber, as well as a resin rich in other valuable substances. Both plants grow in the deserts of the southwestern United States, giving economic value to lands not suitable for other agricultural purposes, and they could provide domestic sources of products that would otherwise have to be imported.



The Texas wild-rice could someday be used to make other strains more productive.

Environmental Monitors. Many individual species are uniquely important as indicators of environmental quality. The rapid decline in bald eagles and peregrine falcons was a dramatic warning of the dangers of DDT—a strong, once widely used pesticide that accumulates in body tissues. (Its effect on these birds was to hamper fertility and egg-hatching success.) In another example, certain plants, such as the eastern white pine, are particularly good indicators of excess ozone, sulfur dioxide, and other air pollutants. If it were not for species like these, we may not have known about the effects of some contaminants until more damage was done.

Aside from the more concrete reasons for preserving endangered species, moral considerations are often mentioned. Many people believe that every creature, after adapting for thousands or even millions of years to fit a constantly changing environment, has an intrinsic right to exist. Exterminating other forms of life, they say, would not only be shortsighted, but wrong—especially since the species could never be replaced. Mankind would also be the loser; being accustomed to diversity in nature, the quality of human life would be diminished.

Ecosystems under Pressure

Hawaii is a classic example of an ecosystem unbalanced by man. In 1794, Western explorers introduced cattle and sheep to the islands, and later horses and goats, which were allowed to multiply and run wild. During the 1800's, herds of these and other livestock animals moved into the forests and, by destroying many native plants through overgrazing, degraded the habitat of birds that, in isolation over centuries, had adapted to this delicate island ecosystem. Accidentally introduced rats became serious predators of both sea birds and forest birds, and the misguided importation of the mongoose as a pest control only aggravated the

problem. Human settlement and agriculture, meanwhile, continue to claim wildlife habitat. Today, 29 of Hawaii's endemic birds and its only 2 native mammals are listed as endangered; over 800 of its native plants also are considered jeopardized or possibly extinct, largely because of overgrazing and competition with introduced flora. At least 65 species of animals and 45 plants have disappeared forever.

Not only island environments are under pressure. A portion of the San Marcos River system, in southcentral Texas, contains the only habitat for four endangered and threatened species: the fountain darter and San Marcos gambusia (fishes), the San Marcos salamander, and the Texas wild rice. These organisms have evolved over time to specific habitat elements, and disruption of the fragile aquatic ecosystem could result in their extinction. The precarious status of these and many other rare species is an indication of how little original habitat remains.

Under the Endangered Species Act of 1973, the U.S. Fish and Wildlife Service has primary responsibility to preserve not only jeopardized life, but also the natural resources on which life depends.

The condition of plant and animal species, then, is a gauge to measure how much of our world still supports a healthy environment.



Delaware
11231 P.O.

The Kauai 'akiakia was once considered common, but it may now be extinct due to overgrazing, exotic plants, and introduced predators.

More knowledge of *complete* ecosystems can help us to better understand, and protect, the requirements of all life—including the human species.

Endangered means there is still time, but *extinction* is forever.

How You Can Help

The conservation and recovery of threatened and endangered species is a tremendous and ever-increasing challenge. Through the efforts of the U.S. Fish and Wildlife Service, and its cooperative programs with some States, other governmental agencies, and private conservation groups, many jeopardized creatures now have a better chance of survival. But the assistance of everyone—including private citizens and organizations—is essential; one need not be a scientist or a government official to help.

Here is what you can do:

- Most States have programs to protect rare animals and plants. Write your State fish and game/natural resources department to find out which species are rare in your area, and what is being done to conserve them.
- Visit one of the nearly 400 National Wildlife Refuges near you, where environmental education specialists describe resident wildlife, its needs, and management. Many refuges are now developing programs to encourage volunteer work by the public, including such activities as bird counting and habitat clean-up.
- Don't buy exotic or wild animals as pets, or plants not of cultivated origin. They are often very difficult to keep, and may be protected species.
- Report violations of conservation laws to your local Federal or State authorities.
- Before travelling overseas, write the U.S. Fish and Wildlife Service, Publications Unit, Washington, D.C. 20240, for a copy of "Facts About Federal Wildlife Laws," and lists of protected species, to learn what items cannot be imported.

Good Neighbor OUTDOOR LIGHTING

PRESENTED BY THE NEW ENGLAND LIGHT POLLUTION ADVISORY GROUP (NELPAG) AND SKY & TELESCOPE.

What is good lighting?

Good outdoor lights improve visibility, safety, and a sense of security, while minimizing energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned?

Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the nighttime environment and neighbors' property values. Light directed uselessly above the horizon creates murky skyglow — the "light pollution" that washes out our view of the stars.

Glare Here's the basic rule of thumb: If you can see the bright bulb from a distance, it's a bad light. With a good light, you see lit ground instead of the dazzling bulb. "Glare" is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

Light Trespass Poor outdoor lighting shines onto neighbors' properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

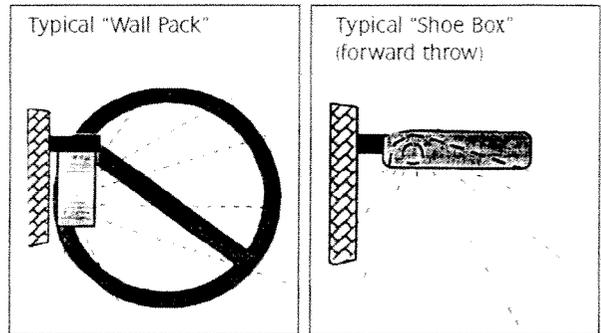
Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

Excess Lighting Some homes and businesses are flooded with much stronger light than is necessary for safety or security.

How do I switch to good lighting?

- 1 Provide only enough light for the task at hand; don't over-light, and don't spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate

Some Good and Bad Light Fixtures

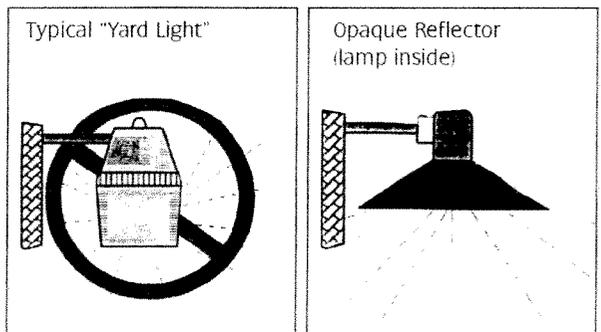


BAD

Waste light goes up and sideways

GOOD

Directs all light down

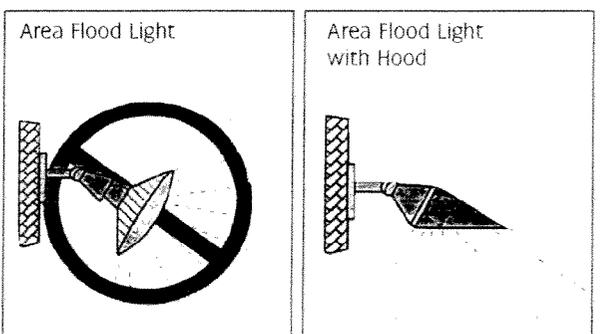


BAD

Waste light goes up and sideways

GOOD

Directs all light down



BAD

Waste light goes up and sideways

GOOD

Directs all light down

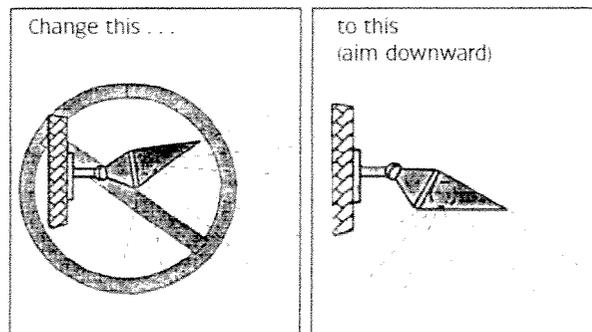
areas 100 times more brightly than the full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbors or polluting the sky.

- 2** Aim lights down. Choose "full-cutoff shielded" fixtures that keep light from going uselessly up or sideways. Full-cutoff fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.
- 3** Install fixtures carefully to maximize their effectiveness on the targeted area and minimize their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night, when you can see where all the rays actually go. Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as well as a wasteful light does with a high-wattage bulb.
- 4** If color discrimination is not important, choose energy-efficient fixtures utilizing yellowish high-pressure sodium (HPS) bulbs. If "white" light is needed, fixtures using compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapor bulbs.
- 5** Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!

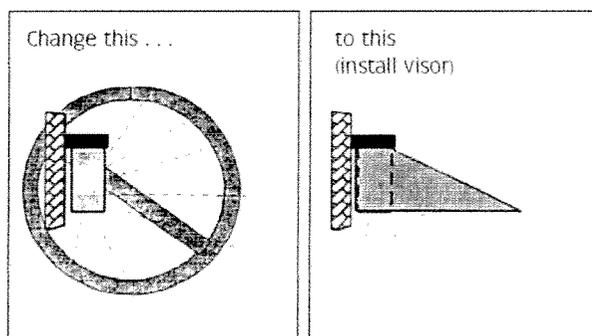
Replace bad lights with good lights.

You'll save energy and money. You'll be a good neighbor. And you'll help preserve our view of the stars.

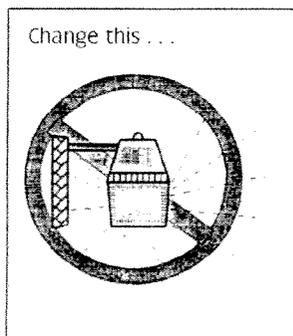
What You Can Do To Modify Existing Fixtures



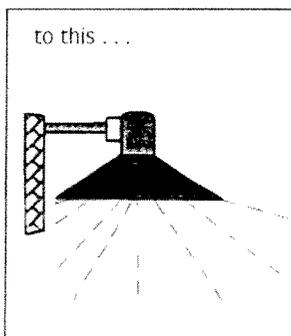
FLOOD LIGHT



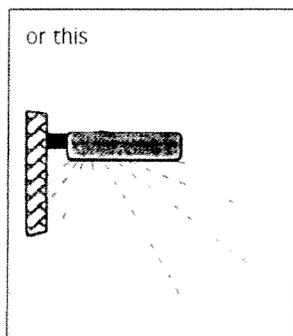
WALL PACK



YARD LIGHT



OPAQUE REFLECTOR



SHOE BOX

Presented by the **New England Light Pollution Advisory Group (NELPAG)** (<http://cfa-www.harvard.edu/cfa/ps/nelpag.html>) and **Sky & Telescope** (<http://SkyandTelescope.com/>). NELPAG and *Sky & Telescope* support the International Dark-Sky Association (IDA) (<http://www.darksky.org/>).

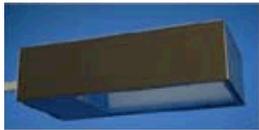
We urge all individuals and groups interested in the problems of light pollution and obtrusive lighting to support the IDA and subscribe to its newsletter. IDA membership costs \$30 per year; send your check to IDA, 3225 N. First Avenue, Tucson, AZ 85719, U.S.A.



Sky Publishing Corp.
49 Bay State Road
Cambridge, MA 02138
SkyandTelescope.com



aeco@americanelectric.com



Model: B Series

Wattage: 1 x 55-180, 2 x 55-180

ARCHITECTURAL LANDSCAPE LIGHTING

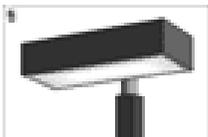
2930 South Fairview Street
Santa Ana CA 92704
800-854-8277
<http://www.allscape.net/>



Model: AL-08
Wattage: 1 x 35-180
Available pole-mount
[Manufacturer's Page](#)



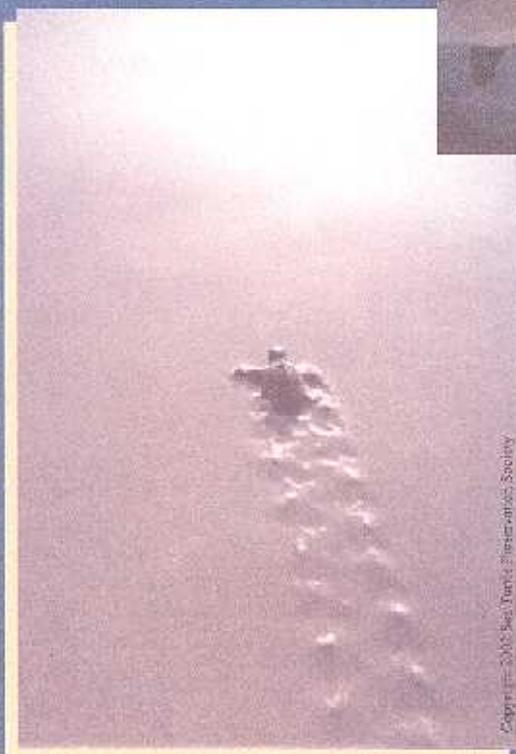
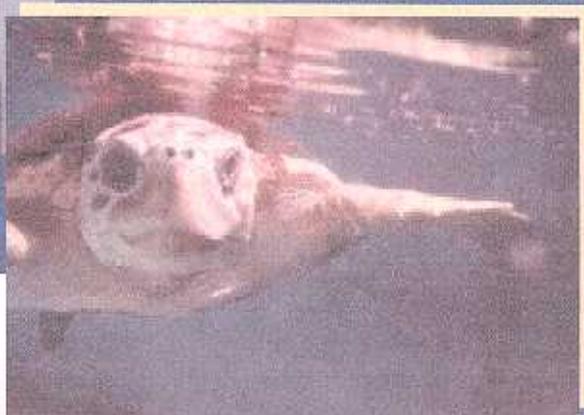
Model: AL-09
Wattage: 1 x 35-180, 2 x 35-90
Available pole-mount
[Manufacturer's Page](#)



Model: AL-10
Wattage: 1 x 35-180, 2 x 35-90
Available pole-mount

Available on the web:
<http://floridaconservation.org/psm/turtles/manual.pdf>

Coastal Roadway Lighting Manual



Copyright © 2002 Sea Turtle Conservation Society

A handbook of practical
guidelines for managing
street lighting to minimize
impacts to sea turtles

May 2002

New Roadway Lighting System being Tested

The FDOT initiated an Embedded Roadway Lighting Demonstration Project in Boca Raton, Florida in June 2001. The project is to test the effectiveness of asphalt-embedded light emitting diodes (LEDs) to see if they will resolve sea turtle lighting disorientation problems while meeting the needs of motorists, pedestrians, and bicyclists. The in-road LEDs are bi-directional and shine from flat plastic disks about the circumference of a grapefruit and are spaced 30 feet apart. Each of these "SmartStuds" rise ¼-inch off the road to delineate the center line (amber) and turn lanes (white). These lights are used to guide jets on runways and lead cars through tunnels in Canada.



Embedded LEDs

Bicycle Lane Lights



Pedestrian Lights

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July 25, 2006

Garrett Lips
Planning and Environmental Management
District 4 - FDOT
3400 West Commercial Blvd
Fort Lauderdale, Florida 33309

RE: Sea Turtle Lighting Issues

Dear Garrett,

I appreciate the opportunity to work together to address roadway lighting affecting nesting sea turtles along Florida's coastline. Over the last few years we have had an excellent opportunity to document which street and roadway lights (fixture styles) cause the most problems for threatened and endangered sea turtles and which fixtures seem to minimize these impacts by carefully balancing human safety and security with habitat protection. The attached specification sheets have been assembled based on research with manufacturers, engineers, biologists, and field inspections so that we can recommend to the FDOT those fixtures that have been documented to meet roadway illumination needs while protecting essential reproductive behaviors of federally listed species.

I have divided these recommendations into an informational format (Problem Fixtures, Temporary Solutions, Long-term Solutions / BAT, and Facing the Future) along with documentation. Where possible, I have tried to include contact information directly with the manufacturer or their engineer who provided our agency with essential technical information, EPA (Effective Projected Area / Wind loading), and photometric data.

Problem Fixtures:



The fixtures that appear above have been documented to cause the deaths and disorientations of threatened and endangered sea turtles. Each of these fixture types share a common trait in that they are very difficult to shield from the beach. They also demonstrate poor photon control. A large percentage of the light generated is wasted in the form of light trespass and glare. They are in order from left to right; globe lights, acorn fixtures, NEMA head, drop lens cobra head, and tear-drop "historic" fixture. EPA for these fixtures varies from 1.4 to 2.11.

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Temporary Solutions:

1) Turning off streetlights

Turning off problem streetlights has been done for a number of years in Florida. While this is very effective for helping reduce sea turtle mortality, it does not address the basic questions of roadway illumination and safety. It does raise the question as to whether some lights are actually needed or not. If the light was deemed to be necessary for safety and liability, turning it off is not viewed as the best long-term solution.

2) Attach shielding to block direct view of the lamp/lens from the nesting beach

Shielding has had various levels of success depending on the fixture/shield combination and the installation. Some shielding is handmade and may void the fixture manufacturer's warranty. Adding shielding may increase the EPA (wind load) of some fixture heads. Add-on shields may alter the photometric footprint of a fixture as well.

Some fixtures allow the possibility of internal shielding (globe lights, acorns, carriage lamps.) These have proven ineffective due to the glowing glass globes. Even clear glass quickly becomes dirty and creates an opaque glow visible laterally up and down the beach. Adding more internal louvers and shielding to try and block this light makes the fixture even less efficient as roadway and pedestrian lighting.



Some shielding has proven to be highly effective. The above NEMA Head streetlight by G.E. has been shielded with a G.E. Skygard®. This shield does not void the manufacturer's warranty. It does not increase the EPA (windload) because it simply replaces the existing glass lens. It actually improves the photometric footprint by re-directing wasted photons onto the roadway. The FWCC is currently offering these shields from Hubble, G.E. and RAB for free to coastal communities as part of a proactive loan program temporarily shielding problem NEMA Head lights.

3) Flat-lens cobra head / Flat-lens cobra head w/amber filter

These fixtures offer a significant improvement in photon control over a standard drop-lens cobra head fixture. Florida Power & Light, Progress Energy, and Gulf Power have installed these fixtures adjacent to sea turtle nesting beaches in order to test their effectiveness. Flat lens cobra heads offer a reduced EPA and an immediate benefit to drivers by reducing glare. Unfortunately, a significant number of sea turtle disorientations and deaths have been documented directly to these fixtures.

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Documentation of disorientation / misorientation events resulting in the deaths of threatened and endangered sea turtles has caused these fixtures to no longer be considered meeting the standard for BAT (Best Available Technology.) However, when appropriately shielded, these fixtures are considered an improvement and are strongly recommended for use when not in direct line-of-sight of the beach or directly adjacent to known nesting habitat (e.g. street ends.)

Long-Term Solutions and Best Available Technology:

1) Embedded Roadway Lights / LED Crosswalks



The demonstration project in Boca Raton for the use of embedded roadway lighting as "roadway delineation" has been documented to be highly effective in reducing or eliminating sea turtle mortality without sacrificing safety. This type of technology cannot be used for every coastal roadway but where appropriate, these lights are highly recommended. The use of Amber LED technology for crosswalks where parking lots are located on the landward side of the road has also been studied. LED Crosswalk technology is highly recommended to replace streetlights without sacrificing human safety. (See attached study; Do Embedded Roadway Lights Protect Sea Turtles?)

2) Full cut-off / cut-off low-pressure sodium fixtures

With the possible exception of the above amber or red LED (light emitting diode) technology, low-pressure sodium is currently the best available, proven technology for balancing human safety and security, roadway illumination, and endangered species protection. The FWCC has documented that LPS provides the most energy efficient, monochromatic, long-wavelength, dark sky friendly, environmentally sensitive light of the commercially available streetlights. Testing on nesting beaches throughout Florida has provided extensive documentation of the benefits of LPS street and parking lot lights.

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Dr. Blair Witherington, FWCC, has prepared some answers to the most common concerns about implementing LPS streetlights:



Aren't there too many disadvantages to using low-pressure sodium-vapor lighting to protect sea turtles?
As is true for any light source, there are both advantages and disadvantages to using low-pressure sodium-vapor (LPS) lighting. The following is a list of issues specific to LPS.

- Expense—The initial costs of LPS are substantially higher than for incandescent and fluorescent sources but are only slightly higher than costs for high-intensity discharge lighting (e.g., HPS). Operating costs, however, are generally much lower for LPS than for any other commercial source.

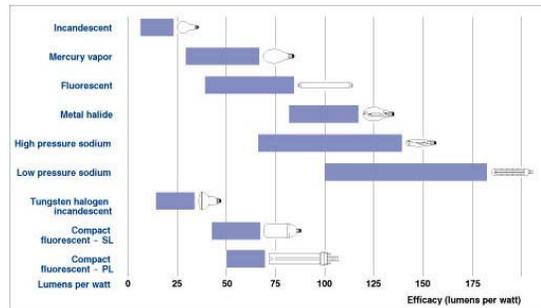


Figure 1 - The energy performance of lamps is expressed as efficacy which is a measure of light output, in lumens, per watt of electrical input (lumens per watt). The efficacy of a regular incandescent light bulb is only a fraction of the efficacy of a fluorescent bulb.

- Color—Because LPS sources are monochromatic, they give poor color rendition. For safety and security applications, however, full-spectrum color is seldom needed. At U.S. Air Force installations near nesting beaches in Florida (areas certain to have rigorous security requirements), most outside security areas are lighted by LPS sources.
- Disposal—The lamps within LPS luminaires contain elemental sodium, a substance that can cause fires if not disposed of carefully. However, unlike the mercury-containing high-intensity discharge lamps (e.g., mercury-vapor, high-pressure sodium vapor), the contents of LPS lamps are not toxic.



- Availability—Although LPS luminaires are not as readily available in retail stores as other light sources are, a wide variety of LPS fixtures are available from a number of manufacturers.

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In addition to the above, we heard concerns that LPS would cause an increase in crime, an inability of first response teams to render aid due to the poor color rendition, and finally that low-pressure sodium lamps blow up in Florida's heavy rains.

- Calls to the FDLE and local law enforcement agencies revealed that there has been no documented increase in crime or accidents in areas where LPS streetlights have been installed.
- A call to local paramedics revealed that all first response (police, fire & rescue, paramedics) carry their own light source and do not depend on an accident occurring under a streetlight. There has never been a documented incident in the State of Florida where aid was not rendered to someone because of poor color rendition under LPS lighting.
- NASA provided information on LPS and water. They documented no tendency for LPS to "blow-up" in rain. The picture on the above right was taken in Hilo, Hawaii. This area is documented as having some of the highest rainfall in the United States. They currently use only LPS street lighting due to the nearby astronomical observatories.

The following fixtures are recommended by the FWCC and the State of Florida's Marine Turtle Protection Program (MTPP) as providing the best available technology (BAT) for coastal roadway lighting when kept at 55 to 90 watt LPS lamping. Fixture Specification Sheets are attached:



These following fixtures meet the criteria for Best Available Technology (BAT) by the DOI, USFWS, and FWCC for Wildlife Lighting

Roadway by Visionaire Lighting / Models RDW-1 and RDW-2 / Type III / EPA 1.2 and 1.4
This fixture is highly recommended due to the low profile, excellent optics, low EPA and ease of installation on existing arms and poles.

AL-Series by ALLScape / Models AL-08, AL-09, AI-10 / EPA 1.33 to 1.52
Another excellent fixture that can be used to replace existing cobra heads. The AL-10 model is suitable for many roadway applications even at fairly low mounting heights. All three models are ETL and CETL listed for wet locations.

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Form 10 by GARDCO / Model Form 10 / EPA 1.49

The Form 10 by GARDCO is very popular for LPS applications. GARDCO is a trusted name and the highly specular Alzak aluminum reflectors do a great job of directing the photons allowing for wider pole spacing.

LPS Luminaires by Spaulding Lighting / Models Oakland 3, Dallas and Medallion

EPA 1.4 to 1.9 depending on the model
Spaulding offers three (3) models of LPS streetlights including twin lamp options.

Cypress by LSI Lighting Systems / Model Cypress LPS / Type A / EPA 1.7

The Cypress is a good value with great photometrics. However, the larger shoebox design does carry a slightly high EPA of 1.7.

*The fixture below does not meet one or more criteria of the DOI, USFWS, FWCC
Wildlife Lighting Requirements*

LPS Roadway Series SRP by AEL (American Electric Lighting) / Model SRP 90 / EPA 1.45

This is the only fixture we recommend that is not considered a full cut-off or cut-off by IESNA standards. This fixture is considered semi cut-off. However, this fixture is installed in Brevard County on the Air Force Base and adjacent to known nesting habitat. Surprisingly, these lights have proven to be better at reducing hatchling disorientations than flat lens cobra head fixtures.

The principle advantage to the SRP Fixture is the broad photometric footprint making it suitable for existing pole spacing and desired uniformity. The principle disadvantage is that this fixture may be in violation of local lighting ordinances in some areas.

Facing the Future:

A few technologies are showing promise for a future that balances the needs of the local community with environmental concerns and reduced dependence on foreign oil. Two test projects have been approved in the State of Florida for LED streetlight / parking lot lights. The technology uses only a fraction of the energy, meets desired EPA standards and can be adapted to sea turtle nesting areas by specifying amber or red-orange diodes.



Tri-Lum™ and Econo-Lum™ by MoonCell, Inc.

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The principle advantages are the extremely long bulb life, low power consumption, and greatly reduced maintenance costs in the corrosive coastal environment. The other advantage is the ability to control the wavelength output by specifying long-wavelength diodes in sea turtle nesting areas. The principle disadvantages are the higher initial cost per fixture and the lower lumens output.

The widespread adoption of LED technology will depend, in part, on revised engineering standards for both roadway and environmentally sensitive areas. The IES is currently reconsidering current illumination standards because existing guidelines were developed based on photopic vision rather than the more accurate mesopic and scotopic vision standard occurring during nighttime driving conditions. Adopting this "less-is-more" standard for roadway illumination would open the way for the widespread use of LED street lighting technology. Although the majority of LED streetlights (not in sea turtle nesting areas) would be "bright white" diodes, the more acceptable 900 lumens output will allow the human eye to function more naturally and reduce "skyglow" light pollution in coastal areas. (See attached editorial; 'NumeLiTe' by E.C. Guest, S.A. Mucklejohn & B. Preston, J.B. Rouffet & G. Zissis.)

Thank you for the opportunity to be part of this team. If I can be of further assistance in any way, please don't hesitate to email me at dean.gallagher@myfwc.com or call me directly at (850) 922-4330.

Sincerely,

Dean Gallagher, ES II
Imperiled Species Management Section

cc: Ann L. Broadwell, FDOT
Larry Watson, Progress Energy
Amy Dierolf, Progress Energy
Sandy McPherson, USFWS
Stacy Forrester, FP & L
Lorna Patrick, USFWS
Blair Witherington, Ph.D., FWCC
R. Erik Martin, Ecological Associates, Inc.
Louis Fisher, Broward County
Christian B. Luginbuhl, U.S. Naval Observatory
Mike Richards, Chelco
Sandy Sims, Gulf Power
Robin Finkel, Gulf Power



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San Leandro CA 94577
800-227-0758 / 510-357-6900

<http://www.sitelighting.com/index.cfm>

<http://www.sitelighting.com/Family.cfm?Brand=gar&ProLine=LPS>

Model: Form 10 LPS
Wattage: 1 x 55-180
Available pole- and wall-mount



LED Crosswalk lighting

Gardco

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The Smart Crosswalk

The Gardco/LightGuard Smart Crosswalk System utilizes a series of [signal heads](#) with light emitting diodes (LED) in a durable housing which is embedded in the roadway. The LED's flash, in a unidirectional manner, a warning to approaching motorists that a pedestrian is in, or entering, the crosswalk.

[The Smart Crosswa](#)
[Signal Heads](#)
[Power Control Unit](#)
[System Activation](#)
[Signs](#)
[Specifications](#)

[Catalog \(PDF\)](#)

[Contact Gardco for
more Information](#)

A pedestrian can activate the System by pushing a [button](#), or the system can be [automatically activated](#) when the pedestrian passes through an activation zone breaking an optical beam. The Smart Crosswalk System can be a stand-alone, [solar-powered](#) system or a conventional [AC powered](#) system (AC to DC) with [battery back-up](#).

<http://www.gardcolighting.com/lgshome.cfm?brand=gar>

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Low Pressure Sodium



LPS Arm Mount



LPS Direct Mount



LPS Post Top



LPS Wall Mount

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Gardco Lighting

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800.227.0758 510.357.6900 FAX 510.357.3088

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Genlyte Thomas Group LLC

KIM LIGHTING

SITE / ROADWAY



Solitaire



Curvilinear VL

OK



Structural



Curvilinear WTH/WTV

OK



Era



NeoSphere

OK



The Entablature



Outdoor Tube System

OK

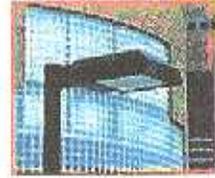


Matrix



EKG Shoebox Luminaires

OK



The Archetype



Type 5 Shoebox Luminaires

OK



Curvilinear

OK

The Ultimate in Architecturally Relevant Outdoor Lighting

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APPLICATIONS

- For outdoor work yards, roadside commercial establishments, suburban developments, rural homes and yards

SPECIFICATION FEATURES

- Complete unit pack in one package standard: includes hood, optical, lamp, PE control, prewired cable and mounting hardware
- Die-cast aluminum hood
- Meets Full Cutoff requirements
- Slipfitter is adjustable for 1-1/4 in. to 2 in. pipe

ORDERING NUMBER LOGIC

PRODUCT IDENT	WATTAGE	LIGHT SOURCE	VOLTAGE	BALLAST TYPE	PE FUNCTION	CABLE	MOUNTING BRACKET	LENS TYPE	LAMP TYPE
XXX SGR = SKYGARD	XX 07 = 70 10 = 100 15 = 150 (55V) 17 = 175	X S = HPS C = Merc	X 1 = 120 3 = 240	X N = NPF Reactor or Lag	X 2 = PE Receptacle 5 = PE Receptacle with PE Control	X 2 = 30-in. (762mm) #16 4 = 5-ft (1.5M/ #14	X L = Long 24-in. (610mm) N = None S = Short	XXXX V5SL = Open Type 5 SKYGARD Latch Type	X C = Clear

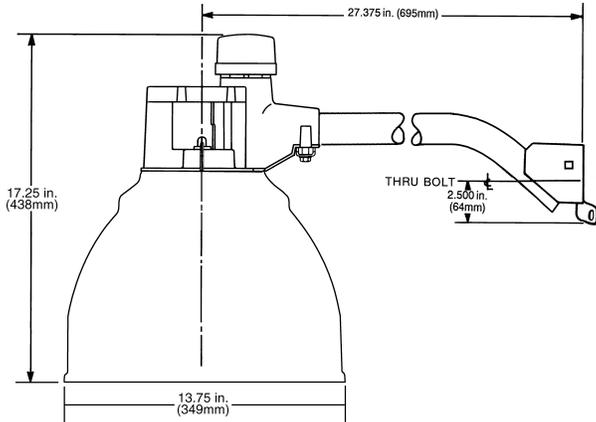
PHOTOMETRIC SELECTION TABLE

Wattage	Light Source	IES Type	Photometric Curve Number 35-
70	HPS	5	452513
100	HPS	5	452512
150	HPS	5	452511
175	Merc	5	452514

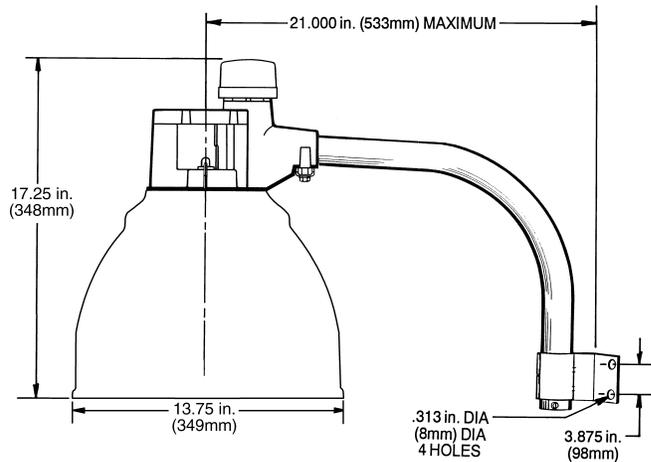
SKYGARD™ 201SA UNIT PACK

FIXTURE DIMENSIONS

LONG MOUNTING BRACKET



SHORT MOUNTING BRACKET



SUGGESTED CATALOG NUMBERS

Opticals Only:	GE Manufacturing Number	
SGR-1	145298	Single Pack
SGR-5	145299	5 Pack - Order as quantity needed in total

Kits with Long Arm, PE, Lamp and Cable included	GE Manufacturing Number	Wattage	Light Source	Voltage
SGR07S1N54LV5SLC	145618	70	HPS	120
SGR10S1N54LV5SLC	145619	100	HPS	120
SGR15S1N54LV5SLC	145620	150	HPS	120
SGR17C1N54LV5SLC	145877	175	Merc	120
SGR17C3N54LV5SLC	145617	175	Merc	240

DATA

Approximate Net Weight			
Short 18 in. (457mm) Mounting Bracket	25 lbs		11 kgs
Long 24 in. (610mm) Mounting Bracket	30 lbs		14 kgs
Effective Projected Area			
	1.4 sq. ft. max		0.13 sq. M max
Suggested Mounting Height			
	12-25 ft.		4-8 M

REFERENCES

See Page R-38 for start of Accessories.
See Page R-42 for Explanation of Options and Other Terms Used.

MONGOOSE®



USE only with Low Pressure Sodium lamps

<http://www.holophane.com/>



The Mongoose Roadway and Area Lighting luminaire offers paramount versatility of applications with advanced optical systems and an aesthetically pleasing design. The ability to configure the Mongoose optics, tilt, and mounting method to meet specific applications enables it to be used in diverse applications ranging from interstates to parking lots. With fourteen optical configurations, including wide roadway,

narrow roadway, medium roadway, forward throw, wide flood, narrow flood, and square distributions and tilts ranging from 0° to 45°, it provides unparalleled solutions for a multitude of lighting requirements. The Mongoose has full cutoff through semi-cutoff distributions providing additional flexibility where required.


HOLOPHANE®
LEADER IN LIGHT TECHNOLOGY

HL 2242 10/02

Information about the Improved Hubbell Skycap from Outdoor Lighting Associates, Inc.

- NEMA head fixtures have a vertically-mounted bulb with the base up, and a cylindrical prismatic refractor/lens made of plastic or glass that tapers inward towards an open bottom. These ubiquitous fixtures produce a great deal of glare and wasted light—between 1/3 and 1/2 of their light is emitted upward and in a nearly horizontal direction.
- Over 10,000,000 streetlights and security lights in the United States are of the standard NEMA head variety. The Skycap reflector replaces the lens assembly on any standard NEMA head. Just unlatch and remove the lens unit, and latch on the Skycap unit. No tools are needed. The Skycap works well for both mercury vapor and high pressure sodium light sources.
- Outdoor Lighting Associates, Inc. adds a centering ring to the basic Hubbell Skycap unit that makes installation easier, provides proper optical alignment, and ensures a firm attachment to the NEMA head in high winds and other adverse weather conditions. We personally inspect and test every unit before shipping. Any substandard or defective units are sent back to Hubbell Lighting, Inc., not to you. NEMA head retrofits are our specialty and primary business. You can be confident that when you buy from us, you will be getting the best NEMA head retrofits available. Our version of the Skycap has the same optical performance as the units purchased directly from Hubbell.
- The optical performance of the Hubbell Skycap is superb. Because the bulb in a NEMA head light is mounted vertically, almost all of the light leaving the bulb reflects off the inner surface of the spun aluminum reflector before reaching the ground. What results is an exceptionally uniform and wide distribution of light on the ground. At a standard mounting height of 25 feet, the Hubbell Skycap effectively lights a circular area 200 feet in diameter. Glare is greatly reduced and direct uplight is totally eliminated. Light trespass onto adjacent properties more than 100 feet away is history. Light levels on the ground are increased by up to 130 percent (45 percent on the average), so the opportunity exists for reduced wattage and thus energy savings (70W HPS instead of 100W HPS, for example).
- When installing the Skycap, it is best to make the NEMA head unit as level as possible. This will give complete horizontal cutoff, minimize glare and light trespass in all directions, and provide an even illumination in all directions.

Outdoor Lighting Associates, Inc. Products & Prices

IMPROVED SKYCAP \$35 each for 1 - 3 units
 \$32 each for 4 - 7 units
 \$30 each for 8 + units

SHIPPING & HANDLING: \$10 per order

SKYCAP SA: We offer a second version of the Skycap called the Skycap SA. The "SA" stands for "small area" and it lights a smaller area than the regular Skycap. Cost is an additional \$5 per unit. Call us for details!

70W HPS COMPLETE SKYCAP PACKAGE: We also offer a complete 70W HPS utility-grade Skycap package for \$120 plus \$10 shipping & handling. This package includes everything you need (complete light fixture, Skycap optics, bulb, ballast, photocontrol, mounting hardware, etc.).

NEW: DPN PHOTOCONTROL FOR HALF-NIGHT LIGHTING! Our standard twist-lock DPN photocontrol turns your light(s) on at dusk and off at dawn on the first night, but every night thereafter the lights are turned off exactly halfway through the night. The DPN automatically keeps track of the times of dusk and dawn as they change throughout the year, always turning the lights off halfway between dusk and dawn. The DPN photocontrol is available with your Skycap Package for an additional \$50, or you may purchase it separately to install on an existing light for \$50 plus \$5 shipping & handling.

SKYCAP NH1204M: We now offer a version of the Skycap that will retrofit the Regent NH-1204M (175W mercury vapor) fixture. Price is the same as our regular improved Hubbell Skycap. Just specify "Skycap NH1204M" when you order so that we send you a unit which includes an additional mounting plate and two self-tapping screws.

LITE-BLOCKER: We also offer a 180° NEMA-head external retrofit shield called the Lite-Blocker, manufactured by Luminaire Technologies, Inc., for \$23 plus \$7 shipping & handling per order. Though we usually recommend the Skycap or Skycap SA because they provide a much better light distribution on the ground, there are situations where the offending light fixture is so close that the only way to solve the problem is by using a blocking shield.

PAYMENT: Check, money order, or institutional purchase order are accepted. Sorry, we do not accept credit cards.

SHIPMENT: Small quantities are in stock, and will be shipped to you immediately upon receipt of your order. Larger quantities will be shipped within 2 weeks. We ship via UPS ground or USPS. If you have a preference, be sure to specify when you place your order. Orders can be shipped C.O.D. for an additional \$6 per order.

For more information, please contact David Oesper at:

Outdoor Lighting Associates, Inc.
1208 Wilson Ave.

Ames, Iowa 50010-5426

Web: <http://members.aol.com/outdoorltg/ola.html>

Phone & Fax: (515) 233-0117 E-mail: OutdoorLtg@aol.com

5/01

NITE-TO-LITE® CUTOFF SERIES

SKYCAP Package

The Nite-To-Lite area cutoff package provides H.I.D. energy savings and safety/security illumination without producing upward light pollution. Its compact, cast aluminum design allows mounting in a variety of applications and provides durable service. The lamp/reflector system produces a wide distribution for maximum coverage. The SKYCAP package redirects wasted upward spill light back onto the area to be illuminated increasing light levels as much as 95% versus refractor style lights. Mounting arms, photocontrols, lamps and hardware are included for a new environmental approach to "dusk to dawn" lighting.

Retrofit optical packages are available to fit existing true NEMA head units.

GENERAL CONSTRUCTION FEATURES:

Die Cast Aluminum Housing — Lightweight, durable, weather resistant. Meets EEL-Nema standards.

Computer Spun Parabolic Aluminum Reflector — High reflectance, exclusive ANODAL® finish. Latch-on optics for ease of installation. Fits all true Nema head units for quick upgrade of existing luminaires.

Porcelain Mogul Socket — Heavy duty socket is equipped with antivibration lamp grips for securing lamp to socket contact. Lamps included.

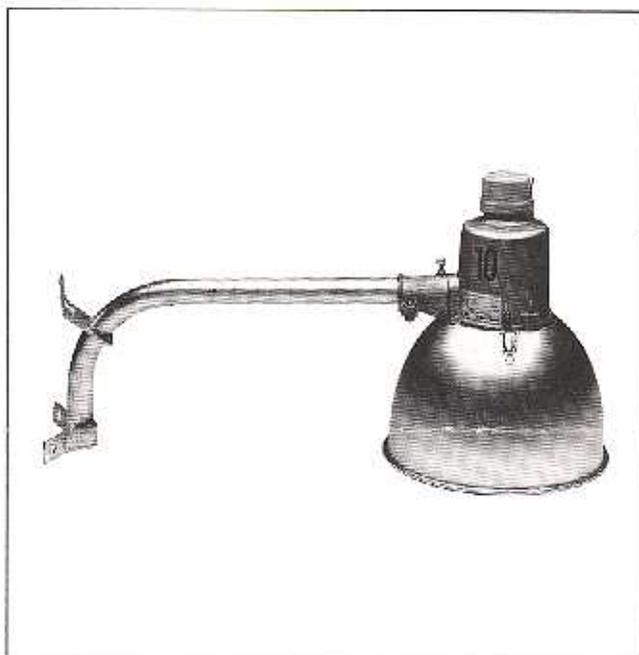
TWIST-LOCK® Photocontrol Receptacle — Rotates for accurate photocell aiming to north. Built in stop controls rotation. Receptacle is U.L. approved. Photocells with arrestors are standard.

Universal Slipfitter Mounting — Two bolt clamp with leveling bolt allows secure mounting to 1 1/4" or 2" pipe brackets.

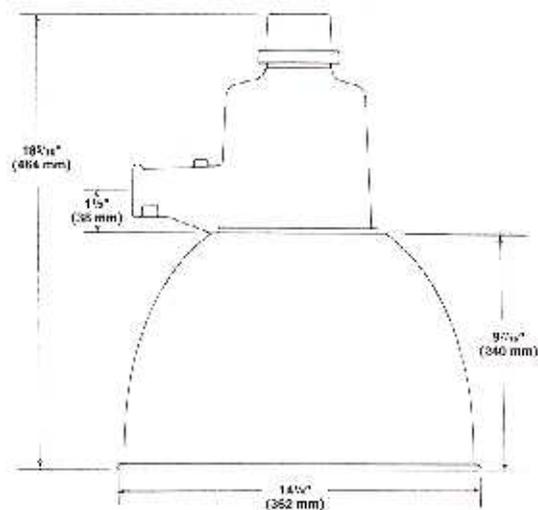
Mounting Arms — "One unit fits all". Kit has 24" curved aluminum arm. Mounting hardware includes two lag screws and one 10' through-bolt.

Ideal Applications — Security areas, storage yards, loading areas, roadway lighting, area lighting, suburban developments, and back yards. Ideally suited where light trespass could be a problem.

Units are designed for wet location applications. IP Suitability IP-02.



DIMENSIONS



Project	
Type	Catalog Number
Remarks	



Lighting, Inc.

ORDERING INFORMATION

NEMA HEAD CUTOFF KIT (SKYCAP Package)

Designed with NEMA interchangeability. Kit includes NEMA head with terminal block, five foot #14 lead wires, lamp, TWIST-LOCK photocontrol receptacle, photocontrol, skycap optics and 24" curved aluminum arm with mounting hardware.

Catalog Number	Watts	Source	Lamp	Volts	Optics	Weight	
						lbs	kgs
NPU-10S1-BI	100	HPS	Clear	120	Cutoff	13	5.94
NPU-17C1-BI	175	Mercury	Coated	120	Cutoff	15	6.86

Carton Size: 14 1/4" x 14 1/4" x 27 3/4"

RETROFIT SKYCAP CUTOFF OPTICS

Designed with NEMA interchangeability, these optical kits hold replacement or retrofit costs to a minimum by allowing the use of existing arm, NEMA head and photocontrol.

Catalog Number	Description	Weight	
		lbs	kgs
NPU-BI	Symmetrical Type V Cutoff Optic	2.5	1.14

Carton Size: 14 1/4" x 14 1/4" x 18 3/4"

Note: Two (2) optics per carton, individual orders accepted.

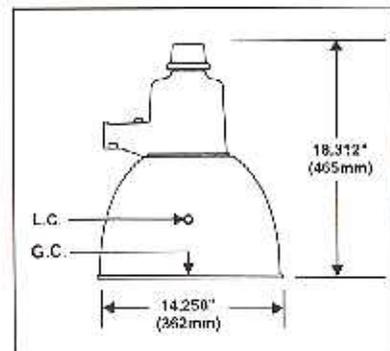
HUBBELL LIGHTING PHOTOMETRIC REPORT

LUMINAIRE

SOCKET POS: FIXED
REFLECTOR: ALUMINUM
DIFFUSE
ENCLOSURE: OPEN

LAMP

TYPE: 100W HPS
ANSI: S54SB-100 I.D.: G-1
FINISH: E-23.5 L.C.L.: 5.0 INCHES
LUMENS: 9500



LIGHT FLUX VALUES		
	LUMENS	PERCENT OF LAMP
DOWNWARD STREETSIDE	3624	38.14
DOWNWARD HOUSESIDE	3624	38.14
UPWARD STREETSIDE	0	.00
UPWARD HOUSESIDE	0	.00
TOTAL	7248	76.28

NPU-10SX-BI

TEST NO: HP-06066

CLASSIFICATION

DISTRIBUTION: N-C
TYPE: V
CONTROL: CUTOFF

GENERAL

Test Distance: 30 FEET

By: _____ Date: 12-14-93

Approved: _____
To approximate performance for similar lamps with different Lumens, multiply Lumens, Lux and Footcandles by this ratio:

RATIO = $\frac{\text{SELECTED LAMP LUMENS}}{9500}$

NPU-BI Replacement/Retrofit Optics



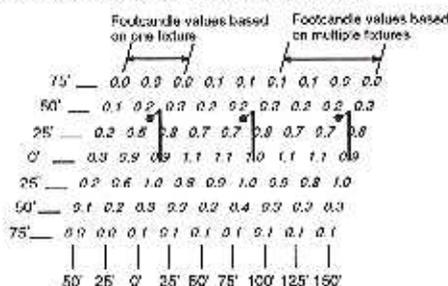
FOOTCANDLE ARRAY DIAGRAM

NPU-10S1-BI

100W HPS

ARRAY BASED ON:

- 25 Ft. Mounting Height
- Data calculated from Test No. HP-06066
- 9500 Lamp Lumens
- Not to Scale. All Values are Initial Footcandles (No LLFI).

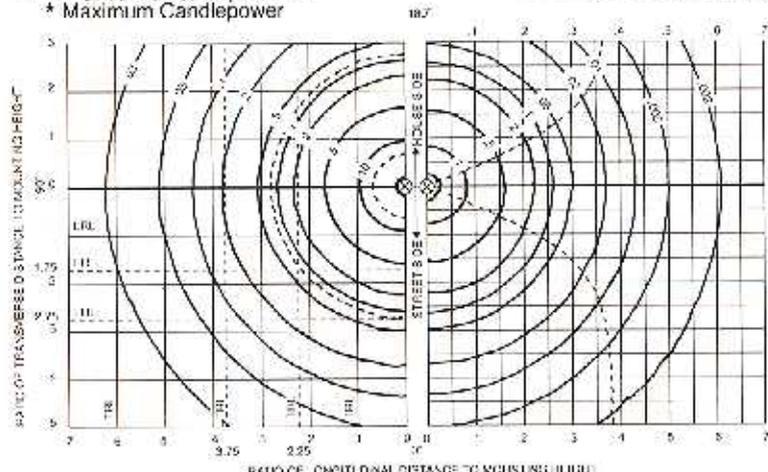


MOUNTING HEIGHT CONVERSION TABLE

Mounting Height (ft.)	Factor
20	1.44
25	1.00
30	0.69

ISOLUX DIAGRAM

MOUNTING HEIGHT: 7.62 METERS
--- Half Maximum Candlepower Trace
* Maximum Candlepower



ISOFOOTCANDLE DIAGRAM

MOUNTING HEIGHT: 25 FEET
--- Coefficient of Utilization Curves

MOUNTING HEIGHT CORRECTION FACTORS						
Mounting Height - Feet	15	20	25	30	35	40
Mounting Height - Meters	4.57	6.10	7.62	9.14	10.67	12.19
Factor	2.78	.56	1.00	.69	.61	.51



Lighting, Inc.

TESTED TO CURRENT IES AND NEMA STANDARDS UNDER STABILIZED LABORATORY CONDITIONS. VARIOUS OPERATING FACTORS CAN CAUSE DIFFERENCES BETWEEN LABORATORY DATA AND ACTUAL FIELD MEASUREMENTS.

Hubbell Lighting, Inc. 2000 Electric Way, Christiansburg, Virginia 24073, (703) 382-6111 • Fax: (703) 382-1526 • Telex: 23-7407719
Hubbell Canada, Inc., 870 Brock Road South, Pickering, Ontario L1W1Z8, (905) 639-1138 • Fax: (905) 639-9108 • Telex: 06-981288
Harvey Hubbell, Ltd., Ronald Close, Woburn Rd. Ind. Estate, Kempston, Bedford, England MK42-7SH • Tel: (44 234) 855444 • Telex: 826065

Skycap® Cut-Off NPU



ORDERING INFORMATION

Skycap® Cut-Off NPU

Security luminaire with controlled light output. Places the light on the ground virtually eliminating light trespass. Performance greater than standard dusk to dawn fixtures

Catalog Number	Description	Watts	Voltage	Weight lbs	Weight kg
NPU-10S1-BI	Complete unit with 24" arm, lamp and photocontrol	100HPS	120	13	5.8
NPU-175CT-BI	Complete unit with 24" arm, lamp and photocontrol	175 Mercury Vapor	120	15	2.3
NPU-BI	Cut-off optical assembly only latches on to NEMA head fixtures	-	-	2.5	1.1

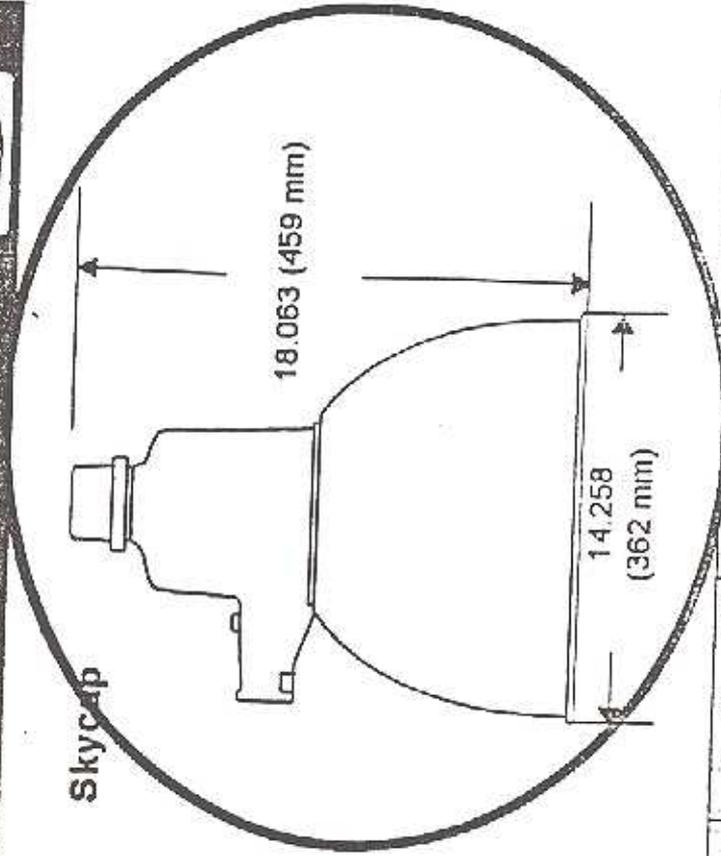
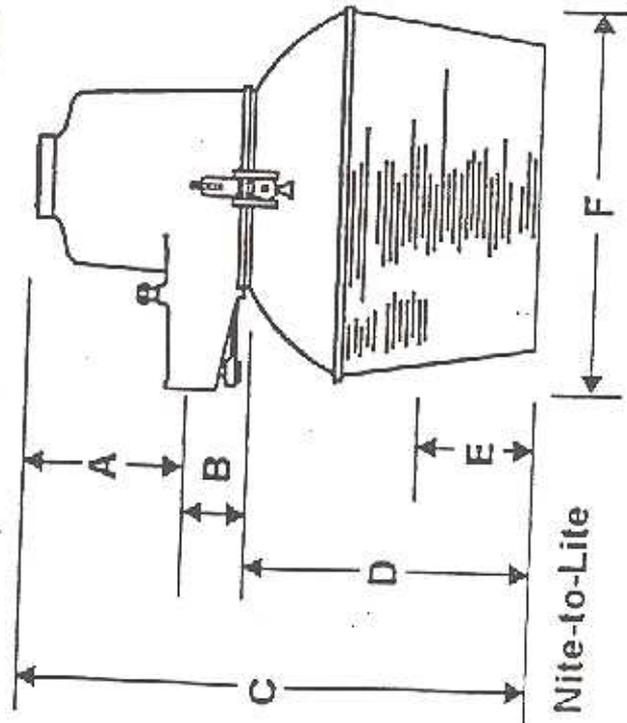
Replacement Photocontrols - Twist-Lock® Cells

Weatherproof Twist-Lock® photocontrol enclosed in high impact butyrate protective housing meets EEI-NEMA and ANSI standards. Use on Twist-Lock® receptacle (PCR)

Catalog Number	Voltage	Max. Watts (H.I.D.)	Arrestor
NPU-PC1P	120	400	YES
NPU-PC3P	120/240	400	YES

Continued

Nite-to-Lite® and Skycap® Series



Dimension	Value	Value	Value	Value	Value
A	B	C	D	E	F
6 7/8"	1 1/2"	17 1/8"	9 3/4"	3 3/4"	12 1/8"
149 mm	36 mm	435 mm	248 mm	95 mm	308 mm

Nite-to-Lite



1736 Dreman Avenue
Cincinnati OH 45223
513-541-3486
[http://www.lsi-
industries.com/index.php/lightingsol.html](http://www.lsi-industries.com/index.php/lightingsol.html)

Model: Cypress
Wattage: 1 x 90-180, 2 x 90
Available pole- and wall-mount





P.O. Box A
Conyers GA 30012
770-922-9000
<http://www.lithonia.com/>



Model: KT
Wattage: 1 x 90, 2 x 90
Available pole- and wall-mount
[Manufacturer's Page](#)

The MoonCell Luminaire

- **Advanced Dual Source Technology**

DUAL (Solar/Wind) renewable energy sources. Innovative design utilizes a mix of circuit optimization, well-chosen components, exclusive hybrid solar cells, wind turbines, and the most advanced power management circuitry available.

- **Environmentally friendly**

Totally Renewable Energy. All parts are recyclable or reusable. Almost no light pollution from specially engineered LED's. LEDs produce no ultraviolet light.

- **Virtually maintenance free**

Weatherproof, designed to withstand winds of 200+ mph. Polycarbonate shell resists erosion, sand, dust, dirt, and bird droppings. Mil-spec luminaire means long-life parts. Uses batteries engineered specifically for solar applications and many repeated charging cycles. LED 's rated for 100,000 hours service.

More efficient, Less expensive

Unique technologies allow faster recharge time, longer life between charging and no connection to an electrical grid = *No electricity bills!*

No infrastructure requirements

No cables, no trenches, no overheads. Adapts to existing poles. Installs in minutes.

Hybrid Solar Cells

MoonCell Solar Cells are designed to charge across a broad spectrum, including the Ultraviolet and Infrared ranges, at less than 2 lux.

Power Management Circuitry

Unique, patented power management circuitry distributes power to lamp to optimize discharge and therefore, extend battery life

Wind Turbine

Charges batteries at only 150 rpm

For more information, email us at:

info@mooncellusa.com

MoonCell USA, Inc.
www.mooncellusa.com

MoonCell Street Lamp Specifications

Case	UV Stabilized Polycarbonate
Dimensions	30" x 12" x 5" (8" at Thickest Point)
Mounting	Universal Fitting
Solar Panel	Integral Design, no External Clampings
Wind Turbine	360 Degree, Venturi Effect Entry, Advanced Centrifugal Design
Batteries	2 x No-Maintenance, Sealed Lead Acid Gel-Cel Batteries, Designed for Solar Applications
Light Source	Dedicated 20mm Light Emitting Diodes
Light Output	Controlled Semi-Coherent Pattern (Reduced Light Pollution and Trespass Violations)
Power	Consumption <6 Watts with 12 LED Configuration @ 12 VDC with Integral Step-Down for LEDs
Minimum Charge	3-4 Hours Bright Sunlight, 6-8 Hours Overcast Conditions
Charge Cycle	Solar: Positive Charge @ <2 Lux; Turbine: Based upon Wind Speed, Positive Charge @ 150+ RPM. Both Sources Combined by Power Management Circuitry
Maintenance	Low-to-None
Lifespan	Indefinite, with Battery Change Approximately Every 5-6 Years
Health/Safety	No Hazardous Materials. No UV Produced by LEDs. All Parts Recyclable or Reusable. Battery Overload Protection. ISO 9001 Compliant and UL Certified
Upgrades	Encoded Radio Frequency Switching (On/Off)
Add-Ons	(In Progress) CCD Camera, Various Sensors, Communications Between Lamps, Wireless Narrowband and Broadband Communications Infrastructure

MoonCell USA, Inc.
www.mooncellusa.com

Howard Hochrad
(904) 379-5320
hhochrad@mooncellusa.com
Florida, Alabama & Georgia Sales

Roadway Lighting

Why LPS?: There has been much confusion about the appropriate fixture and lamp to use for roadway lighting. In part, this confusion has been due to the availability of fixtures that can accommodate low pressure sodium lamps (LPS), misinformation about the safety of LPS lamps, the color rendition (or lack thereof), and the cost of the fixtures. Safety, cost, and color rendition have been addressed or explained by a variety of sources. A good summary can be found at: http://www.nofs.navy.mil/about_NOFS/staff/cbl/ or <http://www.darksky.org/index.html>. Regarding availability, while the selection of LPS fixtures may be limited compared to other fixture types, there are quite a number of manufacturers that carry LPS products.

Existing lights versus new or replacement lights: To address the concern for unavailability of LPS fixtures and the need to provide a quick fix to existing problem lights that were still in working condition we recommend the use of adding shields to high pressure sodium (HPS) fixtures or using full cut off HPS fixtures. **THIS IS STILL OUR RECOMMENDATION FOR EXISTING FIXTURES. HOWEVER, REPLACEMENT OF EXISTING FIXTURES OR INSTALLATION OF NEW FIXTURES SHOULD BE WITH LPS FIXTURES.** Since availability of LPS fixtures has vastly improved, we have revised the guide to only provide information on LPS fixtures and a few fixtures that can be used as a temporary “fix” until replacement of the existing fixture is needed.

1736 Dreman Avenue

Cincinnati OH 45223

513-541-3486

<http://www.spauldinglighting.com/>

http://www.spaulding-ltg.com/products/browse/Low_Pressure_Sodium_Area.asp



SPAULDING
LIGHTING, INC.



Model: Medallion LPS

Wattage: 1 x 35-55

Available pole-mount only



Model: Oakland I LPS

Wattage: 1 x 35-180

Available pole- and wall-mount



Model: Oakland II LPS

Wattage: 2 x 35-180

Available pole- and wall-mount



Model: Oakland III

Wattage: 1 x 90-180

Available pole- and wall-mount



Model: Dallas LPS

Wattage: 2 x 18-90

Available pole-mount only



Model: Palomar LPS

Wattage: 1 x 35-180

Note: CFL option only is fully shielded



Model: Cambridge II LPS

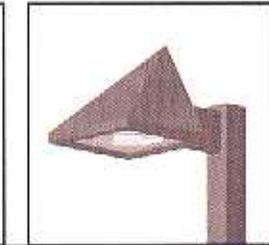
Must request LPS specifications from Mfr.



Model: Alaire LPS

Must request LPS specifications from Mfr

Night Sky Friendly Commercial Lighting Fixtures



Architectural Lighting

Area Lighting

Starry Night
Lights



www.StarryNightLights.com

(877) 604-7377

Starry Night Lights... Saving The Night Sky... One Star at a Time!

Crime and Outdoor Lighting

**A Collection of Information Sheets and
and
Extracts from the US Department of Justice
1997 Report to Congress**

June 21, 2000

Prepared by:

Bob Gent, IDA Public Relations Officer
Member, IESNA
BobGent@aol.com

for

International Dark-Sky Association, Inc.
3225 North First Avenue
Tucson, Arizona 85719-2103

(520) 293-3198

www.darksky.org
ida@darksky.org



Crime and Lighting

The 1997 National Institute of Justice report to the US Congress is available on the web. At over 500 pages, it's huge, but the relevant stuff is in Chapter 7, Preventing Crime at Places in a section describing security lighting. Here are some quotes from "Conclusions for Open Urban Places:"

"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..."

We may speculate that lighting is effective in some places, ineffective in others, and counter productive in still other circumstances. The problematic relationship between lighting and crime increases when one considers that offenders need lighting to detect potential targets and low-risk situations (Fleming and Burrows 1986). Consider lighting at outside ATM machines, for example. An ATM user might feel safer when the ATM and its immediate surrounding area are well lit. However, this same lighting makes the patron more visible to passing offenders. Who the lighting serves is unclear."

The entire publication is available on the web at: <http://www.ncjrs.org/works/wholedoc.htm>

Additional information and extracts are included at the end of this brochure.

Bob Gent
Public Relations Officer
International Dark-Sky Association

International Dark-Sky Association

3225 North First Avenue, Tucson, AZ 85719-2103 USA

ida@darksky.org

http://www.darksky.org

Security Lighting: Let's Have Real Security, Not Just Bad Lighting

Clearly, what we all want and need is security and safety at night, at home and away from home, for ourselves, our families, our homes and property, and for all others. The task is to *be* safe, not just to feel safe. This means that we need effective and efficient lighting. Visibility is the goal. We want to be able to see well, rather than lighting the criminal's way. This goal exists for us at home, on the streets, in parking lots, at work, wherever. Good lighting can be a help, poor lighting always compromises safety.

Most crime actually occurs during the day, or inside buildings. However, we want the feeling *and* the reality of being safe outside at night. That does *not* mean putting in the brightest light we can find, blinding everyone in the area, creating light trespass, and lighting up the sky. What we do need is effective lighting, lighting that puts light where we need it (and nowhere else) and where it will help visibility. That means: no glare, no light trespass, no uplight, no harsh shadows, no steep transitions from light to dark, etc. Lighting by itself does not insure safety. Is there more crime in the "well lit" centers of large cities or in smaller towns with much less lighting? A cynic might derive a positive correlation between crime and light: the more light, the more crime. Current and past studies by competent crime authorities can be summarized as follows: "The paucity of data preclude any definitive statement regarding the relationship of lighting and crime, but there is a strong indication that lighting decreases the fear of crime." Quality lighting rather than poor lighting is essential for any real security.

Here are some examples of bad security lighting—lighting that often actually compromises safety. These poor quality fixtures can give the illusion of safety or the feeling of security, but in reality they don't add to safety at all; they may even make things worse. They are beacons to the criminal: "Come and get me, my lighting will help you, not me."

1. **The 175-watt dusk-to-dawn "security light"**. This fixture was designed in the old days when energy was cheap, when there were no good lighting fixture designs, and when the adverse effects of bad lighting were not well appreciated. It sells for \$29.95 or less, but uses over 200 watts of power. That means it costs about \$70 per year to operate in most locations—much more in high electricity cost areas. Much of the light output is wasted, going up or sideways where it does no good at all. It has a great deal of glare, often blinding the homeowner and others. It splatters light everywhere, alienating neighbors. It casts harsh shadows behind trees and buildings, allowing criminals plenty of dark areas to hide in. It is a prime example of bad lighting. But it is in use by the millions throughout the country. Why? It's cheap, and bright. We see lots of glare so we think there is lots of light. But it's a most ineffective and inefficient light. (See IDA Information Sheets No. 3, 26, and 103 for more information.)

2. **Globes**. Again, light is splattered everywhere. Because it wastes so much light, one must put a high-wattage lamp inside to get any light on the ground. That means a great deal of glare is produced, so much that often one can't easily see the ground! Why are so many of these inefficient fixtures used? Mainly because they look good in the daytime! If one likes that look, then one should use only a very low wattage lamp (as in the days of gas lighting), preserving the daytime appearance and providing a nighttime "ambience". One can install a separate, quality, lighting system to light the ground. There's no glare or light trespass from this good system, so it doesn't detract from the looks of the globes. One gets the desired attractiveness and also good lighting and safety. It costs more initially, but there is quality lighting.

3. **Poorly shielded "wall packs"** or similar fixtures. These also splatter light everywhere, some getting where needed but most is wasted. They also create lots of glare. Well-shielded wall packs can be excellent light sources, but one must be sure of what one is buying. Some wall packs have good light control, many nearly none.

4. **Poorly designed or installed flood lights.** Flood lights can be good, if they have good light control. But they must be well-designed and installed to take advantage of their pluses. Often they are poorly installed, aimed at what seems a random direction or, worse, right at the street (causing terrible glare for motorists) or at the neighbor's yard or bedroom window. We have all seen many examples of such bad lighting at night.

Here are some examples of good quality security lights:

(a) A well-shielded low pressure sodium (LPS) fixture: well-controlled light, energy efficiency, no glare. A lack of color rendering is not a disadvantage for most security lighting. Visibility is excellent with LPS lighting.

(b) A similar full-cutoff high pressure sodium (HPS) or metal halide (MH) fixture, or even the new low-wattage compact fluorescent PL lamps in good fixtures: no uplight and no glare.

(c) Well-controlled and installed flood lights or spot lights.

(d) The infrared sensor spot lights that come on only when someone walks into the field of view of the infrared (IR) detector. (They can activate an alarm too, if wanted.) These are very cost-effective and are most effective security lights. They scare intruders away, they offer good visibility to the homeowner when needed (e.g. when taking out the garbage, or when there is an intruder). They should be installed so as to put the light only where it is needed, not shooting up into the sky or onto the neighbor's property. Under the eaves is a good location, usually.

To see well, we need adequate light, but not too much. Too much can ruin our adaptation to less well-lit areas at night, blinding us just when we need to see. When we go from too bright to too dark or vice versa, we have poor visibility for a while. This effect is called "transient adaptation", and good designs should minimize its adverse effect on visibility.

To see well, we need to minimize any glare. Glare never helps visibility. To see well, we need to minimize dark areas near well-lit areas. This means good lighting design is required. Think, too, about energy savings. We should not waste light nor use inefficient light sources. We waste far too much energy and money (over a billion dollars annually in the U.S.A.) throughout the world due to poor lighting. Use light, don't waste it.

What else can we do to maximize safety at night? Here are some ideas (consult libraries, the local police, companies specializing in security equipment, and others for details and other ideas): use good locks, use a peep hole in the door to see who is there before answering the door, have an effective alarm system, include motion sensors (such as are used in the IR spotlight mentioned above), have good phone sense (what you say when answering the phone or on your answering machine), play the radio when gone, put indoor lights on a time switch, put good labels on your property (and put security labels on your windows), have a dog, join or promote a neighborhood watch program (one of the best ideas: promote quality outdoor lighting through such a group, too!), and so forth.

Write IDA for a list of additional information sheets about outdoor lighting; we also have excellent slides that illustrate the issues of poor lighting and quality lighting.

International Dark-Sky Association
3225 N. First Ave., Tucson, AZ 85719-2103 USA
ida@darksky.org <http://www.darksky.org>

Dark Campus Programs Reduce Vandalism and Save Money

Conventional wisdom suggests that light reduces crime. That's why outdoor lights are often called "security lights". School districts across the U.S. are turning conventional wisdom on its head by turning off lights on school grounds.

The results have been impressive. Annual energy savings can add up to hundreds of dollars per school. Significant decreases in vandalism have been documented since the "Dark Campus" policies have gone into effect. Here are three examples.

The San Antonio (Texas) School District was one of the first to try this idea back in 1973. The annual cost of repairing damage caused by vandalism dropped from \$160,000 to \$41,000 in just a few years.

"I remember as a kid, we never hung around in the dark," says Sam Wolf, director of security for the district. "We hung around a street light. We wanted to see who was with us." The thrill of vandalism is partly in seeing a window shatter or watching paint cover a wall. Darkness takes away the thrill.

The 4-J School District in Eugene, Oregon has eight schools participating in their Dark Campus program. Since it began as an experiment in 1989, vandalism has virtually disappeared in certain problem schools.

At one school annual energy savings totaled \$300. That was just icing on the cake compared to time saved on repairing and cleaning up damage caused by vandalism. The district also researched their insurance requirement and found that turning off **all** the lights, including exit signs, was okay when nobody was in a facility.

In California, the Livermore Joint Unified School District reports energy savings of about ten percent along with a slight decrease in vandalism. Cupertino Union School District reported that vandalism dropped 29 percent, while energy savings totaled \$8,190 during the 1981-82 school year. For both districts, the campus blackout was part of a larger anti-vandalism strategy.

Why Dark Campus Works

There's no scientific evidence that night time blackouts cause a reduction in vandalism. However, it seems to work well, especially in upper and middle class neighborhoods. When everyone gets used to dark school grounds, lights of any kind will arouse suspicion.

To be effective, turn off **all** the lights to make the campus as dark as possible. This may be difficult to do in some buildings, and rewiring may be required.

To make Dark Campus work you have to do more than just turn out the lights. Communication is the key component of the program. You need to be sure that students, staff, neighbors, and police know what you're doing. Expect skepticism. Bring proof that the idea works.

The 4-J School District developed the following checklist that will help you cover all the bases.

Checklist for Success

Define the Policy

- Set hours for the blackout; 11:00 PM to 6:00 AM is often used.
- Instruct students and staff that the building is off limits during dark hours.

Implement The Program

- Inform local law enforcement officials. Get their views and try to address their concerns.
- Inform school district officials.
- Communicate with neighbors and parents. Informal meeting, flyers, and school newsletters are a few methods for getting the word out. Emphasize that any lights seen during dark hours should be reported to the police.
- Post prominent signs on all sides of the campus listing the dark hours and a police telephone number to call.
- Block access to all foot and vehicle traffic.'

- Install lights controlled by occupancy sensors and audible alarms in areas with valuable equipment, such as computer labs.

Track The Program

- Keep notes on starting dates, communications, etc.
- Record results, including energy savings and occurrences of vandalism.
- Promote your success.

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The International Dark-Sky Association, a tax-exempt non-profit membership based organization, has been founded to help preserve dark skies while at the same time maximizing the quality and efficiency of nighttime outdoor lighting. Contact them at the address below for further information about any aspects of dark skies or effective outdoor lighting.

International Dark-Sky Association
3225 North First Avenue
Tucson, AZ 85719-2103
USA

International Dark-Sky Association
3225 N. First Ave., Tucson, AZ 85719-2103 USA
ida@darksky.org <http://www.darksky.org>

Does Stanford University Need More Outdoor Lighting?

A Letter by Dan Schroeder

The Stanford Daily has recently printed two letters offering opposing views on whether the campus needs more outdoor lighting. Since neither letter did justice to the complexity of this issue, I think a third letter is needed.

Outdoor lighting should be designed with at least four factors in mind. They are, in order of decreasing importance, personal safety, energy conservation, esthetics, and astronomical research. By following four simple guidelines, it is easy to satisfy them all.

First, aim the light where it's needed: down. Many light fixtures waste energy by directing light upwards, where it only blocks out the stars, or sideways, where it casts long shadows and creates glare to blind the people it is intended to protect. The use of modern, efficient fixtures and proper installation will make for much more effective lighting. We don't need light up in the sky: we don't live up there.

Second, use the most efficient types of lighting sources available. Incandescent bulbs consume far more energy than fluorescent, mercury, metal halide, or sodium lamps. Professional astronomers prefer low pressure sodium light, which is the most efficient of all and can be blocked by filters for most types of research.

Third, turn off lights when they're not needed. Purely ornamental lights serve no purpose at 2 a.m., for example.

Fourth, don't use more light than necessary. The human eye can adapt to amazingly low levels of light, if given the chance. Areas that are over illuminated spoil dark adaptation and make surrounding, moderately lit areas seem dark in comparison. The best alternative is a uniform, moderate level of outdoor lighting.

I live in Stanford's newest residence, the Rains Houses. The outdoor lighting here was obviously designed in response to requests from students worried about safety, and I don't think anyone would argue that there is not enough. But I can easily argue that there is too much. The lights in the courtyard regularly come on within minutes after sunset, half an hour before their illumination is noticeable. At night, they cast enough light to read by inside my third floor apartment. The stairways and landings are brighter than the living rooms. In the commons area, there are a dozen ornamental lights aimed directly at the ceilings of the arcades. All of these lights use relatively efficient lamps, but that is the only respect in which they are not wasteful.

No doubt there are many areas of campus that are inadequately lit. Probably there are many more that would be safer if lights were modified to direct the light down instead of into people's eyes. Those who are concerned with safety should compile a detailed list of the improvements that are needed, and insist on the use of effective types of lighting, rather than issuing a general demand for more lighting.

International Dark-Sky Association

3225 N. First Ave., Tucson, AZ 85719-2103 USA

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http://www.darksky.org

U.S. Department of Justice Study of Street Lighting and Crime

In 1977, a U.S. Department of Justice study report was published giving the results of a thorough study of the correlation between street lighting and crime. This information sheet reproduces the abstract of that study and offers a few additional comments. As far as we know, there has been no comprehensive study since, though many "studies" have been done—most suffering from the defects identified in the report

National Institute of Law Enforcement and Criminal Justice

United States Department of Justice,
July 1977

By James M. Tien, Principal Investigator,
Vincent F. O'Donnell, Arnold I. Barnett, and Pitu B. Mirchandani

National Evaluation Program, Phase I Final Report

Abstract: The purpose of this report is to detail the present state of knowledge regarding the impact of street lighting on crime and the fear of crime, based on a comparative analysis of past and on-going street lighting projects whose description and impact have either been documented or are easily accessible. As with every NEP Phase I study, this report does not purport to be prescriptive with respect to the design of street lighting projects. The report briefly traces the historical and technical development of street lighting; reviews the pertinent issues in street lighting and crime; develops an evaluation framework for the comparative analysis of street lighting projects; undertakes a systematic assessment of available evaluation studies in street lighting; outlines a single project evaluation design; and identifies gaps in the present knowledge base and makes recommendations concerning future research and evaluation activities which should be undertaken to fill those gaps.

Although 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, a number of policy-relevant findings are contained in the report. **In particular, while there is no statistically significant evidence that street lighting impacts the level of crime, especially if crime displacement is taken into account, there is a strong indication that increased lighting—perhaps lighting uniformity—decreases the fear of crime.** Consequently, it is recommended that LEAA continue to fund street lighting projects for the purpose of deterring crime, but that the funding be a joint inter-agency effort so that the range of street lighting objectives is taken into consideration in the development of such projects.

The report is very lengthy and has many appendices. It is a worthwhile reference, and discusses quite well the many pitfalls and shortcomings that research studies dealing with lighting and crime often have. The Abstract above is a good summary. Let us take a zero-order look at lighting and crime statistics: Is there more crime and worry about crime now in our cities than there was only a few decades ago? Is there more street lighting and other "security" lighting? Obviously, lighting (mostly bad lighting) and crime are positively correlated! However, as with most all "studies", this one is also flawed. IDA's position is that good lighting can often be helpful in promoting safety and security, while bad lighting is not helpful, and may badly compromise the intended goals for which the lighting was designed and installed.

Definitions of Terms Used in the Abstract:

crime displacement—when the intervention (e.g. a change in street lighting) does not deter the criminal or offender but merely displaces the crime to the daytime, a nearby area, a different target, or type of crime.

LEAA

International Dark-Sky Association

3225 N. First Ave., Tucson, AZ 85719-2103 USA

ida@darksky.org

http://www.darksky.org

Rethinking the Conventional Wisdom of Security Lighting

Too Much Light

To help maximize the effectiveness of security lighting, security professionals should consider another strategy—turning off unnecessary lights.

Regardless of the light source and its energy efficiency, most nighttime lighting goes unused. It neither lights the way for normal users of the environment in question nor assists witnesses in seeing something worthy of being witnessed. The light simply falls on the ground and is wasted.

This effect becomes particularly evident during long weekends in the winter. For example, on one occasion a blanket of fresh snow that fell on a Friday in the factory area of Mississauga, Ontario remained unbroken until the workers returned to work on Monday morning. No one used the well-lit area for three days, yet throughout the weekend the lights burned from dusk till dawn.

Immunity to Light

The ubiquitous effort to eliminate the dark of night makes the public immune to security lighting. As a result, security lighting has lost the ability to turn heads and grab the attention of a potential witness. In response to this phenomenon, some law enforcement officials now advocate parking vehicles in unlit areas under certain circumstances. They conclude that the light, rather than alerting witnesses, only illuminates the criminal's work area.

Security professionals who question this view need only ask themselves whether a person looks more suspicious standing under a light or in the dark with a flashlight. Yet in remote factory areas and large municipal parks, security designers continue to provide bright lighting.

The alternative to the current lighting strategy is not necessarily darkness. Technology is now available that will supply white light only when it is needed by using motion sensitive devices. Lighting on demand may not be as energy conscious as some of the energy efficient high intensity discharge (HID) sources, but it saves energy by not being on when light is not required. It

also has the ability to attract attention to an area when attention is required by reducing the public's immunity to light. Witnesses can more easily identify culprits because the light reacts to any movement in the area.

Not only can motion sensitive devices be used in conjunction with conventional white light sources, but their effectiveness for security purposes can be greatly increased by having them activate rapidly flashing strobe lights when an intruder is detected. Not only will this surprise and disorient the would-be criminal, but it will also draw immediate attention to the perpetrator for blocks—or even miles—around.

Street, park, commercial, and factory lighting on private and public land should all be considered part of the same security and safety strategy. Lighting a roadway in a remote factory area for vehicular traffic makes sense. Lighting all the buildings adjacent to this roadway that are not in use after hours does not make sense and reduces the effectiveness of streetlights.

By leaving the buildings dark, the security design delineates a clear path of travel and reinforces the existence of forbidden and dark areas, particularly around the rear of buildings. Motion sensitive lights highlight the trespasser, and make him or her stand out. The lights may also increase police patrol efficiency by emphasizing key areas in need of checking.

Off the roadway, where witness potential exists, HID lights connected to occupancy sensors can be used that supply a minimal amount of light to the area but have instant full output capability when motion is detected.

The strategy for security lighting has often been "more is better". Instead, security professionals should rethink current lighting strategies and their effect on human behavior. It is time to question conventional wisdom and examine the alternatives.

This information sheet is primarily excerpted from an article by Henri Bérubé, constable with the Peel Regional Police Department in Brampton, Ontario

Questions about Crime and Lighting Systems

by Jules Granata, February 16, 2000

Question 1: Isn't lighting a deterrent to crime? What facts do you have to show otherwise?

Answer: It has been my experience that police officers on the street recognize the debilitating effect of glare. Criminals use glare caused by poor lighting as an aid to their efforts to commit crimes. I have witnessed high volume lights installed in high crime areas of New Haven, Connecticut. The immediate effect was to lower the crime rate in those areas; however, within a short time, the crime rate in those areas went back up, and in some cases exceeded the level before the new lights were installed. Studies that have been done show it both ways. Some studies show a reduction – some do not. The material I have read seems to be inconclusive. I feel not enough data has been gathered to draw accurate conclusions. Depending on who is conducting the surveys, the outcome could be influenced by a predetermined opinion on the part of the people interpreting the data gathered. I feel well designed lighting without glare could be a deterrent to crime, but we seem to be simply flooding light in an effort to recreate daytime, and the results fall short of expectations.

Question 2: Malls and department stores have taken surveys of customers. Almost always, people favor more brightly lit parking lots and stores for safety reasons. What facts do you have to show this is not the case?

Answer: Surveys taken from people who "feel" safer with more light than less does not surprise me. We have been conditioned to fear the dark. The perception that we are safer in a brightly lit area is just that -- a perception. Some of the most brightly lit shopping centers and malls are also the highest crime areas. In New Haven, for example, the Super K Mart was one of the highest crime areas in the State of Connecticut the year it opened. This shopping center is excessively illuminated, yet this did nothing to reduce crime. Some reports I have seen that claim that more light reduces crime are based on surveys such as these: Data is gathered by simply asking people if they feel safer in the higher illuminated areas, and most will respond "yes". This perception that dark is bad is deeply embedded in us from the time we are children. I also feel that this perception can work against safety in some cases. If we feel a false sense of security due to over-lighting, this could prevent us from using common sense in protecting ourselves from crime.

Question 3: One of the most popular lighting systems is the "Dusk-to-Dawn" security light. These have sold very well for years based upon their ability to lower crime rate. Utility companies who promote these lights for this reason. Don't these lights reduce crime rates?

Answer: Once again, the ability of these lights to lower crime is simply a perception. When the average person is asked whether all-night lights deter crime, the answer is "yes". To prevent crime such as burglary, a change of environment is necessary. A loud siren going off in a normally quiet area is a change of environment. Lights coming on due to motion detection is a change of environment. Dusk to dawn lighting is not a change of environment and will not, therefore, prevent crime.

Question 4: Most prisons are illuminated very brightly at night. This is due to the fact that it is easier to find escaped convicts who like to escape at night. Wouldn't less light make it more difficult for security guards to find these escapees?

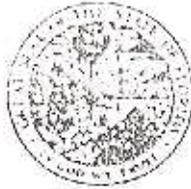
Answer: According to the UD Dept. of Justice, Bureau of Prisons significant incidents report, only one convict has escaped from the inside of prison between August 1997 and August 1999. During this same time period, 272 convicts escaped from the outside of prisons, such as from work groups. These numbers indicate,

contrary to popular belief, that people seldom escape from the inside of a prison. The escapees who walk away from a job crew are doing so during the day, since they must return at night for lock up. For the few times that prisoners may escape at night, modern security systems such as infrared camera systems, motion detectors and pressure sensors are far more effective than floodlights sweeping an area. In fact, most security camera systems work better in low or no light situations.

Question 5: Many states have passed laws requiring brighter lights around ATMs. If we dimmed our lights near these machines, wouldn't it just be inviting criminals to rob customers?

Answer: ATMs have been a high crime location in recent years. The safest sites, however, are the ATMs located inside card access doors and the drive up machines. I feel the banks and credit unions that install these machines should concentrate on inside and drive up units. The inside machines are protected by locked doors which are accessed by the user's card. Card access doors have become extremely popular over the past several years. These units can be programmed to store the user's ID number for future reference. By doing this, if a customer is robbed, it would be easy to identify the person entering the area just prior to and after the victim did. To the best of my knowledge, banks do not do this now, even though the technology allows them to. I also believe an emergency telephone should be located within these areas in the event a customer feels threatened by someone standing outside. Raising the illumination around the outside of ATMs does little, if anything, to deter crime. More effort should go into the basic design of these locations similar to what I have just described.

About the author: Jules Granata has been involved in security for most of his life. Most recently, he worked for Security Professionals in New Haven, Connecticut installing, servicing and designing security systems. For the past 13 years, he has been a Department Head of a State program teaching the L6 Security License curriculum. This is the license needed to install and service security systems. At this time, the program is the only State approved full time adult class available in Connecticut.



STATE ATTORNEY, SEVENTH JUDICIAL CIRCUIT
Volusia, Flagler, Putnam and St. John's Counties

JOHN TANNER
State Attorney

119 S. Palmetto Avenue, Daytona Beach, Florida 32014
(904) 257-6020

December 19, 1989

Volusia County Council
DeLand, Florida

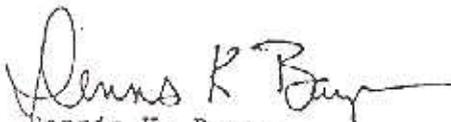
Dear Council Members,

As Assistant State Attorney responsible for Environmental Crimes, I would like to go on record as supporting the adoption of a County-wide sea turtle lighting ordinance. A uniform ordinance is necessary to facilitate enforcement by the Beach Rangers and the Department of Natural Resources and the prosecution by my office. The County should proceed to implement these minimum standards prior to the next laying season to ensure that we are in compliance with the State and Federal Endangered Species Acts.

Opponents to lighting ordinances often cite the increase in crime as a reason for non-adoption. I have enclosed comments from the Brevard County State Attorney's Office and the Chief of Police in New Smyrna Beach concerning this issue.

Please do not hesitate to contact me if I can be of any assistance to the county on this matter. I am confident that the Council can enact a reasonable ordinance that will protect our endangered sea turtles and not unduly restrict the County's human inhabitants.

Sincerely,


Dennis K. Bayer
Assistant State Attorney

OFFICE OF THE STATE ATTORNEY

EIGHTEENTH JUDICIAL CIRCUIT OF FLORIDA
BREVARD AND SEMINOLE COUNTIES



NORMAN R. WOLFINGER
STATE ATTORNEY

August 7, 1989

Seminole County Office
100 East First Street
Sanford, FL 32771
(407) 322-7534

Titusville Office
700 S. Park Avenue
Titusville, FL 32780
(407) 269-8112

Rockledge Branch Courthouse
1040 South Florida Avenue
Rockledge, FL 32955
(407) 636-6920

Melbourne Branch Courthouse
50 South Nieman Avenue
Melbourne, FL 32901
(407) 727-9712

Reply To: Titusville

Mr. Dennis K. Bayer
Assistant State Attorney
Seventh Judicial Circuit
119 South Palmetto Avenue
Daytona Beach, Florida 32014

Dear Mr. Bayer:

I have attempted to gather what information there is as to any increased beach-front crimes as a result of the turtle ordinances in Brevard County. As best can be determined, it does not appear that there has been any substantial increase as a result of these ordinances.

I have also checked to determine if there have been any prosecutions by our office as a result of this ordinance and have found none. Overall it appears that there have been no problems with businesses and citizens complying with this ordinance. My understanding is that the ordinance does not ban beach-front lighting, but it is the placement and type of lighting that are regulated. The result is the community has been very understanding as to the need to protect sea turtles and have willingly complied with the intent of the ordinance.

I hope that this information will be of assistance to you.

Sincerely,

NORMAN R. WOLFINGER

BY:

Handwritten signature of Robert Wayne Holmes in cursive.

ROBERT WAYNE HOLMES
ASSISTANT STATE ATTORNEY
CHIEF OF OPERATIONS

RWH:kq



RECEIVED
APR 11 2002

Department of Environmental
Resources Management
23 Belvedere Road, Building 502
West Palm Beach, FL 33406-1548
(561) 233-2400
Fax: (561) 233-2414
www.pbcgov.com

**Palm Beach County
Board of County
Commissioners**

- Warren H. Newell, Chairman
- Carol A. Roberts, Vice Chair
- Karen T. Marcus
- Mary McCarty
- Burt Aaronson
- Tony Masilotti
- Addie L. Greene

County Administrator

Robert Weisman

April 8, 2002

Ms. Loma Patrick, Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, Florida 32405

Dear Ms. Patrick:

This is in response to your inquiry on Palm Beach County's experience with our Sea Turtle Protection Ordinance and associated impacts to human safety and security. Our ordinance regulates coastal lighting and was one of the first ordinances in Florida and has been in effect since 1987. Since then it has been modified twice making it one of the most stringent in the state. It is in effect from sunset to sunrise between March 1 to October 31.

We are not aware of any increases in crime or accidents related to the implementation of this ordinance. Preservation of public safety is, of course, paramount and was discussed before the ordinance was passed. However, staff has found that there are a number of management tools that can be used to reduce the amount of light visible from the beach while not jeopardizing public safety. I feel that the key to the success of Palm Beach County's program is that the approach has been to first educate the property owners about the importance of the local beaches to sea turtles and then provide reasonable alternatives for controlling the lights.

I hope this information is helpful. Please feel free to contact either myself or Mr. Paul Davis at 561-233-2509 if you have any other questions.

Sincerely,

Richard E. Walesky, Director
Environmental Resources Management

REW:pd

Sheriff

NEIL J PERRY

904/824-8304



ST JOHNS COUNTY

4015 LEWIS SPEEDWAY, SAINT AUGUSTINE, FLORIDA 32095

06 December 1993

Robert P Stoll, DDS, MHA, MS
19 Little Bay Harbor
Ponte Vedra Beach, Florida 32082

Dear Dr Stoll:

As a followup to our meeting in regard to the proposed lighting ordinance, members of my staff contacted the following Sheriff's Offices who have lighting ordinances in effect: Brevard, Broward, Charlotte, Collier, Indian River, Lee, Martin, Nassau, Palm Beach, ST Lucia, Sarasota, and Volusia.

Each of the Sheriff's Offices that were canvassed indicated that the passage of the ordinance had no significant impact on crime in the areas covered by the ordinances. The only recurring item was to upgrade lens coverings of the lights to resist vandalism.

I hope that this information will provide useful. Please continue to call upon me whenever I can be of service.

With kind personal regards, I am

Sincerely,


Neil J Perry
Sheriff

rph





CITY OF ORMOND BEACH

FLORIDA



The Birthplace of Speed



CHIEF OF POLICE
JAMES M. PATTERSON

POLICE DEPT. - CIVIL DEFENSE
P. O. BOX 6361 PHONE 677-0731
170 W. GRANADA BLVD. 32074

MEMORANDUM

TO : John Baker, Planning Department
From : Lt. Kevin McCue *km*
Reference : Beach Lighting
Date : March 20, 1990

As per your request, I have checked the crime reports generated by the Police Department in the areas adjacent to the Atlantic Ocean Beach. In checking these reports, it was impossible for me to determine if the change in the City's lighting ordinance had any impact on the crime rate. The statistical data required to support a determination that a change in the lighting had an effect on crime in this specific crime location is not captured in our reporting system.

Generally, we have not experienced a significant increase in reportable crimes in that particular area of the city since the passage of the lighting ordinance.

City of New Smyrna Beach

DENVER H. FLEMING, III
CHIEF OF POLICE

POLICE DEPARTMENT

1400 NORTH DIXIE FREEWAY
NEW SMYRNA BEACH, FLORIDA 32168
(904) 426-2414

July 31, 1989

Dennis K. Bayer
Assistant State Attorney
Seventh Judicial Circuit
119 S. Palmetto Ave.
Daytona Beach, FL 32014

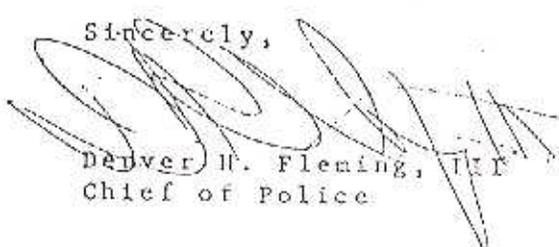
Dear Dennis:

Originally there were some citizenry concerns regarding the implementation of a lighting ordinance within the City of New Smyrna Beach. Those concerns were primarily the philosophy that reduced lighting in particular areas might entice or have an adverse impact on the safety of citizenry and residents who would have the occasion to travel in these areas. The Police Department's experience with criminal activity in relationship to the lighting ordinance on the beach proper was negligible at best. There were no increase in burglary, larcenies or vandalism other than that which would be considered normal in relationship to our overall standing comparably through the Uniform Crime Report. In some cases, the lack of lighting allowed Police Officers in marked patrol cars to sit inconspicuously and observe pedestrian movements and traffic movement on the beach that would otherwise not be possible. In this regard, it had a positive effect on pro-active deterrent law enforcement presence on the beach which of course would directly correlate to reduced criminal activity rather than an increase.

Since there were no correlating statistics to tabulate during this period of transition from pre-lighting ordinance to post-lighting ordinance, I can be of no assistance as far as providing any statistical data that would assist you in reducing any apprehensions or fears residents might have about the State Attorney's Office position to uphold statutory provisions of the Endangered Species Act.

If I can be of any further assistance or provide staff support for you in your endeavors, please don't hesitate to contact me.

Sincerely,



Denver H. Fleming, III
Chief of Police

DHF/nab

Security Lighting: Let's Have Real Security, Not Just Bad Lighting

One of the main goals for nighttime lighting is to have good safety and security at night, both at home and away from home, for ourselves, our families, our homes and property, and indeed for everyone. However, the task is to be safe, not just to feel safe. This means that we need effective and efficient lighting. Good visibility is the goal. We want to be able to see well, rather than just lighting the criminal's way. This goal exists for us at home, on the streets, in parking lots, at work, wherever. Good lighting can be a help; poor lighting always compromises safety.

Most crime actually occurs during the day, or inside buildings. However, we want the feeling and the reality of being safe outside at night. That does not mean putting in the brightest light we can find, blinding everyone in the area, creating light trespass, and lighting up the night sky. What we do need is effective lighting, lighting that puts light where we need it (and nowhere else) and where it will help visibility. That means: no glare, no light trespass, no direct uplight, no harsh shadows, no steep transitions from light to dark, etc. Lighting by itself does not insure safety. Is there more crime in the "well lit" centers of large cities or in smaller towns with much less lighting? A cynic might derive a positive correlation between crime and light: the more light, the more crime. Current and past studies by competent crime authorities can be summarized as follows: "The paucity of data preclude any definitive statement regarding the relationship of lighting and crime, but there is a strong indication that lighting decreases the fear of crime." Quality lighting rather than poor lighting is essential for any real security.

Here are some examples of bad security lighting—lighting that too often compromises safety. These poor quality fixtures can give the illusion of safety or the feeling of security, but in reality they don't add to safety at all; they often make things worse. They are beacons to the criminal: "Come and get me, my lighting will help you, not me." In essence, criminal friendly lighting.

1. The 175-watt dusk-to-dawn "security light". This fixture was designed in the old days when energy was cheap, when there were no good lighting fixture designs, and when the adverse effects of bad lighting were not

well appreciated. It sells for \$29.95 or less, but uses over 200 watts of power. That means it costs about \$70 per year to operate in most locations—much more in high electricity cost areas. A good deal of the light output is wasted, going up or sideways where it does no good at all. It has a great deal of glare, often blinding the homeowner and others. It splatters light everywhere, alienating neighbors. It casts harsh shadows behind trees and buildings, allowing criminals plenty of dark areas to hide in. It is a prime example of bad lighting. But it is in use by the millions throughout the country. Why? It's cheap, and bright. We see lots of glare so we think there is lots of light. But it is a most ineffective and inefficient light. (See IDA Information Sheets No. 3, 26, and 103 for more information.)

2. Globes. Again, light is splattered everywhere. Because it wastes so much light, one must put a high-wattage lamp inside to get any light on the ground. That means a great deal of glare is produced, so much that often one can't easily see the ground! Why are so many of these inefficient fixtures used? Mainly because they look good in the daytime! If one likes that look, then one should use only a very low wattage lamp (as in the days of gas lighting), preserving the daytime appearance and providing a nice nighttime "ambience". One can install a separate, quality lighting system to light the ground. There is no glare or light trespass from this good system, so it doesn't detract from the looks of the globes. One gets the desired attractiveness and also good lighting and safety. It costs more initially, but there is now good lighting.

3. Poorly shielded "wall packs" or similar fixtures. These also splatter light everywhere, some of the light getting where needed but most being wasted. They also create lots of glare. Well-shielded wall packs can be excellent light sources, but one must be sure of what one is buying. Some wall packs have good light control, many nearly none.

4. Poorly designed or installed flood lights. Flood lights can be good, if they have good light control. But they must be well-designed and well installed to

continued

take advantage of their pluses. Often they are poorly installed, aimed at what seems a random direction or, worse, right at the street (causing terrible glare for motorists) or at the neighbor's yard or bedroom window. We have all seen many examples of such bad lighting at night.

Enough of the bad, here now are some examples of good quality security lights:

1. A well-shielded low pressure sodium (LPS) fixture: well-controlled light, energy efficiency, no glare. A lack of color rendering is not a disadvantage for most security lighting. Visibility is excellent with LPS lighting.
2. A similar full-cutoff high pressure sodium (HPS) or metal halide (MH) fixture, or the new low-wattage compact fluorescent (PL) lamps used in good fixtures: no upright and no glare.
3. Well-controlled and installed flood lights or spot lights. These need great care in design and installation to be in the "good" camp, for most all present installations are clearly not that way.
4. The infrared sensor spot lights that come on when someone walks into the field of view of the infrared (IR) detector. (They can activate an alarm too, if wanted.) These are very cost-effective and are effective security lights. They scare intruders away, they offer good visibility to the homeowner when needed (e.g. when taking out the garbage, or when there is an intruder). They must be installed so as to put the light only where it is needed, not shooting up into the sky or onto the neighbor's property. Under the house's eave is often a good location.

To see well, we need adequate light, but not too much. Too much can ruin our adaptation to darker areas at night, blinding us just when we need to see. When we go from too bright to too dark or vice versa, we have poor visibility for a while. This effect is called "transient adaptation", and good designs should minimize its adverse effect on visibility.

To see well, we need to minimize any glare. Glare never helps visibility. To see well, we need to minimize any dark areas near well-lit areas. This means good lighting design is required.

To see well, we must not allow the eye to be flooded with too much light when driving or walking at night. "Luminance overload" can easily compromise vision and dark adaptation.

Think, too, about energy savings. We should not waste light nor use inefficient light sources. We waste far too much energy and money (over a billion dollars annually in the U.S.A., much more throughout the world) due to poor lighting.

What else can we do to maximize safety at night? Here are some ideas (consult libraries, the local police, companies specializing in security equipment, and others for details and other ideas): Use good locks, use a peep hole in the door to see who is there before answering the door, have an effective alarm system, include motion sensors (such as are used in the IR spotlight mentioned above), have good phone sense (what you say when answering the phone or on your answering machine), play the radio when gone, put indoor lights on a time switch, put good labels on your property (and put security labels on your windows), have a dog, join or promote a neighborhood watch program (one of the best ideas: promote quality outdoor lighting through such a group, too!), and so forth.

Write IDA for a list of additional information sheets about outdoor lighting; we also have excellent slides that illustrate the differences between poor lighting and quality lighting.



Sarasota County Office

April 15, 2002

RECEIVED
APR 18 2002

Lorna Patrick
U.S. Fish and Wildlife Service
1601 Balboa Ave
Panama City, FL 32405

RE: Crime on Sarasota County Beaches

Dear Ms. Patrick:

Enclosed please find the crime data for Sarasota County's three Gulf front Sheriff's Department patrol zones. This data covers the years 1996 through 2001. Sarasota County adopted one of the strictest sea turtle protection ordinances in Florida in October 1997. Among other things, this ordinance regulates lighting that is visible from the beaches and dunes. As you can see from the data, crime either has fallen markedly or has remained relatively stable in all three patrol zones, despite population increases. Please keep in mind that this data includes all complaints, not simply arrest or convictions.

If you require further information, please contact me at (941) 366-3130.

Sincerely,

A handwritten signature in blue ink, appearing to read "E. Freeman".

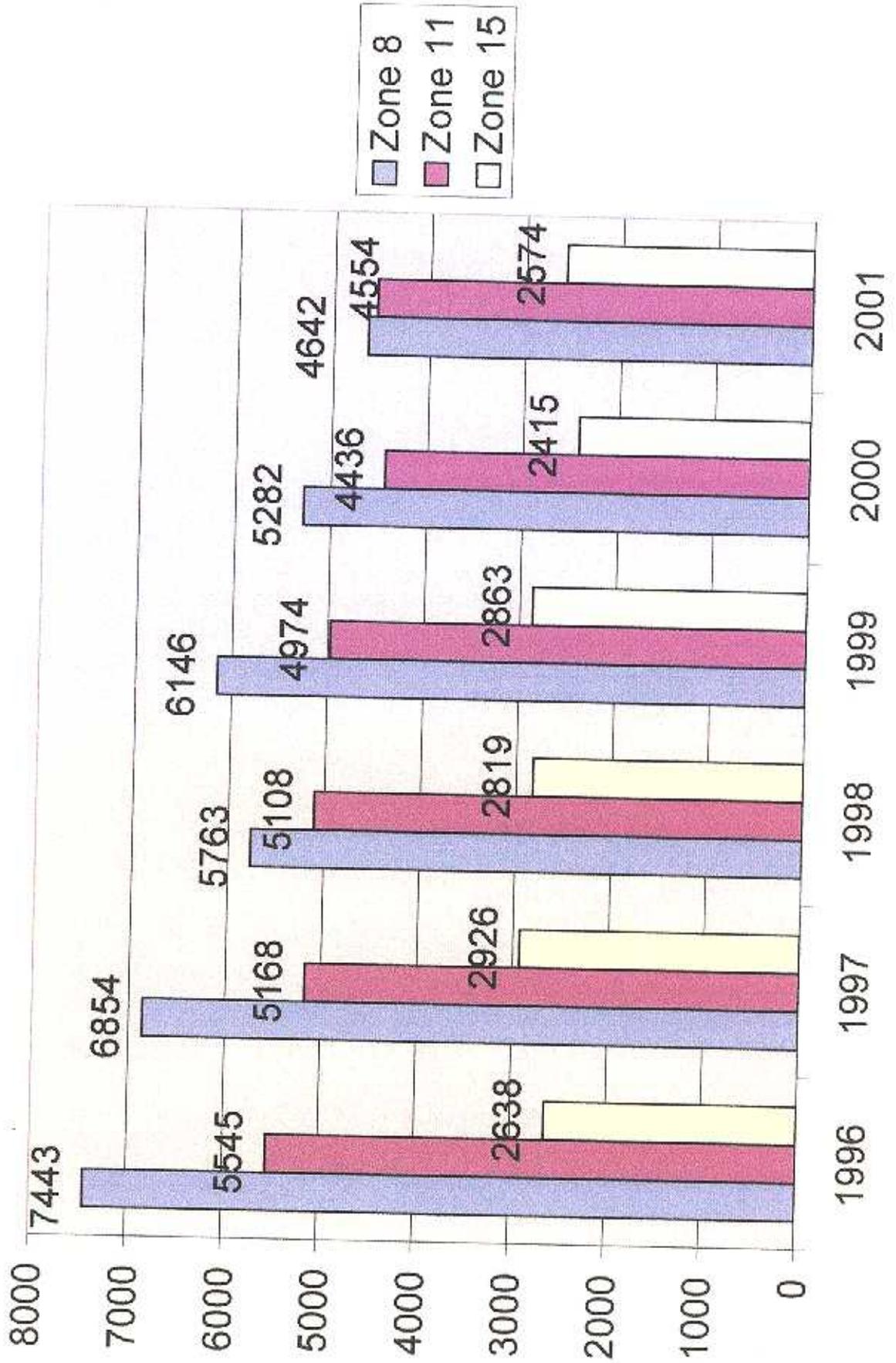
Edward H. Freeman
Land Protection

*Annual statistics available upon request
to Lorna, FWS.*

Crime Statistics

Zone 8, 11, 15

1996 - 2001



Florida Fish and Wildlife Conservation Commission
Office of Environmental Services
Bureau of Protected Species Management
620 South Meridian Street
Tallahassee, FL 32399-1600
Dr. Robbin Trindell or Dean Gallagher
(850) 922-4330

CCCL PROJECT GUIDELINES TO REDUCE IMPACTS TO MARINE TURTLES

SECTION 161.053(5)(C) FLORIDA STATUTE. The department may condition the nature, timing, and sequence of construction of permitted activities to provide protection to nesting sea turtles and hatchlings and their habitat, pursuant to §370.12, and to native self-resistant vegetation and endangered plant communities.

SECTION 370.12(3)(D) FLORIDA STATUTE. Any application for a department permit or other type of approval for an activity that affects marine turtles or their nests or habitat shall be subject to conditions and requirements for marine turtle protection as part of the permitting or approval process.

CONSTRUCTION TIMING

Construction or repair of any structure on the sea turtle nesting beach (e.g., dune walkover, seawalls or other revetments, sandbags, groins or jetties, piers, etc.) or any other activity requiring beach disturbance (e.g., placing fill, dune revegetation, excavation, etc.) is strongly discouraged during the main portion of the nesting season, May 1 to October 31 (in areas of known leatherback nesting, special conditions may be imposed beginning March 1). Proposals to conduct such activities during the nesting season will require extended review and are unlikely to be approved unless emergency circumstances are demonstrated. These proposals may also require the applicant to contract the services of an entity possessing a special marine turtle permit to perform work involving marine turtles. Projects which result in permanent modification of nesting habitat may require the evaluation of long-term (multi-year) impacts on nesting activity.

Please Remember: Any construction activity that disrupts a nesting marine turtle, disrupts or destroys a sea turtle nest, or results in the injury or mortality of a marine turtle may subject the applicant to prosecution under the U.S. Endangered Species Act and Florida Statutes.

LIGHTING

General Information

The negative effects of beachfront lighting on marine turtle hatchlings and nesting females are well documented. Hatchlings emerge during hours of darkness, allowing them to make their journey to the sea when sand temperatures are low and terrestrial, avian, and aquatic predators comparatively few. Proper hatchling orientation depends largely on a visual response to light. Under natural conditions, the ocean presents the brightest and most open horizon, and this serves as a cue to hatchlings in their ocean-finding behavior. Artificial lights disrupt this behavior and attract hatchlings as they emerge from their nests. Visible light sources and the reflection or "glow" resulting from the cumulative effects of coastal lights both contribute to this problem. Instead of making their way to the ocean, hatchlings become misoriented and may wander extensively on the beach. Even for those hatchlings that eventually reach the ocean, unnecessary wandering increases their vulnerability to predation and expends limited energy stores. In addition, hatchlings may wander landward through beachfront property or across parking lots and highways toward light sources. Most die from desiccation, direct exposure to the morning sun, or contact with vehicles. Furthermore, beachfront lighting has been documented to negatively affect nesting females and often results in reduced or abnormal nesting activity.

CCCL PROJECT GUIDELINES TO REDUCE IMPACTS TO MARINE TURTLES (page 2)

General Guidelines

To prevent hatchling misorientation and adverse impacts to nesting turtles, installation of exterior lighting is strongly discouraged. If exterior lighting is proposed, the following general guidelines shall be followed. Adherence to these guidelines will help in developing an acceptable lighting plan. However, in some cases, specific site conditions may warrant more stringent lighting restrictions.

1. Lights should not be placed on the seaward side of the subject property or in any location visible from the nesting beach.
2. Lights positioned seaward of the landward toe of the dune (or its equivalent) are prohibited.
3. The light source or any reflective surface of the light fixture must not be visible from any point on the nesting beach. Illumination of any area of the nesting beach, either through direct illumination, reflective illumination, or cumulative illumination is prohibited.
4. Completely shielded downlights without interior reflective surfaces are preferred. All proposed fixtures shall be appropriately shielded, louvered, and/or recessed.
5. Fixtures shall be low mounted through the use of low bollards, ground level fixtures, or low wall mounts.
6. Lights proposed for the seaward side of the subject property must incorporate either shielded low pressure sodium lamps or low wattage (i.e., 50W or less) "bug" type bulbs. Exceptions may be granted for extremely low wattage bulbs (e.g., 5W).
7. Lights for purely decorative or accent purposes shall not be used on the seaward side of the subject property and, if proposed for the landward side, shall be limited in number and intensity. The use of uplights is strongly discouraged and in most cases, cannot be approved.
8. High intensity lighting, such as that proposed for roadways, shall utilize shielded low pressure sodium lamps. The number of fixtures shall be kept to a minimum and shall be positioned and mounted in a manner such that the point source of light or any reflective surface of the fixture is not visible from any point on the nesting beach. Light emanating from these fixtures may not directly or indirectly illuminate the nesting beach.
9. Only low intensity lighting shall be utilized in parking areas that are visible from any point on the nesting beach. This lighting shall be set on a base which raises the source of light no higher than 48" off the ground, and shall be positioned and shielded such that the point source of light or any reflective surface of the light fixture is not visible from any point on the nesting beach. The light emanating from such fixtures may not directly or indirectly illuminate the nesting beach.
10. Parking lots and roadways, including any paved or unpaved area upon which motorized vehicles will operate, should be designed or positioned such that vehicular headlights do not cast light toward or onto the nesting beach. Hedges, native dune vegetation, and/or other ground-level barriers should be utilized to meet this objective.
11. During construction, temporary security lighting during the main portion of the sea turtle nesting season (May 1 - October 31) is strongly discouraged. If absolutely necessary, these lights shall be limited to the fewest number necessary. Security lights shall be completely shielded and low-mounted. Low pressure sodium vapor lamps or low wattage yellow "bug" type bulbs shall be utilized. Under no circumstances shall these lights directly or indirectly illuminate any area of the nesting beach.
12. Tinted glass or window film that meets a transmittance value of 45% or less (inside to outside transmittance) shall be utilized on all windows and glass doors visible from any point on the nesting beach.

Adjusta-Post Lighting Company

Shades for Floodlights

Use with Motion-detector Outfitted Floodlights

Use floodlights that accept 40 watt or lower
Bug light bulbs

FLOOD LIGHTING

Polycarbonate Flood Lights

Available with or without Snap-on Shades!



15RP2



15RP2-W &
15RP2-SHW

EASY TO USE
SNAP-ON
SHADES!



15RP2-W (White)
15RP2 (Black)

+



15RP-SHW (White)
15RP-SH (Black)

=



15RP2W & 15RP-SHW (White)
15RP2 & 15RP-SH (Black)

Stainless Steel
Hardware!

Will Not Rust
or Corrode!



For Flood Light with Shade in Black order (1) 15RP2 & (1) 15RP-SH
For Flood Light with Shade in White order (1) 15RP2-W & (1) 15RP-SHW

Max. Wattage: 150 Watt Inc. Par Lamp
Note: Flood Light and Snap-on Shades sold
and packaged separately! Lamps not included.

Adjusta-Post Lighting Company

3960 Summit Rd

P.O. Box 71

Norton, Ohio 44203

Tel: (330) 745-1692

Fax: (330) 745-9746

Customer Service 1-800-321-2132

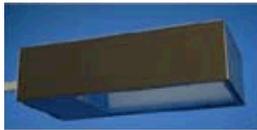
Website: www.aplighting.com

Light with shade = \$28.00

Bug bulbs 1 = \$1.21



aeco@americanelectric.com



Model: B Series

Wattage: 1 x 55-180, 2 x 55-180

ARCHITECTURAL LANDSCAPE LIGHTING

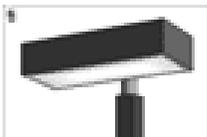
2930 South Fairview Street
Santa Ana CA 92704
800-854-8277
<http://www.allscape.net/>



Model: AL-08
Wattage: 1 x 35-180
Available pole-mount
[Manufacturer's Page](#)



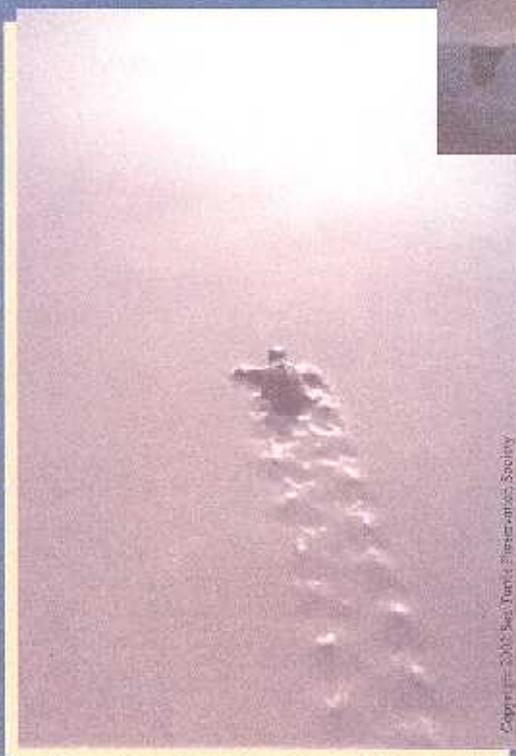
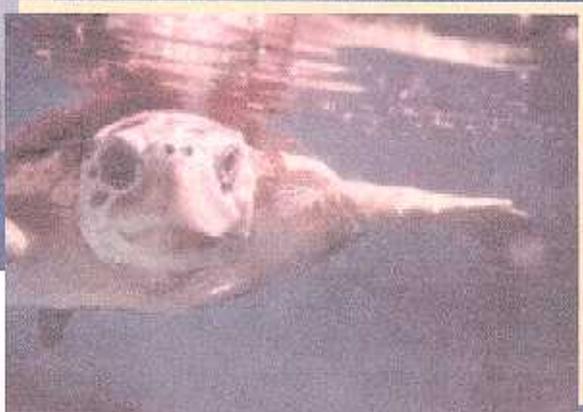
Model: AL-09
Wattage: 1 x 35-180, 2 x 35-90
Available pole-mount
[Manufacturer's Page](#)



Model: AL-10
Wattage: 1 x 35-180, 2 x 35-90
Available pole-mount

Available on the web:
<http://floridaconservation.org/psm/turtles/manual.pdf>

Coastal Roadway Lighting Manual



Copyright © 2002 Sea Turtle Conservation Society

A handbook of practical
guidelines for managing
street lighting to minimize
impacts to sea turtles

May 2002



2661 Alvarado Street
San Leandro CA 94577
800-227-0758 / 510-357-6900

<http://www.sitelighting.com/index.cfm>

<http://www.sitelighting.com/Family.cfm?Brand=gar&ProLine=LPS>

Model: Form 10 LPS
Wattage: 1 x 55-180
Available pole- and wall-mount



[bollards](#) [canopy](#) [cylinders](#) [emergency](#) [fascia forms](#) [fascia plates](#) [fascia wash](#) [floods/spots](#) [garage](#) [gullwing](#) [lightcolumns](#) [lps](#) [poles](#) [round sconces](#) [square](#) [step/aisle lights](#)

Low Pressure Sodium



LPS Arm Mount



LPS Direct Mount



LPS Post Top



LPS Wall Mount

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Gardco Lighting

2661 Alvarado Street, San Leandro, CA 94577
800.227.0758 510.357.6900 FAX 510.357.3088

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Genlyte Thomas Group LLC

KIM LIGHTING

SITE / ROADWAY



Solitaire



Curvilinear VL

OK



Structural



Curvilinear WTH/WTV

OK



Era



NeoSphere

OK



The Entablature



Outdoor Tube System

OK

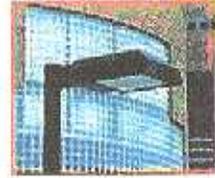


Matrix



EKG Shoebox Luminaires

OK



The Archetype



Type 5 Shoebox Luminaires

OK



Curvilinear

OK

The Ultimate in Architecturally Relevant Outdoor Lighting

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SKYGARD™

201SA UNIT PACK



APPLICATIONS

- For outdoor work yards, roadside commercial establishments, suburban developments, rural homes and yards

SPECIFICATION FEATURES

- Complete unit pack in one package standard: includes hood, optical, lamp, PE control, prewired cable and mounting hardware
- Die-cast aluminum hood
- Meets Full Cutoff requirements
- Slipfitter is adjustable for 1-1/4 in. to 2 in. pipe

ORDERING NUMBER LOGIC

PRODUCT IDENT	WATTAGE	LIGHT SOURCE	VOLTAGE	BALLAST TYPE	PE FUNCTION	CABLE	MOUNTING BRACKET	LENS TYPE	LAMP TYPE
XXX SGR = SKYGARD	XX 07 = 70 10 = 100 15 = 150 (55V) 17 = 175	X S = HPS C = Merc	X 1 = 120 3 = 240	X N = NPF Reactor or Lag	X 2 = PE Receptacle 5 = PE Receptacle with PE Control	X 2 = 30-in. (762mm) #16 4 = 5-ft (1.5M/ #14	X L = Long 24-in. (610mm) N = None S = Short	XXXX V5SL = Open Type 5 SKYGARD Latch Type	X C = Clear

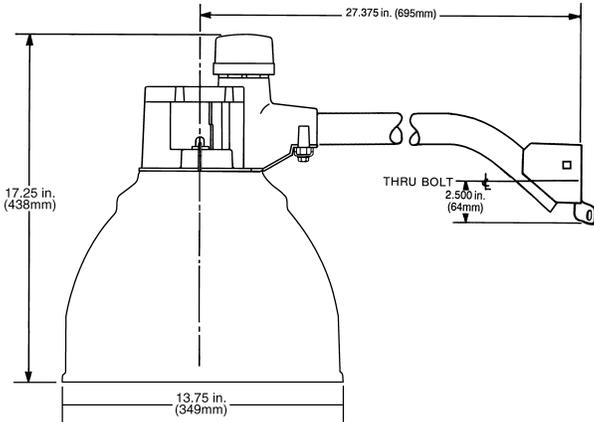
PHOTOMETRIC SELECTION TABLE

Wattage	Light Source	IES Type	Photometric Curve Number 35-
70	HPS	5	452513
100	HPS	5	452512
150	HPS	5	452511
175	Merc	5	452514

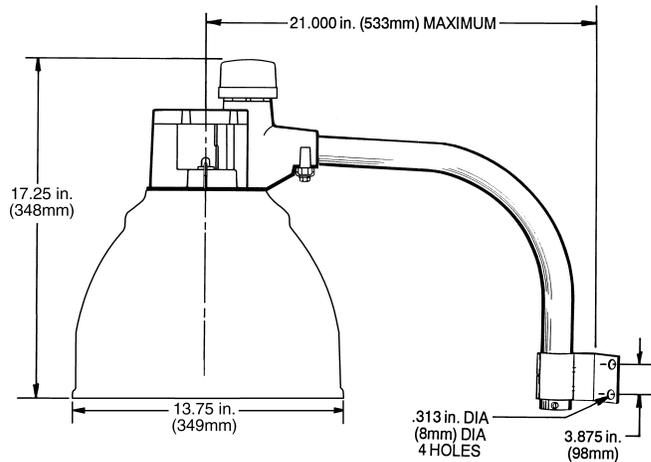
SKYGARD™ 201SA UNIT PACK

FIXTURE DIMENSIONS

LONG MOUNTING BRACKET



SHORT MOUNTING BRACKET



SUGGESTED CATALOG NUMBERS

Opticals Only:	GE Manufacturing Number	
SGR-1	145298	Single Pack
SGR-5	145299	5 Pack - Order as quantity needed in total

Kits with Long Arm, PE, Lamp and Cable included	GE Manufacturing Number	Wattage	Light Source	Voltage
SGR07S1N54LV5SLC	145618	70	HPS	120
SGR10S1N54LV5SLC	145619	100	HPS	120
SGR15S1N54LV5SLC	145620	150	HPS	120
SGR17C1N54LV5SLC	145877	175	Merc	120
SGR17C3N54LV5SLC	145617	175	Merc	240

DATA

Approximate Net Weight			
Short 18 in. (457mm) Mounting Bracket	25 lbs		11 kgs
Long 24 in. (610mm) Mounting Bracket	30 lbs		14 kgs
Effective Projected Area			
	1.4 sq. ft. max		0.13 sq. M max
Suggested Mounting Height			
	12-25 ft.		4-8 M

REFERENCES

See Page R-38 for start of Accessories.
See Page R-42 for Explanation of Options and Other Terms Used.

MONGOOSE®



USE only with Low Pressure Sodium lamps

<http://www.holophane.com/>



The Mongoose Roadway and Area Lighting luminaire offers paramount versatility of applications with advanced optical systems and an aesthetically pleasing design. The ability to configure the Mongoose optics, tilt, and mounting method to meet specific applications enables it to be used in diverse applications ranging from interstates to parking lots. With fourteen optical configurations, including wide roadway,

narrow roadway, medium roadway, forward throw, wide flood, narrow flood, and square distributions and tilts ranging from 0° to 45°, it provides unparalleled solutions for a multitude of lighting requirements. The Mongoose has full cutoff through semi-cutoff distributions providing additional flexibility where required.


HOLOPHANE®
LEADER IN LIGHT TECHNOLOGY

HL 2242 10/02



1736 Dreman Avenue
Cincinnati OH 45223
513-541-3486
<http://www.lsi-industries.com/index.php/lightingsol.html>

Model: Cypress
Wattage: 1 x 90-180, 2 x 90
Available pole- and wall-mount





P.O. Box A
Conyers GA 30012
770-922-9000
<http://www.lithonia.com/>



Model: KT
Wattage: 1 x 90, 2 x 90
Available pole- and wall-mount
[Manufacturer's Page](#)

The MoonCell Luminaire

- **Advanced Dual Source Technology**

DUAL (Solar/Wind) renewable energy sources. Innovative design utilizes a mix of circuit optimization, well-chosen components, exclusive hybrid solar cells, wind turbines, and the most advanced power management circuitry available.

- **Environmentally friendly**

Totally Renewable Energy. All parts are recyclable or reusable. Almost no light pollution from specially engineered LED's. LEDs produce no ultraviolet light.

- **Virtually maintenance free**

Weatherproof, designed to withstand winds of 200+ mph. Polycarbonate shell resists erosion, sand, dust, dirt, and bird droppings. Mil-spec luminaire means long-life parts. Uses batteries engineered specifically for solar applications and many repeated charging cycles. LED 's rated for 100,000 hours service.

More efficient, Less expensive

Unique technologies allow faster recharge time, longer life between charging and no connection to an electrical grid = *No electricity bills!*

No infrastructure requirements

No cables, no trenches, no overheads. Adapts to existing poles. Installs in minutes.

Hybrid Solar Cells

MoonCell Solar Cells are designed to charge across a broad spectrum, including the Ultraviolet and Infrared ranges, at less than 2 lux.

Power Management Circuitry

Unique, patented power management circuitry distributes power to lamp to optimize discharge and therefore, extend battery life

Wind Turbine

Charges batteries at only 150 rpm

For more information, email us at:

info@mooncellusa.com

MoonCell USA, Inc.
www.mooncellusa.com

MoonCell Street Lamp Specifications

Case	UV Stabilized Polycarbonate
Dimensions	30" x 12" x 5" (8" at Thickest Point)
Mounting	Universal Fitting
Solar Panel	Integral Design, no External Clampings
Wind Turbine	360 Degree, Venturi Effect Entry, Advanced Centrifugal Design
Batteries	2 x No-Maintenance, Sealed Lead Acid Gel-Cel Batteries, Designed for Solar Applications
Light Source	Dedicated 20mm Light Emitting Diodes
Light Output	Controlled Semi-Coherent Pattern (Reduced Light Pollution and Trespass Violations)
Power	Consumption <6 Watts with 12 LED Configuration @ 12 VDC with Integral Step-Down for LEDs
Minimum Charge	3-4 Hours Bright Sunlight, 6-8 Hours Overcast Conditions
Charge Cycle	Solar: Positive Charge @ <2 Lux; Turbine: Based upon Wind Speed, Positive Charge @ 150+ RPM. Both Sources Combined by Power Management Circuitry
Maintenance	Low-to-None
Lifespan	Indefinite, with Battery Change Approximately Every 5-6 Years
Health/Safety	No Hazardous Materials. No UV Produced by LEDs. All Parts Recyclable or Reusable. Battery Overload Protection. ISO 9001 Compliant and UL Certified
Upgrades	Encoded Radio Frequency Switching (On/Off)
Add-Ons	(In Progress) CCD Camera, Various Sensors, Communications Between Lamps, Wireless Narrowband and Broadband Communications Infrastructure

MoonCell USA, Inc.
www.mooncellusa.com

Howard Hochrad
(904) 379-5320
hhochrad@mooncellusa.com
Florida, Alabama & Georgia Sales



2661 Alvarado Street
San Leandro CA 94577
800-227-0758 / 510-357-6900

<http://www.sitelighting.com/index.cfm>

<http://www.sitelighting.com/Family.cfm?Brand=gar&ProLine=LPS>

Model: Form 10 LPS
Wattage: 1 x 55-180
Available pole- and wall-mount



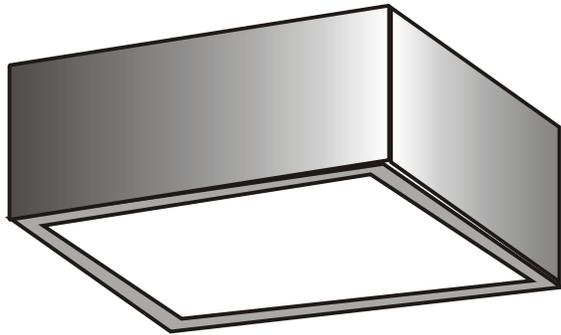


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Model: KT
Wattage: 1 x 90, 2 x 90
Available pole- and wall-mount
[Manufacturer's Page](#)

SELS RECESSED SERIES



SHOWN WITH CLEAR FLAT
TEMPERED GLASS LENS

ORDERING INFORMATION
SELS-35LPS-120V-HF3-BZ

Electrical Data:

Low Pressure Sodium Ballast
DCB-Double Contact Bayonnette base socket

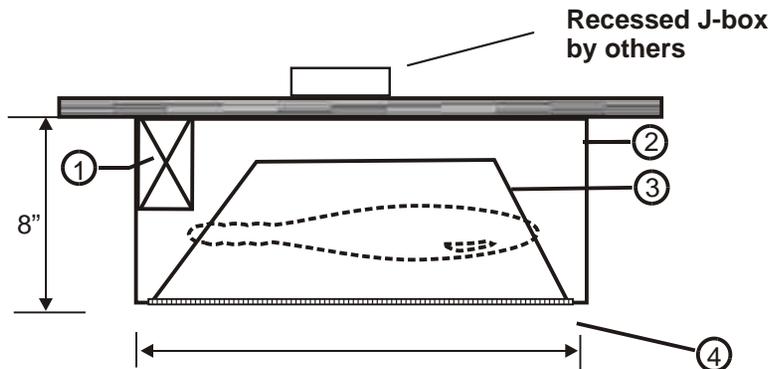
Lamp: (by others)
35LPS

Options:

CG Clear tempered glass
SM Surface Ceiling Mount

Finish:

Polyester powder coat finish - semi-gloss white



24" SQUARE

SIDE VIEW

- ① 60Hz core/coil ballast, 120V operation
- ② Satin coat steel housing suitable for surface ceiling mount. Independent support by installer
- ③ Hammertone symmetric reflector system
- ④ Clear tempered glass lens flush in hinged frame.

Listing:
Complies with CSA, UL approved with
ETL label for wet location.

CAT. NO.: SELS-35LPS-120V-HF3-BZ			
227 Wilkinson Rd. Brampton, Ontario. L6T 4M2 Tel. 905-457-4777 Fax 905-457-1115		 solera www.soleracorp.com architectural lighting innovations	
DWG NO. OD-CR408-B2		PROJECT: THE VIEW CONDO	
TYPE PGA		SCALE NTS	SIZE A REV A QTY: 9



1736 Dreman Avenue

Cincinnati OH 45223

513-541-3486

<http://www.spauldinglighting.com/>

http://www.spaulding-ltg.com/products/browse/Low_Pressure_Sodium_Area.asp



SPAULDING
LIGHTING, INC.



Model: Medallion LPS

Wattage: 1 x 35-55

Available pole-mount only



Model: Oakland I LPS

Wattage: 1 x 35-180

Available pole- and wall-mount



Model: Oakland II LPS

Wattage: 2 x 35-180

Available pole- and wall-mount



Model: Oakland III

Wattage: 1 x 90-180

Available pole- and wall-mount



Model: Dallas LPS

Wattage: 2 x 18-90

Available pole-mount only



Model: Palomar LPS

Wattage: 1 x 35-180

Note: CFL option only is fully shielded



Model: Cambridge II LPS

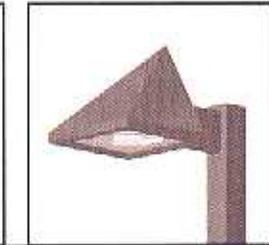
Must request LPS specifications from Mfr.



Model: Alaire LPS

Must request LPS specifications from Mfr

Night Sky Friendly Commercial Lighting Fixtures



Architectural Lighting



Area Lighting

Starry Night
Lights



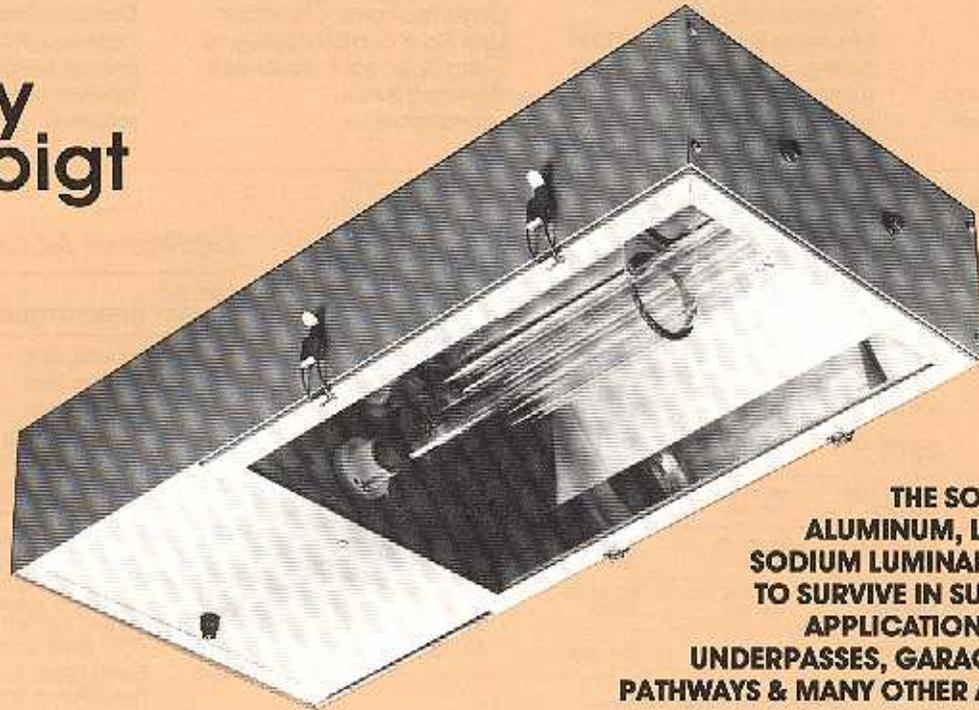
www.StarryNightLights.com

(877) 604-7377

Starry Night Lights... Saving The Night Sky... One Star at a Time!

UNDER DECKER™

by
Voigt

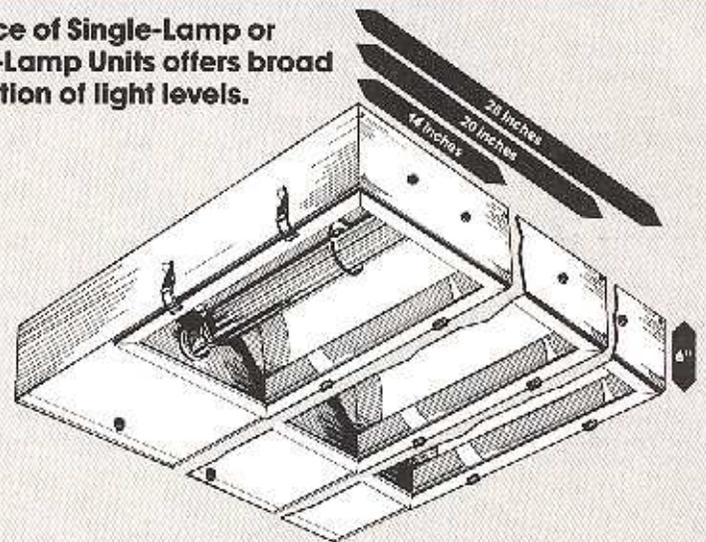


THE SOLID EXTRUDED ALUMINUM, LOW PRESSURE SODIUM LUMINAIRE—DESIGNED TO SURVIVE IN SUCH OUTDOOR APPLICATIONS AS TUNNELS, UNDERPASSES, GARAGES, COVERED PATHWAYS & MANY OTHER APPLICATIONS

THE
UNDER DECKER
FAMILY

- No. 0-75** for 180 Watt L.P.S.
- No. 0-74** for 135 Watt L.P.S.
- No. 0-73** for 90 Watt L.P.S.
- No. 0-72** for 55 Watt L.P.S.
- No. 0-71** for 35 Watt L.P.S.

Choice of Single-Lamp or Multi-Lamp Units offers broad selection of light levels.



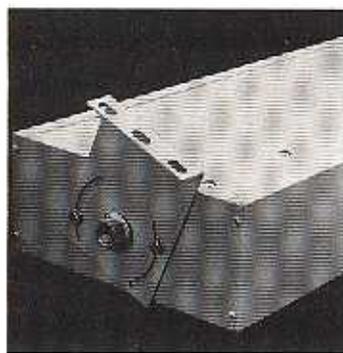
UNDER DECKER™ is available in various widths as required to accommodate one or more lamps with optimum photometric effectiveness.



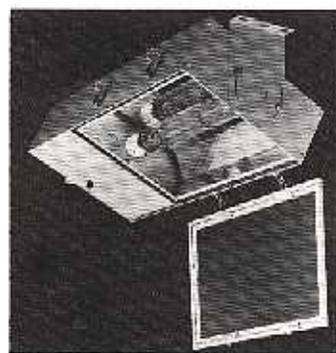
Voigt Lighting Industries, Inc.



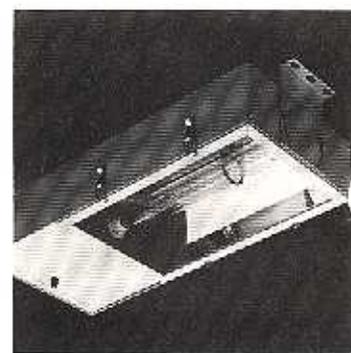
Direct Ballast Chamber Accessibility for easy installation and maintenance. Terminal block or quick disconnect options available.



Optional Adjustable Mounting Bracket ($\pm 45^\circ$) for ceiling or wall installation. All external hardware is corrosion resistant.



Gasketed Lamp Chamber Lens Door can be captive or swing open from either side. Standard lens is polycarbonate.



Optional Bracket (BR-7) Orients unit 3 inches below ceiling. Longer or different types of brackets available if required.

Table of Electrical Characteristics for UNDER-DECKER™

Low Pressure Sodium Lamp	180 Watts	135 Watts	90 Watts	55 Watts	35 Watts
Nominal Primary Voltage (Volts)	120, 208, 240 277, 480	120, 208, 240 277, 480	120, 208, 240 277, 480	120, 208, 240 277, 480	120, 208, 240 277, 480
Starting Line Current (Amps)	2.0, 1.15, 1.0 0.85, 0.5	1.8, 1.04, 0.9 0.8, 0.45	1.2, 0.7, 0.6 0.5, 0.4	0.95, 0.55, 0.48 0.41, 0.3	0.8, 0.46, 0.4 0.35, 0.2
Operating Line Current (Amps)	1.9, 1.18, 0.95 0.82, 0.5	1.64, 0.95, 0.82 0.71, 0.4	1.16, .67, .58 0.50, .29	0.88, 0.43, 0.37 0.32, 0.19	0.54, 0.32, 0.27 0.24, 0.14
Open Circuit Current (Amps)	5.2, 2.9, 2.8 2.3, 1.9	5.2, 2.9, 2.6 2.3, 1.9	4.0, 2.3, 2.0 1.7, 0.9	2.5, 1.45, 1.25 1.1, 0.6	2.5, 1.45, 1.25 1.1, 0.6
Primary Drop-out Voltage (Volts)	90, 156, 180 208, 360	66, 114, 132 152, 204	66, 114, 132 152, 240	66, 114, 132 152, 250	40, 63, 96 111, 185
Ballast Power (Initial (Watts))	40, 40, 40 40, 40	43, 43, 43 43, 43	35, 35, 35 35, 35	25, 25, 25 25, 25	25, 25, 25 25, 25
Total Power (Initial (Watts))	220, 220, 220 220, 220	178, 178, 178 178, 178	125, 125, 125 125, 125	80, 80, 80 80, 80	60, 60, 60 60, 60
Power Factor	Over 90%	Over 90%	Over 90%	Over 90%	Over 90%
Lamp Lumen Regulation	+5% or +10% Voltage Regulation				
Minimum Ambient Start Temp	-20°F (Lower Temperature on Special Order)				

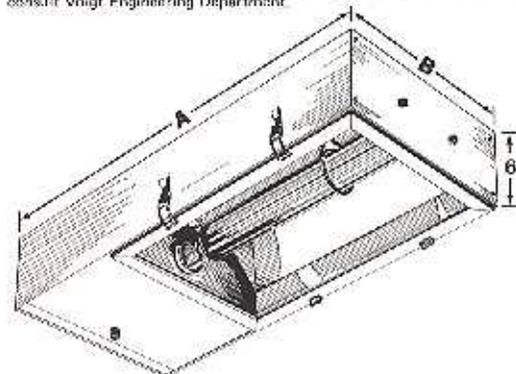
Specification and Ordering Information

CATALOG NUMBER	L. P. S. Nominal Lamp Watts	OVERALL DIMENSION IN INCHES				Approximate Weight In Pounds 1 Lamp Unit
		1 Lamp Unit and 2 Lamp Unit		3 Lamp Unit and 4 Lamp Unit		
		A	B	A	B	
0-75-000*	180	57	14	67	20	42
0-74-000*	135	43	14	53	28	37
0-73-000*	90	32	14	42	28	30
0-72-000*	55	28	14	28	28	23
0-71-000*	35	24	14	24	28	21

*SPECIFY VOLTAGE DESIRED: 120, 208, 240, 277 or 480. i.e. No. 0-75-277.

Add number of lamps per unit (if more than one) with suffix: i.e. 3-Lamp Unit would be No. 0-75-3-277.

For combinations of different wattage lamps in one unit, or addition of fluorescent lamps for color improvement, consult Voigt Engineering Department.



Refer to above Specification Chart for "A" and "B" dimensions.

Optional Accessories

CAT. NO.	SUFFIX	DESCRIPTION
2		2-Lamp Unit
3		3-Lamp Unit
4		4-Lamp Unit
ACR		Acrylic Lens in place of Standard Polycarbonate
ASY		Asymmetric Light Distribution (1-Lamp Unit Only)
BR-7		Adjustable Mounting Brackets (3" Drop)
BR-8X		Adjustable Mounting Brackets—substitute inches of drop below ceiling for "X" in suffix ("X" must exceed 3")
BR-9		Fixed Right Angle Mounting Brackets on end for flush mounting
BR-10		Fixed Right Angle Mounting Brackets on sides for flush mounting
BZ		Bronze Painted Exterior Finish (Indicate other colors as required)
EF		Single Fuse (Externally Accessible)
EFF		Double Fuse (Externally Accessible)
F		Single Fuse (Internal)
FF		Double Fuse (Internal)
GLAS		Tempered Glass in place of Standard Polycarbonate
HUB-1		Threaded 3/4" Power Entry at Ballast End
HUB-2		Threaded 3/4" Power Entry at Opposite to Ballast End
HUB-3		Threaded 3/4" Power Entry at Side of Ballast Chamber
HUB-T		Lengthwise, Through-Wiring Provision (3/4" Threaded)
NB		Unit without ballast to allow remote mounting
PI		Internal Photocell (120 Volts Only)
PR		Twist Lock Photocell Receptacle
QU		Quick Disconnect Ballast Wiring
TB		Terminal Block (In Ballast Chamber)

Various photometric patterns are available with diffuse, specular and shaped reflectors. Consult Voigt Engineering Department for data and application suggestions.



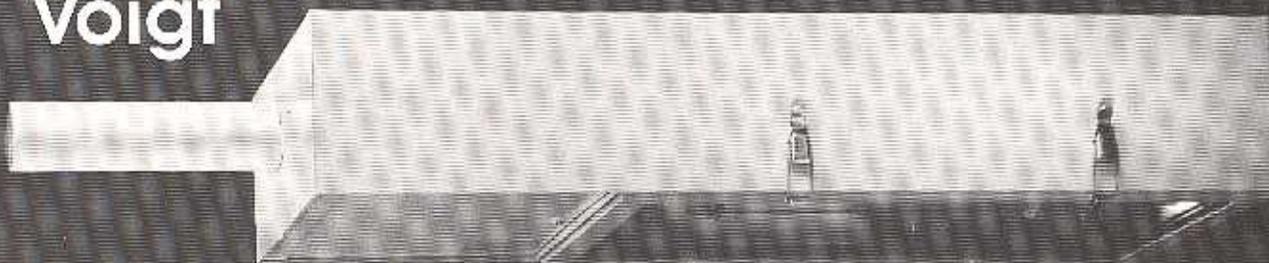
Voigt Lighting Industries, Inc.

Headquarters Location
135 Fort Lee Road
Leonia, NJ 07635
201 461-2493

Manufacturing Location
7347 Melrose Street
Philadelphia, PA 19136

WIDELINER™

by
Voigt



THE CONTEMPORARY WIDELINER™ FOR GLARE-FREE,
WIDE-RANGING LIGHTING EFFECTS AT GREATEST
EFFICIENCY WITH LOW PRESSURE SODIUM SOURCES
MADE OF SOLID EXTRUDED ALUMINUM

THE OUTDOOR

WIDELINER

FAMILY

No. 0-76 for 35 Watt L.P.S.

No. 0-77 for 55 Watt L.P.S.

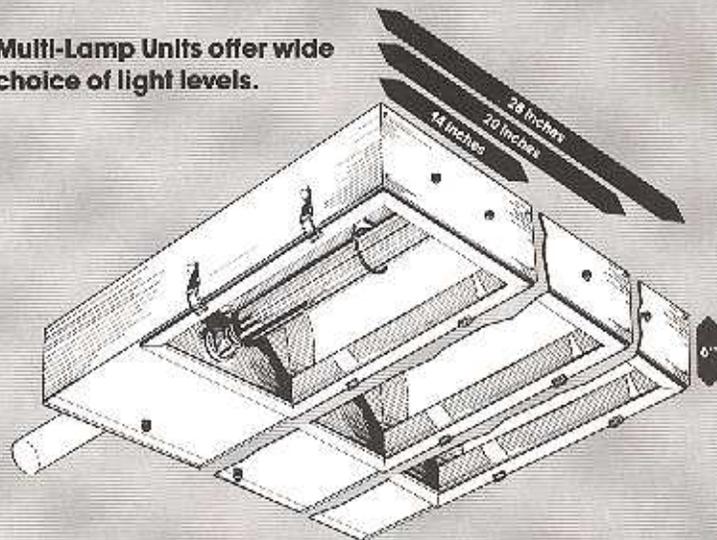
No. 0-78 for 90 Watt L.P.S.

No. 0-79 for 135 Watt L.P.S.

No. 0-81 for 135 Watt L.P.S.
& 2-30 Watt Fluor.

Combination of Low Pressure Sodium &
Fluorescent may be used to provide
color recognition.

Multi-Lamp Units offer wide
choice of light levels.



WIDELINER™ is available in various widths as required to
accommodate one or more lamps with optimum photometric
effectiveness.



Voigt Lighting Industries, Inc.



Direct Ballast Chamber Accessibility for easy installation and maintenance. Terminal block or quick disconnect options available.

Lamp Specification and Ordering Data

LOW PRESSURE SODIUM LAMPS ONLY (Order Separately)

CATALOG NUMBER	Watts	Rated Life (Hours)	Initial and Maintained Lumen Output	Max. Overall Length In Inches
SOX-35	35	18,000	4,800	12 3/16
SOX-55	55	18,000	8,000	16-3/4
SOX-90	90	18,000	13,500	20-3/4
SOX-135	135	18,000	22,500	30 1/2

Table of Electrical Characteristics for WIDELINER™

Low Pressure Sodium Lamp	135 Watts	90 Watts	55 Watts	35 Watts
Nominal Primary Voltage (Volts)	120, 208, 240 277, 480	120, 208, 240 277, 480	120, 208, 240 277, 480	120, 208, 240 277, 480
Starting Line Current (Amps)	1.8, 1.04, 0.9 0.8, 0.45	1.2, 0.7, 0.6 0.5, 0.4	0.95, 0.55, 0.48 0.41, 0.3	0.8, 0.46, 0.4 0.35, 0.2
Operating Line Current (Amps)	1.64, 0.95, 0.82 0.71, 0.4	1.16, .67, .58 .50, .29	0.68, 0.43, 0.37 0.32, 0.19	0.54, 0.32, 0.27 0.24, 0.14
Open Circuit Current (Amps)	5.2, 2.9, 2.6 2.3, 1.9	4.0, 2.3, 2.0 1.7, 0.9	2.5, 1.45, 1.25 1.1, 0.6	2.5, 1.45, 1.25 1.1, 0.6
Primary Dropout Voltage (Volts)	66, 114, 132 152, 264	66, 114, 132 152, 240	66, 114, 132 152, 250	48, 83, 98 111, 185
Ballast Power Factor (Watts)	43, 43, 43 43, 43	35, 35, 35 35, 35	25, 25, 25 25, 25	25, 25, 25 25, 25
Total Power Initial (Watts)	178, 178, 178 178, 178	125, 125, 125 125, 125	80, 80, 80 80, 80	60, 60, 60 60, 60
Power Factor	Over 90%	Over 90%	Over 90%	Over 90%
Lamp Lumen Regulation	±5% at ±10% Voltage Regulation			
Minimum Ambient Start Temp	-20°F (Lower temperature on Special Order)			

Optional Accessories

CAT. NO. SUFFIX	DESCRIPTION
ACR	Acrylic Lens in place of Standard Polycarbonate
GLAS	Tempered Glass Lens in place of Standard Polycarbonate
ASY	Asymmetric Light Distribution
BZ	Bronze Painted Exterior Finish
COLOR	Painted Exterior Finish (Specify Color)
TB	Terminal Block (In Ballast Chamber)
QU	Quick Disconnect Ballast Wiring
PI	Internally Mounted Photo Cell (120 Volts Only)
PR	Twist-Lock Photocell Receptacle
F	Single Fuse (Externally Accessible)
FF	Double Fuse (Externally Accessible)
IF	Single Fuse (Internal)
IFF	Double Fuse (Internal)
NB	Unit without ballast to allow remote mounting
BR-3	Mounting Bracket—out from wall
CA	Corner Adapter (Use with BR-3)

Specification and Ordering Information

CATALOG NUMBER	Lamp Used	OVERALL DIMENSIONS IN INCHES			Standard Termination	Approx. Weight Lbs.	Projected Area Sq. Ft.
		Length	Width	Height			
0-76-000*	SOX-35	24	14	6		25	1.0
0-77-000*	SOX-55	28	14	6	2-3/8"O.D.	27	1.2
0-78-000*	SOX-90	32	14	6	PIPE	34	1.4
0-79-000*	SOX-135	43	14	6	ENTRY	41	1.8
0-81-000**	SOX-135 & 2 F. 30	43	14	6		46	1.8

* SPECIFY VOLTAGE DESIRED: 120, 208, 240, 277 or 480 - i.e. No. 0 78 277

** UNIT AVAILABLE ONLY FOR USE WITH 120 VOLT OR 277 VOLT SUPPLY. FLUORESCENT LAMPS ARE ADDED TO PROVIDE COLOR RECOGNITION.

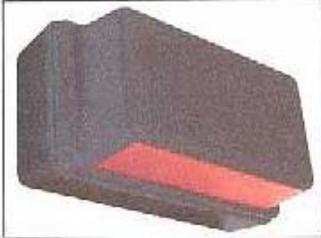
NOTE: Multi-Lamp Units can be provided on special order. Varying widths of luminaires can be furnished to accommodate up to 4 L.P.S. Lamps of similar or differing sizes.

Various photometric patterns are available with diffuse, specular and shaped reflectors. Consult Voigt Headquarters Engineering Department for data and application suggestions.

To specify a single Catalog Number that includes WIDELINER™; aluminum, steel or wood pole; single units or multiple cluster arrangements; and all other mounting hardware—contact Voigt Engineering Department.

For detailed photometric data (including point-by-point computer printouts) and a demonstration of the WIDELINER™; contact Voigt Lighting Industries, Inc. Headquarters.

W.F. Harris Wall Mount LED Fixture



Shielded Wall Lighting with 3 Watt Amber LED

- ☆ Designed for Coastal Environments
 - Nonconductive
 - Polycarbonate - Injection molded, UV-Stabilized Lens and Housing
 - Rustproof Base Plate - Tempered Marine-grade Aluminum
- ☆ Easy Installation
- ☆ Maintenance Free Performance
- ☆ UL Listed for Wet Locations
- ☆ Lifetime Warranty for Lens, Housing, and Base Plates against Rust, Corrosion, Breakage





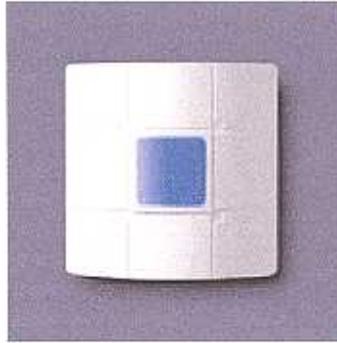
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Architectural Area Lighting

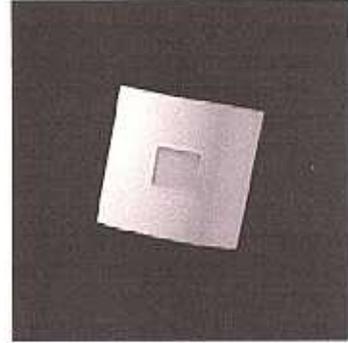
period	contemporary	floodlights	steplights	wall sconce	bollards
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miniFlex



eSconce



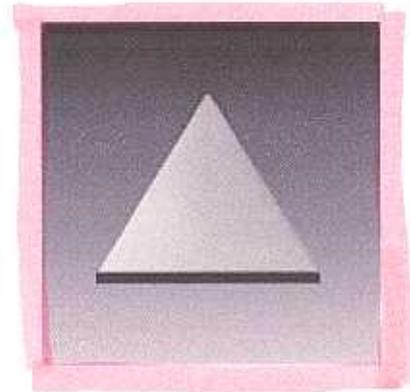
mini • eSconce



Universe Collection

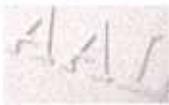


Spectra



Mitre

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Architectural Area Lighting

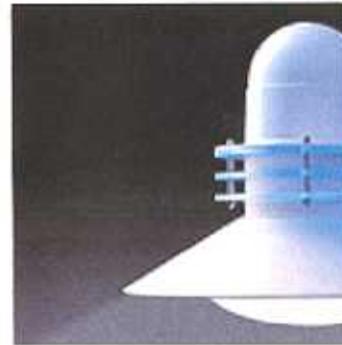
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Flex



Indirect



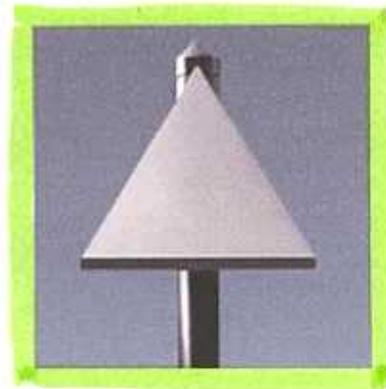
Universe Collection



Spectra

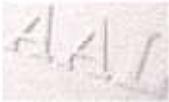


Largent



Mitre

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Architectural Area Lighting

period	contemporary	floodlights	steplights	wall sconce	bollards
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Trad. Con. Bollards



Concrete Bollards



Mitre



Spectra

*shields
needed
on
seaward
side*

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...Sea turtle lighting experts....

HOMELAND SECURITY FOR TURTLES



For more information contact us at:

Beeman Lighting, Inc.
1600 Tallevast Rd.
Sarasota, Florida. 34243
(941) 552-4145
www.beemanenterprises.com



...Sea turtle lighting experts...

- Beeman meets all standards for "ideal Lighting" near Florida Sea Turtle nesting beaches from
 - Florida Fish & Wildlife Commission (FWCC)
 - Department of Environmental Protection
 - More Marine Laboratories
- *Beeman LED-based light emits 100% pure red, 650 nanometers (nm) "minimally disruptive" to sea turtle migration.
- Beeman LED light uses half the energy
- Beeman LED light will not have to be replaced for up to 10 years.
- Beeman light fixture complies with FWCC low profile standards
- Change to one of eight colors after turtle season is over

*Per the Florida Marine Research Institute technical report TR-2



Available in four different colors 3 3/4 Tier Pagoda Style 6.5" & 9.5" Post

Black
Copper
Green
White

Made from scientific plastic no-toxic plastic resin. Withstands even the harshest environment, heat, cold, salt and rain.

Never replace your pathway lights again.

Pole mounted downlight luminaires with high performance cut-off light distribution and shielded light source

Pole top luminaires for roadway, parking areas, walkways and open pedestrian scale landscape areas, available in three sizes. Can be in single or twin configurations.

Housing/filter: Heavy one piece die cast aluminum (minimum .125" thick) with two specular anodized aluminum main beam reflectors. Slip fiber and arm extensions are die cast aluminum secured by six (6) socket head stainless steel set screws threaded into stainless steel inserts. Pole extension is extruded aluminum with a die cast aluminum cap.

Enclosure: One piece die cast aluminum, hinged, step baffle/trim with 1/2" thick clear tempered glass, silicone sealed to trim. Trim/baffle is retained by stainless steel fasteners threaded into stainless steel inserts. Fully gasketed for weather tight operation for downlighting only.

Electrical: Lampholders; H.I.Q. are medium base porcelain with nickel plated copper screw shell supplied with 200°C high temperature leads, rated 4KV.

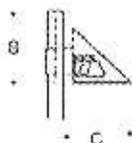
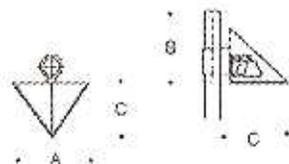
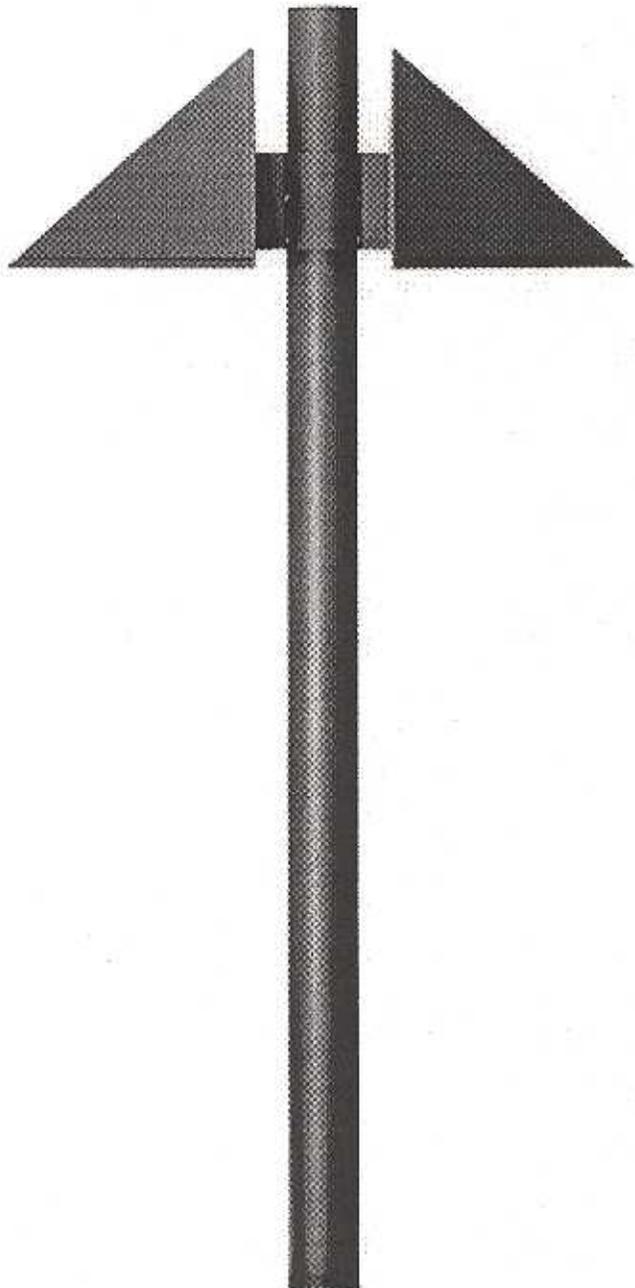
Ballasts are located in the luminaire and are available in 120V or 277V, HPF - specify.

Finish: Standard finish is an eight step process consisting of two coats of black or white polyurethane, one with light texture over a phosphate base.

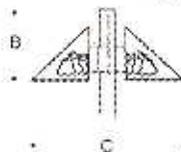
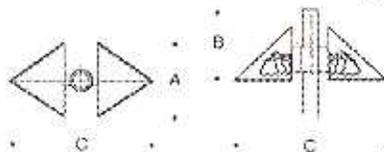
Custom colors supplied on special order.

U.L. listed, suitable for wet locations.

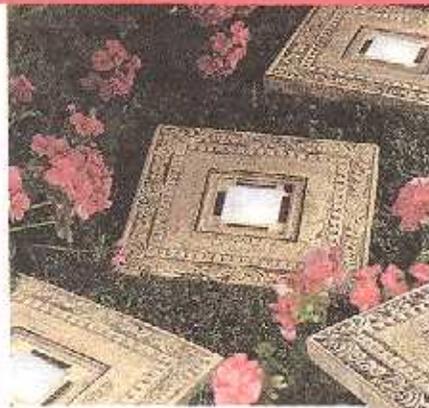
Type:
 BEGA Product #:
 Project:
 Voltage:
 Color:
 Options:
 Modified:



Single or twin pole top luminaires with asymmetrical light distribution. Internal twin optical system. Tempered glass lens. Specify coated lamps for optimum performance. Stopped, die cast aluminum trim. 9804, 9849 slip fit 3"ø pole top. 9900, 9906 slip fit 4"ø pole top. 9998, 9999 slip fit 5"ø pole top. Color: Black or white.



	Lamp	Lumen	A	B	C
9900S	Single 1 50W E-17 HPS	4000	19%	18	13%
9900MH	Single 1 70W ED-17 MH	5500	19%	18	13%
9998S	Single 1 70W E-17 HPS	8500	23%	21	16%
9998MH	Single 1 100W ED-17 MH	12000	23%	21	16%
9804S	Single 1 150W E-17 HPS	16000	28%	23%	21
9804MH	Single 1 175W ED-17 MH	14000	29%	23%	21
9906S	Twin 2 50W E-17 HPS	8000	19%	18	36
9906MH	Twin 2 70W ED-17 MH	11000	19%	18	36
9999S	Twin 2 70W E-17 HPS	17000	23%	19%	40%
9999MH	Twin 2 100W ED-17 MH	12000	23%	19%	40%
9849S	Twin 2 150W E-17 HPS	32000	29%	23%	51%
9849MH	Twin 2 175W ED-17 MH	28000	29%	23%	51%
958HR	Pole for 9900, 9906 - 4"ø x 10' high - See page 214				
974HR	Pole for 9998, 9999 - 5"ø x 12' high - See page 214				
Tapered poles for 9804, 9849 - See page 240 - 3"ø top					



**No wires or
cords to hide!**

**Solar-powered lighted
stepping stones make it safer
to navigate a pathway at night.**



It's easy to give your yard a spectacular look after dark with these solar-lighted stepping stones. Just place them in the ground—no difficult installation or electricity bills. Use them to light a path or surround your patio with their soothing glow. They feature a Siemens high-quality, silicone-encapsulated crystal solar cell that charges the built-in battery by day; a photo cell turns the energy-efficient, white LED light on at dusk for up to eight hours. Waterproof mix of fiberglass and resin; 12.4" x 12.4". *Special shipping; see order form.*

#65932 Solar Lighted Stepping Stone; \$39.50 ea.
SAVE: 2 or more Solar Lighted Stepping Stones just \$37.50 ea.

Walkway step lights - low voltage

www.solutionscatalog.com

1-800-342-9988

FC Lighting - Bollards

All fixtures pictured at right are available for use with incandescent, PL (fluorescent), or HID lamps.

Other Exterior categories:

[Steplights](#)
[Cylinders](#)
[Wall Mounts](#)
[Post mounts](#)
[Floods](#)
[Rt Ms](#)

*May need shielding on
seaward side.*



[Interior](#) | [Exterior](#) | [Recessed](#) | [Track](#) | [Specialty](#)
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FC Lighting - LED Steplights

All fixtures pictured at right are available for use with LED lamps.

Other Exterior categories:

[Bollards](#)
[Cylinders](#)
[Steps](#)
[Wall Mounts](#)
[Post mounts](#)
[Floods](#)
[R.L.M.s](#)



[Top](#)



[Interior](#) |
 [Exterior](#) |
 [Recessed](#) |
 [Track](#) |
 [Specialty](#)
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GENERAL DESCRIPTION: Gardco's BRM100 Dome Top Bollard provides uniform illumination, wide spacings and remarkable brightness control. Rugged extruded and cast construction with silicone seals and gasketing assures years of trouble free service.



Example:



PREFIX	HEIGHT	WATTAGE 1	VOLTAGE	FINISH	OPTIONS
BRM 800	42	50 MH ²	120	BRP	F
	36	70 MH ²	208	BLP	DUPI/GFCI
	30	100 MH ¹	240	NP	SHD
	24	50 MV	277	WP	BCC
		75 MV		SC	
		100 MV			
		35 HPS ³			
		50 HPS ³			
		70 HPS			
		100 HPS			
	INCAND ⁴				

OPTIONS

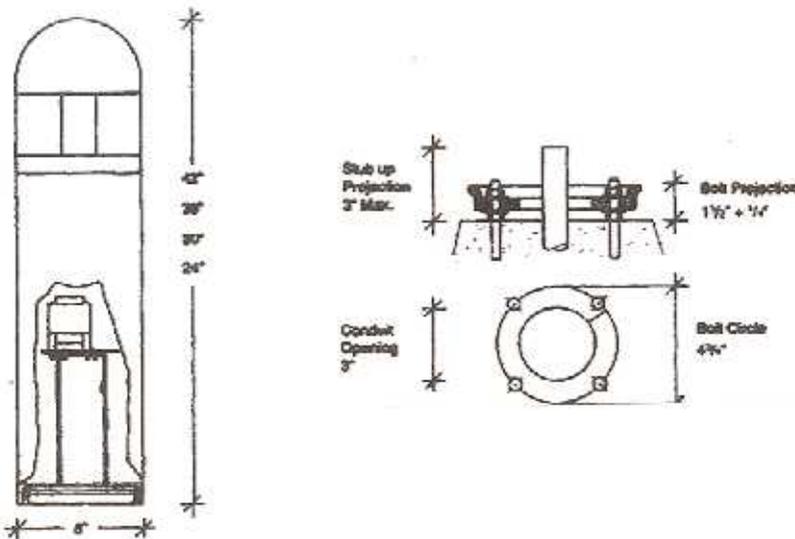
- F : In-Line Primary Fuse
- SHD : 180° Shield
- DUPI/GFCI : Weatherlight Fluorescent in Lower Housing
- BCC : Black Center Column

FINISH

- BRP : Bronze Paint
- BLP : Black Paint
- NP : Natural Aluminum Paint
- WP : White Paint
- SC : Special Color (specify)

NOTES

1. Use medium base lamps only.
2. 120 volt primary only.
3. 120/277V primary only.
4. Maximum wattage: 100W A-19.



Need to shield on side facing the beach

LED Crosswalk lighting

Gardco

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[glowtops](#) [gullwing](#) [lightcolumns](#) [lps](#) [mantaray/miniray](#) [poles](#) [round](#) [sconces](#) [square](#) [step/aisle lights](#)



The Smart Crosswalk

The Gardco/LightGuard Smart Crosswalk System utilizes a series of [signal heads](#) with light emitting diodes (LED) in a durable housing which is embedded in the roadway. The LED's flash, in a unidirectional manner, a warning to approaching motorists that a pedestrian is in, or entering, the crosswalk.

[The Smart Crosswa](#)
[Signal Heads](#)
[Power Control Unit](#)
[System Activation](#)
[Signs](#)
[Specifications](#)

[Catalog \(PDF\)](#)

[Contact Gardco for
more Information](#)

A pedestrian can activate the System by pushing a [button](#), or the system can be [automatically activated](#) when the pedestrian passes through an activation zone breaking an optical beam. The Smart Crosswalk System can be a stand-alone, [solar-powered](#) system or a conventional [AC powered](#) system (AC to DC) with [battery back-up](#).

<http://www.gardcolighting.com/lgshome.cfm?brand=gar>

LARGE STEPLYTES



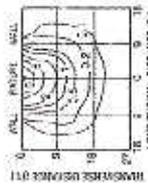
Elegant styling combines with a lighting capacity of up to 200 watts! Available in form, use RB3 and RB3 Large Steplyte. The fixtures are constructed with a heavy-duty aluminum body, lens for further spacing or a cast louver face plate with shadow-free frosted lens. Symmetric patterns are available as well as asymmetric patterns for left or right light distribution.

45



RB33

4" depth
Aluminum Body
5 1/2" (140mm) deep
5" (127mm) dia.
Surface Size
4 1/2" (114mm) dia.
4 1/8" (107mm) deep



RB33
Dimension Symmetric
Lamp/Wattage: 5W/4W
Mounting Height: 3"



RB35

4" depth
Aluminum Body
5 1/2" (140mm) deep
5" (127mm) dia.
Surface Size
4 1/2" (114mm) dia.
4 1/8" (107mm) deep



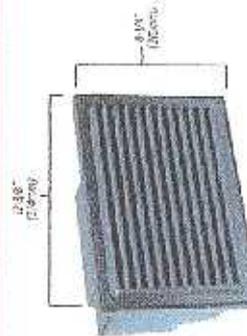
RSB3

4" depth
Aluminum Body
7 1/4" (184mm) deep
8" (203mm) dia.
Surface Size
6 1/2" (165mm) dia.
6 1/8" (159mm) deep

Style	Finish	Optics
RSB33 Recessed Round Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSB35 Recessed Rectangular Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSB35 Recessed Round Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSB35 Recessed Rectangular Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSB35 Recessed Round Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSB35 Recessed Rectangular Bubble	Aluminum	5 Symmetric, 15 Asymmetric

To order select style, finish, optics, wiring and voltage.
EXAMPLE: RRB3351E Recessed Round Bubble, Black, Symmetric Optics
(Recessed, 120 volt)

Other lamp wattages available. Consult factory.



RSC3

4" depth
Aluminum Body
7 1/4" (184mm) deep
8" (203mm) dia.
Surface Size
6 1/2" (165mm) dia.
6 1/8" (159mm) deep



RSB33
Dimension Symmetric
Lamp/Wattage: 5W/4W
Mounting Height: 3"

Style	Finish	Optics
RSC33 Recessed Round Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSC35 Recessed Rectangular Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSC35 Recessed Round Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSC35 Recessed Rectangular Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSC35 Recessed Round Bubble	Aluminum	5 Symmetric, 15 Asymmetric
RSC35 Recessed Rectangular Bubble	Aluminum	5 Symmetric, 15 Asymmetric

Accessories—Mounting Kits

Catalog No.	Application
MAK1N	Aluminum
MAK1S	New Steel Wall
MAK1E	Existing Steel Wall

Note: All units supplied with mounting hardware for concrete pour installation. If other mounting kits are required, order accordingly.

Features

Housing—Aluminum die-casting containing less than .1% copper to prevent corrosion in concrete applications.

Sockets—UL listed for appropriate lamps with high pressure sodium sockets rated for 4 or

Lens—Bubble Lens. Unobstructed injection molded clear polycarbonate bubble lens. Lens projects out of the wall, enabling efficient beam lumens to be directed down to ground level and a wide distribution for further spacing of fixtures. RSC3, frosted glass and stainless steel with stainless steel clips. Lens is completely sealed to prevent water, dust and insect infiltration.

Reflector—RB33, RB35, diffuse specular aluminum, available in symmetric and asymmetric light patterns. Asymmetric patterns are field adjustable to left or right distribution. RB32, RB33, highly reflective specular aluminum, symmetric pattern.

Wiring Compartment—Internal wiring compartment has a removable cover and contains two (2) 1/2" NPT conduit taps in the bottom and one (1) 3/4" NPT conduit tap in both sides. A removable plug will be provided for three (3) taps.

Ballast—(HID) are regulated with power factor greater than 90% (CFL). Selects that provide 14,000 amp power regulation with 4-10% input voltage regulation. Fluorescent ballasts (FL) are Class 1 and Class 2. 28 is rated at -20°F. Rating temperature ballasts are factory wired and tested.

Cast Louver—Die-cast aluminum, offering 45° shading. Lens is frosted glass and attached to back of louver with stainless steel clips. Lens is completely sealed to prevent water, dust and insect infiltration.

UL, cUL Listed.

Turtle Safe and Environmentally Friendly Landscape Lighting from W. F. Harris Lighting

Exceptional Lighting for Ecologically Sensitive Areas Along Coastlines, Wetlands, Wilderness Areas, National Parks, and Migratory Corridors.



Scapeform® Large Single Shade, Two Shade and Three Shade Landscape Lighting Systems are recommended and approved by the Florida Fish and Wildlife Conservation Commission for lighting ecologically sensitive areas.

- Attractive
- Rustproof
- Watertight
- UV Resistant
- Economical and Easy to Install
- Nonconductive — Safe around water or pool areas
- Impact-Resistant Injection Molded Polycarbonate Shades and Housing
- Stainless Steel Screws Retain Shade/Lens Assembly
- Energy Efficient — Fluorescent lamps provide up to 78% energy savings
- Rustproof Black PVC Direct Burial Staff
- Self-contained Wiring Compartment Eliminates Need for Junction Box
- Photo Control Available

Available Styles, Colors, and Specification Information



BRONZE



FOREST GREEN



BLACK

Ballast Housing Shades

Lens

Lamp

Ballast

Hardware

Staffs

Accessories

Illumination Shield

Styles

Colors

UL Listed

Manufacturing

Injection molded polycarbonate. Permanent color with textured finish.

Injection molded polycarbonate. Permanent color with textured finish.

Translucent amber polycarbonate.

7 watt twin tube fluorescent. 0°F starting temperature.

Self-start, preheat type, 120 volt Normal Power Factor.

Stainless Steel Screws.

Extruded black PVC.

Coupling Extenders, Threaded Adapters, Photo Control.

Aluminum.

Large Single Shade. Two Shade. Three Shade.

All 3 models are available in all 3 colors.

Suitable for Wet Locations.

Made in USA.



MADE IN USA



W.F. Harris Lighting

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800/842-9345 (TOLL FREE)

E-mail: info@wfharris.com

www.wfharrislighting.com

In Partnership for Environmentally Responsible Lighting

TURTLE-FRIENDLY
SCAPEFORM® SERIES

7 WATTS - 120 VOLT

FOR USE WITH
PL TYPE LAMPS



Fill In Blocks For Complete Catalog Number

Example:

SCF-2S-A

Model

—

FG

Shade/
Housing
Color



Listed For
Wet Locations

MODEL	SHADE/ HOUSING COLOR	WATTS/ LAMP	LAMP START TEMP.	STD. PK.	LBS. EA.	LIST PRICE	LAMPED LIST PRICE
SCF-3S-A (Amber Lens and Internal Light Shield)	FG (Forest Green)	7 PL	0°F	6	2.0	\$ 40.86	\$ 43.11
	BK (Black)						
	BZ (Bronze)						
SCF-2S-A (Amber Lens and Internal Light Shield)	FG	7 PL	0°F	6	2.0	45.06	47.31
	BK						
	BZ						
SCF-LS-A (Amber Lens and Internal Light Shield)	FG	7 PL	0°F	6	2.0	44.34	46.59
	BK						
	BZ						

NOTE: Scapeform Fixtures Require 1/2" Conduit for Mounting



SCF-CE



SCF-TM



SCF-PC



SCF Staff

ACCESSORIES (Order Separately)

	STD. PK.	LBS. EA.	LIST PRICE
SCF-CE - Coupling Extender (For Joining 8" Direct Burial Staffs With SCF-TM)	12	—	2.12
SCF-TM - 1/2" Threaded Adapter	12	—	1.99
SCF-S8 [†] - 8" Direct Burial Staff	12	—	1.43
SCF-S14 [†] - 14" Direct Burial Staff	12	—	3.05
SCF-S24 [†] - 24" Direct Burial Staff	12	—	5.04
SCF-S30 [†] - 30" Direct Burial Staff	12	—	6.22
SCF-PC - Photo Control Housed In SCF-NS (No Lamp) Specify Color	6	1.0	15.65

[†] Direct Burial Staffs Are Black, UL Listed, Schedule 80, and Require 1/2" Conduit

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Electrical & Datacom Products

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www.wfharrislighting.com

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07/06

Prices, Specifications, And Availability
Are Subject To Change Without Notice.

Lighting Concepts Awaiting Approval From Florida Fish and Wildlife Conservation Commission



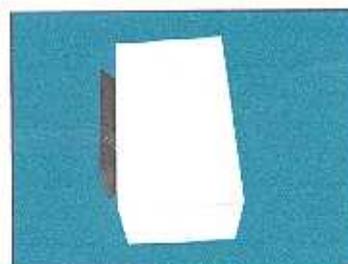
Shielded Directional Floodlights

- ☆ Specifically Designed to Withstand Severe Coastal Environments
 - Rustproof
 - Nonconductive
 - Polycarbonate - Injection Molded and UV-Stabilized Construction
 - Stainless Steel Hardware
- ☆ Easy Installation
- ☆ Maintenance Free Performance
- ☆ Lifetime Warranty for Housing and Directional Hoods against Rust, Corrosion, Breakage



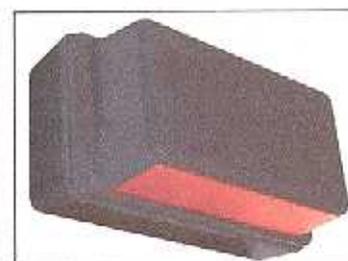
Shielded LED Step Lights

- ☆ Specifically Designed to Withstand Severe Coastal Environments
 - Rustproof
 - Nonconductive
 - Polycarbonate - Injection molded and UV-Stabilized Construction
 - Stainless Steel Hardware
- ☆ Easy Installation
- ☆ Maintenance Free Performance



Shielded Contemporary Lighting

- ☆ Specifically Designed for Coastal Environments
 - UV-Stabilized Opaque Acrylic Lens
 - Nonconductive
 - Polycarbonate - Injection molded, UV-Stabilized Mounting Base
 - Rustproof Base Plate - Tempered Marine-grade Aluminum
- ☆ Easy Installation
- ☆ Maintenance Free Performance
- ☆ UL Listed for Wet Locations



Shielded Wall Lighting with 3 Watt Amber LED

- ☆ Designed for Coastal Environments
 - Nonconductive
 - Polycarbonate - Injection molded, UV-Stabilized Lens and Housing
 - Rustproof Base Plate - Tempered Marine-grade Aluminum
- ☆ Easy Installation
- ☆ Maintenance Free Performance
- ☆ UL Listed for Wet Locations
- ☆ Lifetime Warranty for Lens, Housing, and Base Plates against Rust, Corrosion, Breakage

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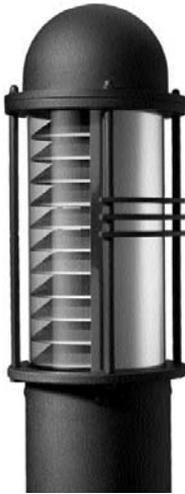


UL Listed for
Wet Locations

In Partnership for Environmentally Responsible Lighting

TURTLE BOLLARD

Sea Turtle Friendly



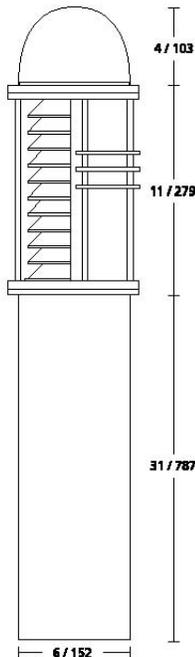
Shown with Dome Top Option



Dome Top



Cone Top



180-degree Shielded, IESNA Cutoff
35w maximum, Vertical Lamp

General Description: Low Pressure Sodium bollard with 180-degree shielding provides pedestrian safety while eliminating light trespass on Sea Turtle Nesting Beaches. The high impact look includes extreme durability and corrosion resistant construction.

Construction: Marine grade low copper content cast aluminum top and mounting gear. Housing is marine grade aluminum extrusion. Stainless steel external hardware protects against corrosion.

Lens: Clear polycarbonate cylindrical lens.

Internal Louvers: High reflectance aluminum.

Houseside Shield: Corrosion resistant, high purity aluminum.

Lamp: Fixture includes vertically mounted Low Pressure Sodium lamp.

Ballast: High power factor ballast. Standard with quad volt (MT) 120/208/240/277V 60Hz ballast.

Decorative Top: Two top styles available: Dome and Cone.

Mounting: Base is secured to concrete footing (by others) using provided masonite template. A 3" (76 mm) dia. conduit opening is provided in the base for ease of wiring.

Finish: Black textured polyester powder coat finish standard. Bronze, gray, white, silver, and verde green options available. For custom colors, please contact factory.

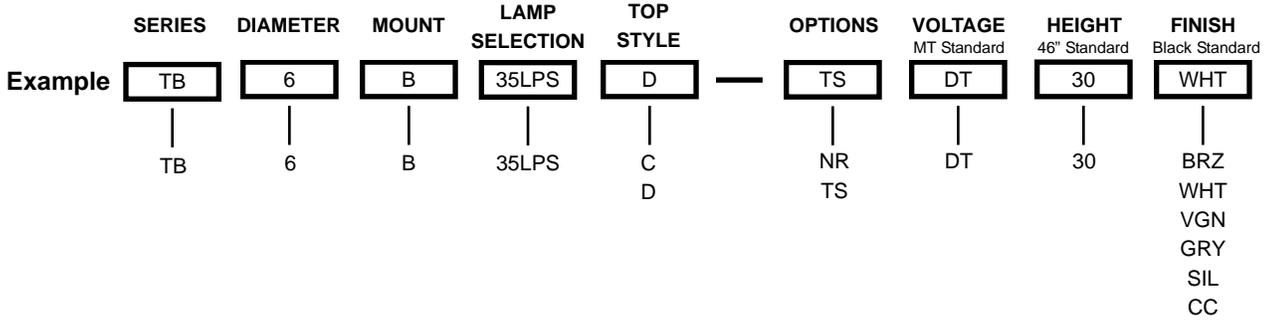
Gaskets: EPDM gaskets are standard.

Listings: UL Listed 1598 for Wet Locations. Indoor/Outdoor listed for use in Canada.



PHOENIX
Intrigue
SERIES™

ORDERING INFORMATION



SERIES

TB = Turtle Bollard, Sea Turtle Friendly

DIAMETER

6 = 6" standard

LAMP SELECTION

35LPS = 35W Low Pressure Sodium (T16, medium base)

MOUNTING

B = Bollard

TOP STYLE

C = Cone Top
D = Dome Top

OPTIONS

NR = No Rings
TS = Tamperproof Screws

VOLTAGE (MT Standard)

DT = 347/480V, 60Hz
MT = 120/208/240/277V, 60Hz

HEIGHT (46" Standard)

30 = 30"

FINISH (Black Standard)

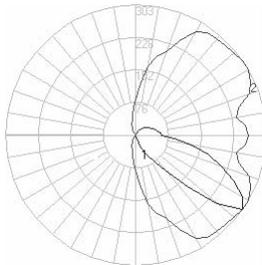
BRZ = Bronze
WHT = White
VGN = Verde Green
GRY = Gray
SIL = Silver
CC = Custom Colors (contact factory)

LAMP AND BALLAST NOTES

1 - LPS lamp not included.
2 - Standard with multi-tap (MT) ballast.
2 - 347V and 480V available, consult with factory for availability.

MOUNTING NOTES

1 - Base is secured to concrete footing using provided masonite template.
2 - Suggested poured base: 2" (610mm) deep x 12" (305mm) diameter (dependent on soil types and frost line - consult with a local civil engineer for verification).



1 x LPS 35w T16
lumen output: 4,600

LF052506 TB





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Three Tier Fluorescent Light

Product number: KIC15207



Your Cost:
\$104.46

Includes Delivery
All Prices US Dollars



List Price: \$107.69

Product Description:

- o Die cast aluminum.
- o 12 volt low voltage.
- o 6" dia. 9 1/4" hgt.
- o Stem or bollard sold separately.
- o Requires 7W or 9W compact fluorescent bulb, included.

PLEASE ALLOW 4 TO 6 WEEKS FOR DELIVERY.

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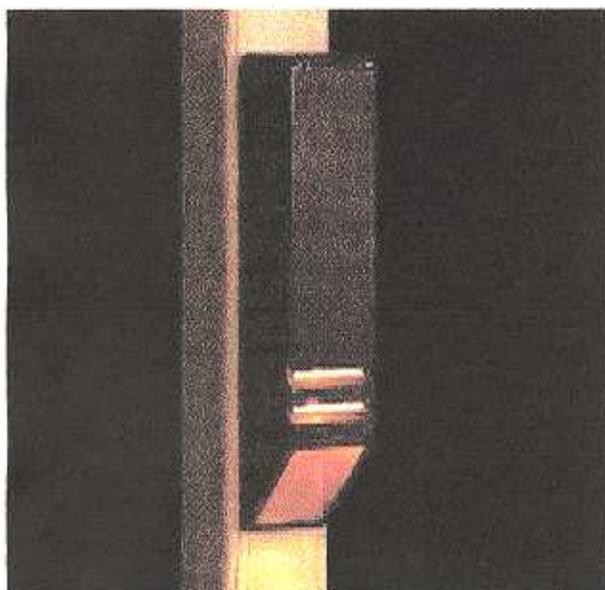


KICHLER

[Learn more about Kichler® ...](#)

Louvered Down Light

Product number: KIC15066AZT



Your Cost:
\$40.44

Includes Delivery
All Prices US Dollars



List Price: \$45.69

• **Product Description:**

- Die-cast aluminum.
- Stainless steel mounting bracket.
- 12 volt low voltage.
- 1 1/4" square, .6" height.
- 6.5W 918 light bulb included.

PLEASE ALLOW 4 TO 6 WEEKS FOR DELIVERY

Model
Dimmable

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Three Tier Low Voltage Light

Product number: KIC-15205



Your Cost:
\$78.85 - \$87.39

Price varies depending on finish and options chosen:



Select Options ...

Colors

Includes Delivery
 All Prices US Dollars
[See Accessories](#)
[See Colors](#)

• **Product Description:**

- 6" dia., 9 1/4" h three tier light
- Featured are louvers that direct tiers of light directly into a variety of landscape settings.
- Durable die-cast aluminum construction.
- Molded ribbed diffuser of clear UV stabilized high resistant polycarbonate.
- 120-Volt Incandescent System.
- 30" of usable 105°C 18 AWG wire leads.
- Medium base porcelain socket with nickel plated shell.
- 75-W Max. A19 light bulb (not supplied).
- **Shown with stem, sold separately**

PLEASE ALLOW 4 TO 6 WEEKS FOR DELIVERY.

Optional Accessories

You may wish to select items below to complete your purchase

Item Number / Name	Your Price
KIC-15656 - 12 Inch Stem	\$14.4



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KICHLER

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Adjustable Under Railing Light

Product number: KIC15077AZT



Your Cost:
\$55.38

Includes Delivery
All Prices US Dollars



List Price: \$57.00

Product Description:

- o Durable aluminum construction
- o 12 volt low voltage.
- o 2 1/2" diameter, 4" height.
- o 18.5W 3155K light bulb included.

PLEASE ALLOW 4 TO 6 WEEKS FOR DELIVERY

Model:
Diversity

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LANDSCAPE ACCESSORIES

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LOW VOLTAGE OUTDOOR LIGHTING/ LANDSCAPE TRANSFORMERS

Multi-Tap units now available with Clock Timer and/or Photocell!

Part#	Wattage	Description	Price
PTX60 	60 Watts	Mini 12v Transformer with Hour Timer & Photocell included! Click Here for details and image.	\$39.00 Buy it!
PTX100	100 Watts	Standard 12v Transformer Click Here for details and image.	\$110.00 Buy it!
PTX120 	120 Watts	Mini 12v Transformer with Hour Timer & Photocell included! Click Here for details and image.	\$75.00 Buy it!
PTX150	150 Watts	Standard 12v Transformer Click Here for details and image.	\$115.00 Buy it!
PTX250	250 Watts	Standard 12v Transformer Click Here for details and image.	\$130.00 Buy it!
PTX300	300 Watts	Standard 12v Transformer Click Here for details and image.	\$150.00 Buy it!
PTX300-MT	300 Watts	<i>Multi-Tap</i> (available w/ CLOCK TIMER and PHOTOCCELL options). Click Here for details and image.	\$240.00 Buy it!
PTX500	500 Watts	Standard 12v Transformer Click Here for details and image.	\$165.00 Buy it!
PTX600	600 Watts	Standard 12v Transformer Click Here for details and image.	\$220.00 Buy it!
PTX600-MT	600 Watts	<i>Multi-Tap</i> (available w/ CLOCK TIMER and PHOTOCCELL options). Click Here for details and image.	\$320.00 Buy it!
PTX750	750 Watts	Standard 12v Transformer Click Here for details and image.	\$230.00 Buy it!
PTX900-MT	900 Watts	<i>Multi-Tap</i> (available w/ CLOCK TIMER and PHOTOCCELL options). Click Here for details and image.	\$420.00 Buy it!
PTX1000	1000 Watts	Standard 12v Transformer Click Here for details and image.	\$270.00 Buy it!

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[Click Here for wiring and transformer information for 12v installations.](#)

[Click Here to find out the difference between Standard and Multi-Tap Transformers](#)

- SCROLL DOWN FOR MORE ITEMS! -



Direct Burial Cable

- Easy to cut / maximum strands
C-12/2 – 500' spool. Rated 20
 amps/240 watts per run

Price: 18¢ per foot, 500' spools only

C-10/2 – 500' spool. Rated 30
 amps/360 watts per run

Price: 29¢ per foot, 500' spools only

Select an option below to order!

Choose either 12/2 or 10/2...

- SCROLL DOWN FOR MORE ITEMS! -

OUTDOOR BULBS

Select from the thumbnail index below to order your bulbs!

<p>12V</p>  <p>MR11/MR16</p>	<p>12V</p>  <p>SC Bayonet</p>	<p>12V/120V</p>  <p>JC BI-PIN</p>	<p>12V</p>  <p>PAR-36</p>
<p>120V</p>  <p>PAR20/PAR38</p>	<p>12V</p>  <p>"A19" Lamp</p>	<p>FLUORESCENT</p>  <p>PL/QUAD</p>	<p>---</p>

- SCROLL DOWN FOR MORE ITEMS! -

Hex Louvers

- Eliminates side glare from spot lights

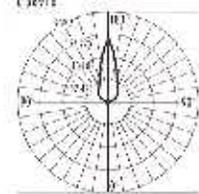
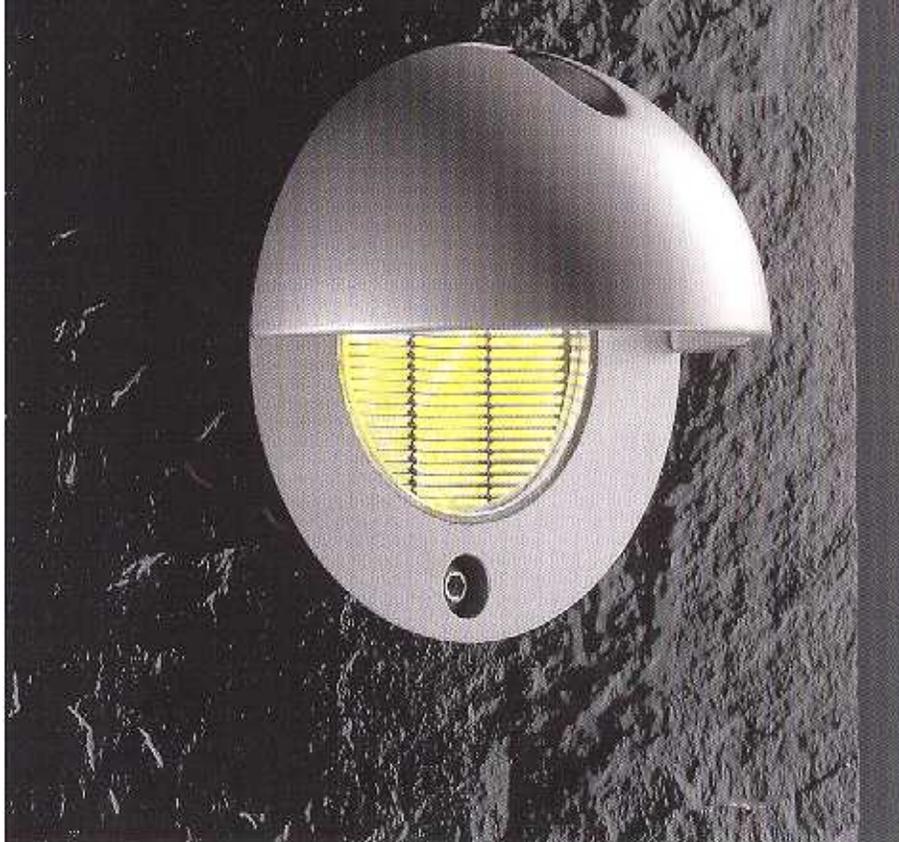
HEX #1 - Round 1 7/8" diameter - **\$3.95**

HEX #2 - Round 2 1/4" diameter - **\$3.95**

HEX #3 - Round 2 5/8" diameter - **\$5.95**



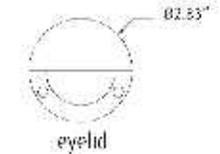
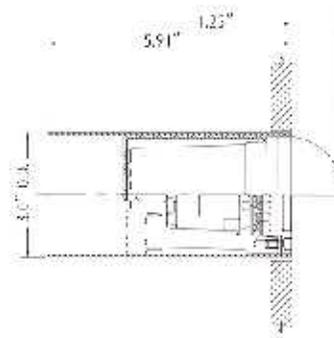
WeeBee Wall



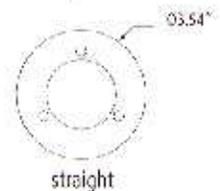
(35W MR16 louver without eyelid)

Design Paul Sayers

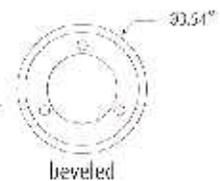
Color/Finish: Stainless steel or aluminum. Glass. **Materials:**
Body: High pressure die-cast anodized aluminum with powder coated paint finish with PTFE content. **Top plate:** Stainless steel or aluminum. **Glass:** 0.197" tempered glass. **Eyelid:** Cast aluminum. **Mounting:** LED versions provided standard with integral 120V transformer. Recommended mounting in installation sleeve (supplied) or cast directly into concrete wall. **Weight:** Max 2.20 lbs. **Approval:** CUL, wet location.



eyelid



straight



beveled

Product variants

Accessories²

Product	Light source	Voltage	Top Plate Style	Shield / Diffuser	Louver	Filter ³	Other
WeeBee Wall ¹	35W/MR11 GU4 LED white	12VDC ⁴	eyelid ⁵	clear	honeycomb 45° louver ⁶	red dichroic green dichroic blue dichroic amber dichroic	spread lens anti-vandal screws 45° prismatic wash lens ⁷
	LED blue	120V	straight	frsted			
	LED red		beveled				
	LED green						
	LED amber						

only

Order Temp: WeeBee Wall/111 (white/120V/eyeid)

1. Provided standard with installation sleeve
2. Req. 105 wattage max. 120V transformer (if others)
3. Only available for frosted glass 35W/MR11 and LED white variant
4. Unless otherwise noted, material is glass
5. Accessories are not available for LED variant
6. For real wash applications it is recommended that the 45° louver and the 45° prismatic wash lens be used together, preferably on clear glass variant only
7. Please refer to the Accessories Matrix on page 48 for product/necessary compatibility

SALE - Save up to 20%

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Lutron Dimmers

Kichler Lighting

Progress Lighting

Commercial Lighting

Home Lighting

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HID Lamps & Light Bulbs

Low Voltage Lighting

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Click Here for quotes, specials & more




Low Voltage Transformers with Timers

- Reduce 120 volts to 12 volt power for low voltage landscape lighting
- Supplied with 3' 3-wire #12-3SJTWA cord and plug
- Thermal cut-off on the primary side and resettable breaker to protect against electrical overload.
- Black Finish
- Multi-tap connections
- Available in 300, 600 and 900 Watts
- Easy connect terminal blocks
- UL and CUL Listed
- Controls 300W or 600W depending on the model



Kichler 15513 - 150W Transformer with Timer



Kichler K15532 - 300W Transformer with Timer



Kichler K15568 - 900W Transformer with Timer

Availability:
Usually ships in 2-3 business days.

K15513
\$161.98

Availability:
Usually ships in 2-3 business days.

K15532BK
\$253.99

Availability:
Usually ships in 2-3 business days.

K15568BK
\$349.99



Kichler 15568 900W Transformer with Timer



Mounting Accessories, Connectors, Filters



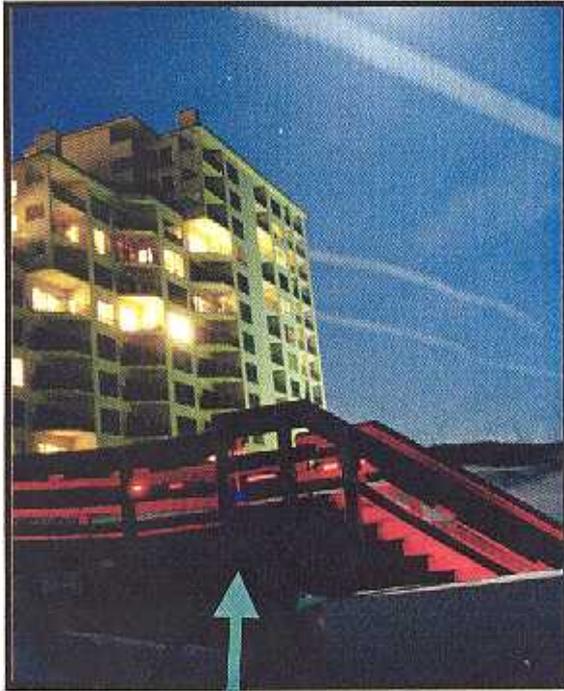
How to Design Outdoor Lighting System

Availability:
Usually ships in 2-3 business days.

K15568BK
\$450.00

Boardwalk & Balcony Neon Lights

by Lighting the Way Enterprises, Inc.



Only red neon permitted on boardwalks (light source can not shine on or be directed at the beach).

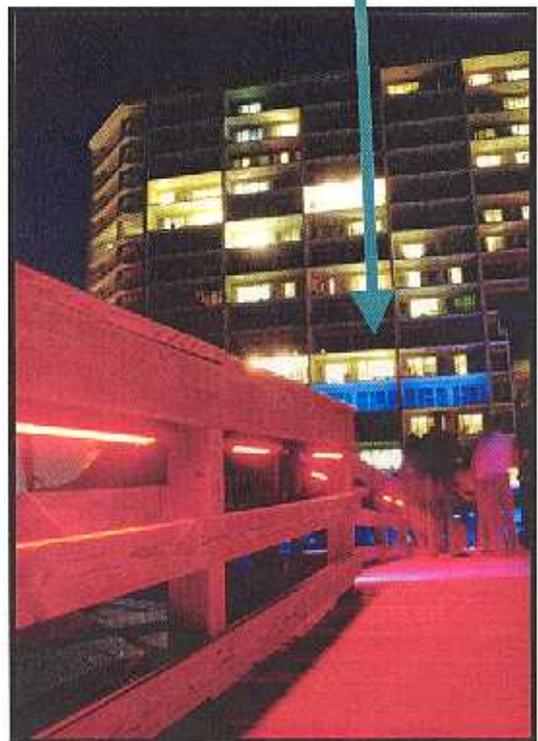
Light Costs

2ft = \$239.00

3ft = \$289.00

installation not included

Red, blue, green, aqua marine, and purple neon are permitted on balconies (that are "off" the beach).



LTW, Inc.

812 NW 8th Ave

Ft. Lauderdale, FL 33311

Tel: (954) 522-1765

Toll Free: (800) 658-1829

Fax: (954) 768-0645

John Vellela



Leader in Outdoor Lighting Since 1959

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Pathlighting

Let Nightscaping® Pathlights lead the way. These inconspicuous fixtures are available in a host of materials and finishes designed to compliment the natural elements of your landscape.

 Infinityliter AD-1309  PDF Cut Sheet	 Charmer AD-1803  PDF Cut Sheet	 Executive AP-0436,0448,0460  PDF Cut Sheet
 Arealiter GA-3208  PDF Cut Sheet	 Navigator GD-0905  PDF Cut Sheet	 Pathliter GD-1112  PDF Cut Sheet
 Footliter GD-1409  PDF Cut Sheet	 Scott GD-1504CU  PDF Cut Sheet	 Quadliter GD-1606  PDF Cut Sheet
 Munroliter GD-1703CU  PDF Cut Sheet	 Sentryliter GD-1810  PDF Cut Sheet	 McKayliter GD-1855  PDF Cut Sheet
 Deliter GD-2404  PDF Cut Sheet	 Director GD-2510  PDF Cut Sheet	 Illuminator GD-2612  PDF Cut Sheet
 Flowerliter GD-2806  PDF Cut Sheet	 Leafliter GD-3205,3306,3407  PDF Cut Sheet	 Micheleliter GD-3209CU  PDF Cut Sheet
 Rose Bud GD-3415  PDF Cut Sheet	 Rose-Stem GD-3815  PDF Cut Sheet	 Belle-liter GD-4009  PDF Cut Sheet
 Libertyliter	 Roseliter	 Seegarliter

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Company Information

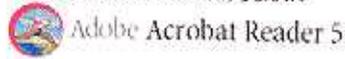
- [History](#)
- [Handcrafted Products](#)
- [Exceptional Service](#)
- [Testimonials](#)

Benefits

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- [Benefits of 12Volts](#)
- [System Control](#)
- [UL1838](#)
- [Warranty](#)

GD-4810  PDF Cut Sheet 	GD-4919  PDF Cut Sheet 	GD-7520CU  PDF Cut Sheet 
Railiter RD-0302  PDF Cut Sheet 	Postlitter WM-3535  PDF Cut Sheet 	Postlitter WM-3535CU  PDF Cut Sheet 
Nicheliter WM-0503  PDF Cut Sheet	Dial-A-Lite WM-0604  PDF Cut Sheet	Bricklitter WM-0802  PDF Cut Sheet

View PDF Cut Sheets using Adobe Acrobat.
To download click link below.





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P | Pathlighting

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Dial-A-Lite WM-0604



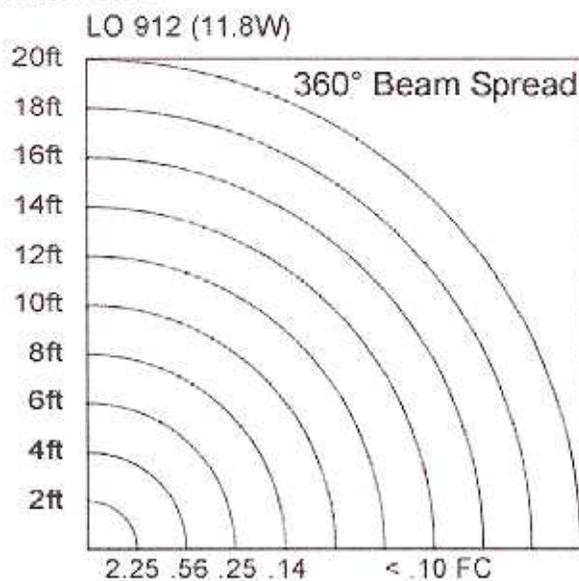
→ Description

Dial A Lite WM-0604 --- As its name suggests, this compact fixture allows one to easily adjust the light beam by turning its body like a dial! Perfect for mounting on posts or pilings, the Dial-A-Lite is a designer's choice for highlighting decks, boat docks, step risers and generally safe, traverse lighting! Lamp type: Wedge Base

[Accessories](#)

[Finishes](#)

Photometric



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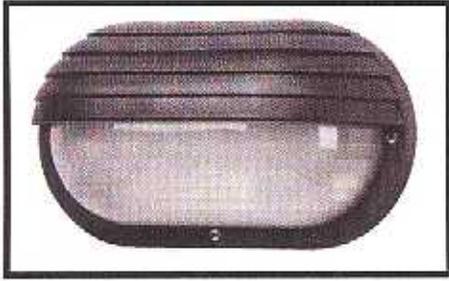
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- ↳ [Benefits of 12Volts](#)
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- ↳ [UL1838](#)
- ↳ [Warranty](#)

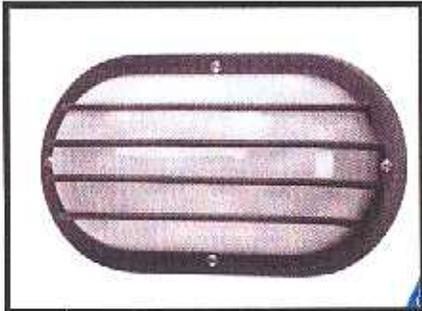
Fixtures that are marginally acceptable or should not be used on beachfront areas



The shields do not adequately direct the light downward. Only suitable for stairways or other areas where they will not shine on the beach.

Attach to wall, post, or railing, mount no higher than 18 inches, use 40 watt or less bug bulb

Each: \$10.00 - \$15.00 each



This fixture allows light distribution in all directions even with bug or low pressure sodium light bulbs, it is too much light. Should not be used.

This fixture allows light distribution in all directions even with bug or low pressure sodium light bulbs, it is too much light. Should not be used.



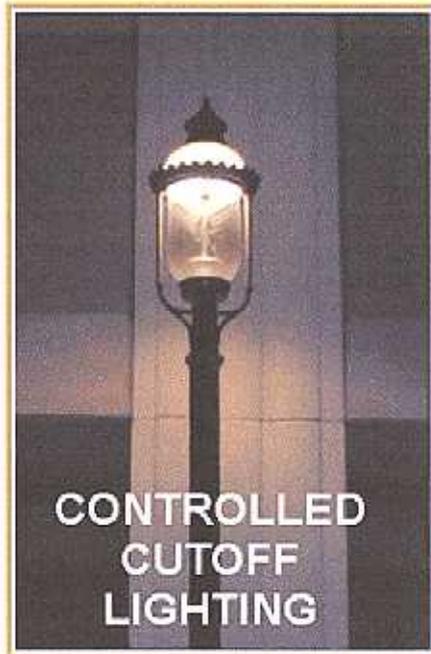


The Pennsylvania Globe Gaslight Company

PENNTROL SYSTEM - CONTROLLED CUTOFF OPTICS
The Complete Solution for Light Pollution

Eliminate High Glare • Energy Efficient Plus • DarkSky Approved
Environmentally Friendly • Economically Sensible

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**Competing Post Top High
Glare Luminaires**

***PennTrol* Luminaire**

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PennTrol is the registered trademark of The Pennsylvania Globe Gaslight Co.

***Specify the PENNTROL Advantage.....
..... Reduce Light Trespass and Increase Visibility***

**For more information please call -
Phone: (203) 484-7749
Fax: (203) 484-7758**



The Pennsylvania Globe Gaslight Company

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Philadephia 750 Philadephia 100 Nantucket 850 Nantucket 950



**Stainless Steel
and Aluminum
Construction**

14.5" square
39" tall



**All bronze
construction**

17.5" square
45" tall



**Cast Aluminum
Construction**

17" square
40" tall



**Cast Aluminum
Construction**

17" square
40" tall

Nantucket 1000 Newporter 1000 Quaker 1000 Colonial 1000



**Cast Aluminum
Construction**

17" square
46" tall



**Stainless Steel
and
Aluminum
Construction**

17" square
49" tall



**Cast Aluminum
Construction**

18" square
44" tall



**Stainless Steel,
ABS
and Aluminum
Construction**

14.5" square
36" tall

*Uses
with
18-watt
LPS.*

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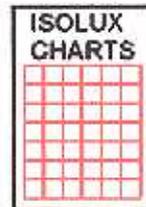
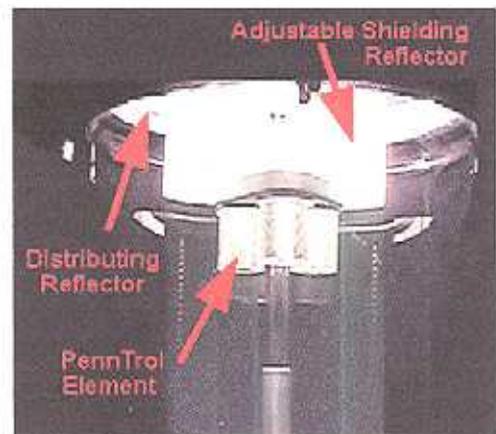


The Pennsylvania Globe Gaslight Company

PENNTROL SYSTEM - CONTROLLED CUTOFF OPTICS

The Complete Solution for Light Pollution

The PennTrol System provides unparalleled lighting control options. These options include specular and translucent reflectors that can produce full cutoff, cutoff or semi-cutoff, IES type II, type III and type IV within 18 distinctive, DarkSky approved, highly efficient designs.



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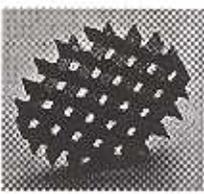
LightingCenter.com / BuilderLighting.com

Oklahoma City, OK 73114
 Phone - 405-879-0405, Fax - 405-879-0445
 Email - sales@lightingcenter.co
 Website - http://www.lightingcenter.co

Search Results

Your search found 123 items

To see a complete product description and a larger picture (if available) click on the View Details hypertext link. Thank you.

Key Specs	Photo	Description	Actions
SKU: P5241-31 Category: Landscape Finish: Black Glass: Clear Price: \$ 50.88		120-Volt Black Cast Aluminum Spot Light	View Details Add to Cart
SKU: P5230-31 Category: Landscape Finish: Black Glass: Clear Price: \$ 24.64		Black powder coat finish over die cast aluminum resists chipping, fading and the effects of salt air. Swivel up or down. 12v	View Details Add to Cart
SKU: P8611-31 Category: Landscape Finish: Black Glass: N/A Price: \$ 33.71		3-1/4 inch 45 louver fits under P5234-31 & P5236-31 glass lens.	View Details Add to Cart
SKU: P8612-31 Category: Landscape Finish: Black Glass: N/A Price: \$ 23.53		Light shields adjust to desired length on cowling of light fixture. Rotate bias-cut end to adjust cut-off angle. For P5234-31 & P5236-31.	View Details Add to Cart



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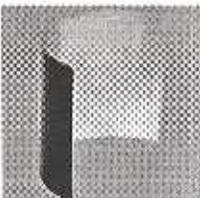
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Key Specs	Photo	Description	Actions
SKU: P8671-31 Category: Landscape Finish: Black Glass: N/A Price: \$ 8.43		Polycarbonate canopy for tree trunks & walls. 1/2" NPS thread.	View Details Add to Cart
SKU: P8672-31 Category: Landscape Finish: Black Glass: N/A Price: \$ 8.90		Miniature pedestal mount. Powder-coat painted cast metal. Flanged base for surface mounting on masonry or wood. Ideal for decks, pedestals and atop walls. 1/2" NPS thread.	View Details Add to Cart
SKU: P8673-31R Category: Landscape Finish: Black Glass: N/A Price: \$ 2.07		120 or 12-volt gel-filled direct burial capsule protects two wire nut connections from elements. Capsule withstands temperatures ranging from -45 to 150 F. Reusable capsule is UL listed & environmentally safe.	View Details Add to Cart
SKU: P8685-31 Category: Landscape Finish: Black Glass: N/A Price: \$ 6.84		Directional reflector/light shield. Specular aluminum. Mounts inside diffuser of modular path lights.	View Details Add to Cart



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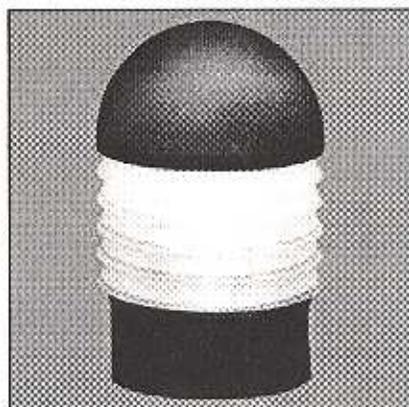


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Oklahoma City, OK 73114
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 Email - sales@lightingcenter.co
 Website - <http://www.lightingcenter.co>

Fixture Details

SKU P5205-31



Price: \$ 57.56

[Buy It](#)

Catalog Page: 362
Category: Landscape

Description: Etched glass.
 1/2 inch NPS threaded fitting
 for permanent or P5233
 installation.

Finish: Black

Glass: Etched

Type: Path

Notes: #For complete
 installation see accessory
 categories#

Width/Diameter: 5"

Height: 7-1/4"

Lamp Quantity: One

Lamp Type: Medium Base

Lamp Wattage: 60w max

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Use low wattage
shield



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 Email - sales@lightingcenter.co
 Website - http://www.lightingcenter.co

Fixture Details

SKU P5246-31



Price: \$ 37.05

Buy It

Catalog Page: 363
Category: Landscape

Description: Polycarbonate modular top, mounted on a P8690-31 modular post (order separately). Clear diffuser with internal conical reflector.

Finish: Black

Glass: Clear Polycarbonate

Type: Path

Notes: #For complete installation see accessory categories#

Width/Diameter: 4-1/2"

Height: 9-1/2"

Lamp Quantity: One

Lamp Type: 12-volt S.C.
 Bayonet

Lamp Wattage: (12w), 17w,
 24w

Low Voltage: Yes

may be too bright

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Use low wattage

Shield

Red LED Rope Lighting

Bear Lighting, Inc.
www.bearbulbs.com
1-888-988-2327
Santa Monica, CA

red LED lights encased in clear rubber, 120 volts
no transformer needed

\$6.20 per foot item # LED 30-1

1 Roll = 150 feet in length

1 roll \$4.00 per ft

3 rolls \$3.74 per foot

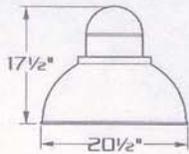
10 rolls \$3.56 per foot

remember to order:

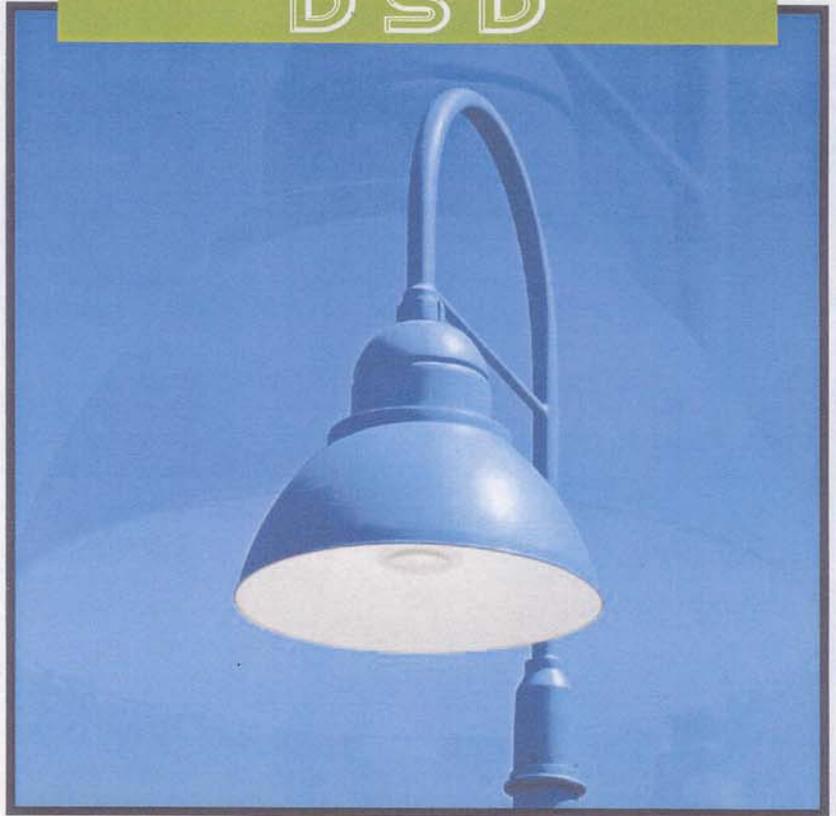
power cord and plug item # NS-001

end caps item # NS-003

DSD



0501
[175 W. MAX.]



E.P.A. 0501- 0.97
0502- 0.59



WM



1



2-180



2-90



3-90



3-120



4-90

SPECIFICATIONS

HOUSING: HEAVY WALL ALUMINUM CONSTRUCTION WITH REMOVABLE BALLAST TRAY FOR EASY BALLAST ACCESS.

REFLECTOR: HEAVY WALL ALUMINUM CONSTRUCTION. INSIDE OF REFLECTOR FINISHED WITH HIGH GLOSS WHITE ENAMEL.

OPTICS: CLEAR TEMPERED GLASS DIFFUSER.
OPTION: CLEAR PRISMATIC OR OPAL GLASS DIFFUSER.

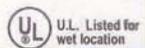
LAMP HOLDER: MEDIUM BASE PORCELAIN.

LAMP: (BY OTHERS)

BALLAST: H.P.F./C.W.A. AUTOTRANSFORMER. -20° STARTING TEMPERATURE. ELECTRICAL COMPONENTS ARE MOUNTED TO A REMOVABLE BALLAST TRAY. BALLAST IS EQUIPPED WITH FACTORY INSTALLED QUICK DISCONNECT PLUG.

FINISH: POLYESTER POWDER COAT-STATE OF THE ART 20 PSI PRESSURE POWER WASH AT 140° TEMPERATURE INCORPORATES FOUR STEP IRON PHOSPHATE PROCESS TO CLEANSE AND PRETREAT THE METAL SURFACE FOR MAXIMUM PAINT ADHESION. ELECTROSTATICALLY APPLIED TEXTURED POLYESTER POWDER TOPCOAT IS BAKED AT 400° TEMPERATURE FOR MAXIMUM HARDNESS AND EXTERIOR DURABILITY.

- These fixtures need to be on low poles so the light source can not be seen from the nesting beach
- The inside of the fixture needs to be painted black
- Use 40-watt or less bug lights if the fixture is in anyway visible from the nesting beach



7900 CLYBOURN AVENUE, SUN VALLEY, CA, 91352
(818) 767-3031 (323) 875-1136
FAX NO. (818) 767-4631
www.usaltg.com

B5-1

Walkway and Stairway Lights



Red•Dot SiteLight Surface light, 10 watt bulb

Attach to wall, post, or railing; mount no higher than 18 inches

Each: \$16.00 bulb: \$0.89

No transformer needed

Need to order: L.E. Mason Co. PT # K851BR.

Home Depot sku #: 246-334.

Intermatic Malibu Surface light, 7 watt bulb

Attach to wall, post, or railing; mount no higher than 18 inches

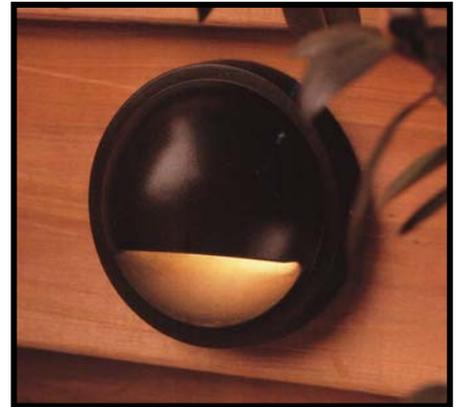
Each: \$10.00 (comes with bulb)

Transformer needed: based on total watts in line

Up to 88 watts: \$29.00; 89 - 121 watts: \$32.00;

123 - 300 watts: \$90.00 301 - 600 watts: \$130.00

100 ft of wire = \$25.00



Marlex Nautical Pier Light; use 7 watt bulb

Attach to wall, post, or railing; mount no higher than 18 inches

Each: \$25.00



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Can be used for indoor and outdoor lighting. Great for step/stair lighting, accent lighting, path lighting, simply use your imagination!



Solid Brass Housing that is INCLUDED with the above cover. This housing is to be mounted recessed (inside) your wall, concrete, brick, etc. The above cover is then mounted in front of this housing



Available in 12v or 120v. Heavy Duty Brass Recessed Step Light shown in Rust Finish
[Click Here for cover finishes](#)

Only \$34.95! (for 12v or 120v)

Price Includes Solid Brass Housing , Cover & Bulb(s)

MADE IN THE USA - LIFETIME GUARANTEE *

-PRODUCT FEATURES for COVER and HOUSING:

- Voltage: Available in your choice of 12v (Low Voltage) or 120v (Standard Voltage).
- 12v application: uses a 13w or 18w SC Bayonet 12v Bulb
- 120v application: uses a 20w JC Bi-Pin 120v Bulb
- You will be asked to choose your voltage and bulb wattage when ordering.
- [Click Here to find out the difference between 12v and 120v Voltage](#)
- Size of Cover: 5 9/16" W x 3" H
- Size of Housing: 4.5" W x 2 1/8" H x 2 3/8" Deep.
- Cover Diffuser: Tempered glass lens diffuser for glare protection.
- Housing Reflector: Highly polished reflector inside of housing for even distribution of light.
- Special Features: Housing includes (2) mounting brackets for easy installation with brass screws, -housing has 1" knockouts on sides & back and compartment space to place and protect your
- wiring and connections.
- UL Listed Brass Based USA High Heat Socket with Stainless Steel Aircraft Grade Contacts and long lead wires for easy installation
- Rain Tight Weather-proofing gasket
- Material: Heavy Gauge Solid Brass Construction finished in the color of your choice.
- You will be asked to choose your color/finish when ordering. [Click here for cover colors.](#)
- No other material offers the same longevity and strength as brass. The Brass material is finished in the color of your choice, we then seal the finish with the same protective coating used on automobiles. This provides the ultimate in protection for your outdoor fixtures. The quality of our brass base material plus our protective coating is how we are able to offer you a lifetime guarantee*.

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MODEL #PD56



Solid Brass Unit Shown Here in Verdi Finish
[Click here for available finishes.](#)

Only \$27.95!

Includes 12v Bulb!

Size: 3" W x 3 7/8" H x 2" Deep

MADE IN THE USA - LIFETIME GUARANTEE *

MATERIAL AND FEATURES:

- Heavy Gauge Solid Brass Construction. (finished in the color of your choice)
This unit is shown in Verdi Finish. [Click Here for available finishes](#)
- UL Listed Wedge Socket (12v Bulb included!)
- For 12v Applications: Uses a 13W or 18W 12v Wedge Bulb
- Mounting: Surface
- This unit throws an up and down light. There is a stronger down light effect.

[Click Here to find out why you should buy our fixture instead of the competitors!](#)

[Click Here to find out the difference between 12v Low Voltage and 120v Standard Voltage.](#)

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OR

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*Click Here for details on our lifetime guarantee

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MODEL #PD425



Solid Cast Alum. Unit Shown Here in White Finish with Frosted Glass Diffuser - [Click here for available finishes.](#)

Only \$11.99!

Black finish is standard.

Add \$3.00 for White finish, \$5.00 for all other finishes.

Size: 4" Dia. x 2" Deep

MADE IN THE USA

MATERIAL AND FEATURES:

- Heavy Gauge Solid Cast Alum. Construction. (finished in the color of your choice) *This unit is shown in White Finish with Frosted Glass Diffuser. [Click Here for available finishes!](#)*
- UL Listed Brass JC Bi-Pin Socket with Stainless Steel Aircraft Grade Contacts
- For 12v Applications: Available with 10w or 20w 12v JC Bi-Pin Bulb
- For 120v Applications: Available with 20w 120v JC Bi-Pin Bulb
- Mounting: Surface

[Click Here to find out the difference between 12v Low Voltage and 120v Standard Voltage.](#)

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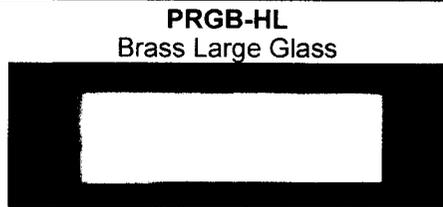
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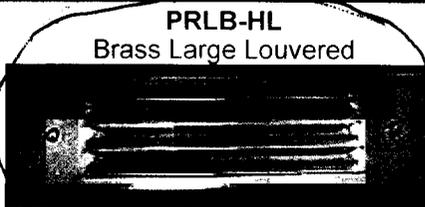
SCROLL DOWN

Outdoor/Indoor 12v / 120v RECESSED mount step lights



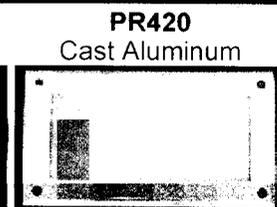
PRGB-HL
Brass Large Glass

[Click for details](#)



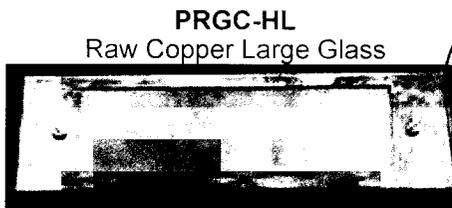
PRLB-HL
Brass Large Louvered

[Click for details](#)



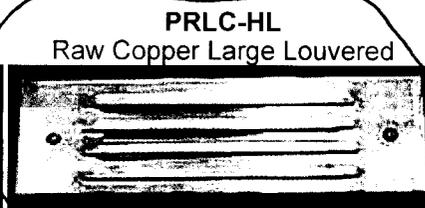
PR420
Cast Aluminum

[Click for details](#)



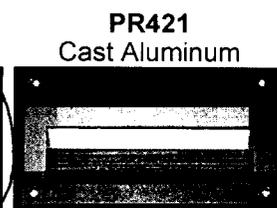
PRGC-HL
Raw Copper Large Glass

[Click for details](#)



PRLC-HL
Raw Copper Large Louvered

[Click for details](#)



PR421
Cast Aluminum

[Click for details](#)



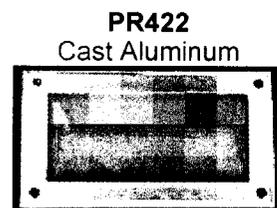
PRGB-HS
Brass Small Glass

[Click for details](#)



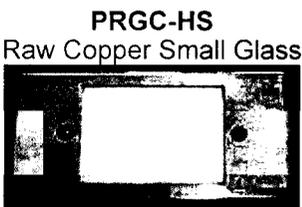
PRLB-HS
Brass Small Louvered

[Click for details](#)



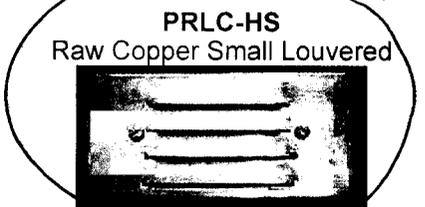
PR422
Cast Aluminum

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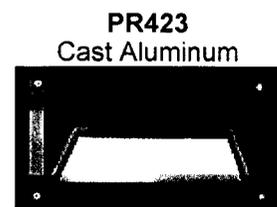
PRGC-HS
Raw Copper Small Glass

[Click for details](#)



PRLC-HS
Raw Copper Small Louvered

[Click for details](#)

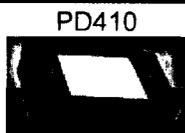


PR423
Cast Aluminum

[Click for details](#)

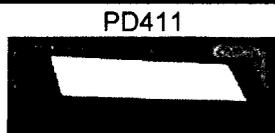


Outdoor/Indoor 12v / 120v SURFACE mount step & mini lights



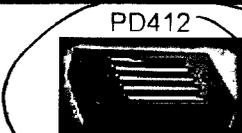
PD410

[Click for details](#)



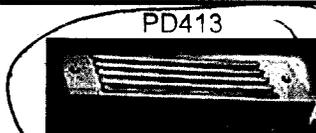
PD411

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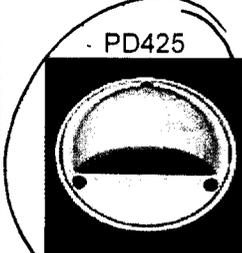
PD412

[Click for details](#)



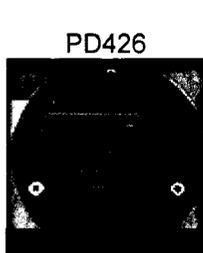
PD413

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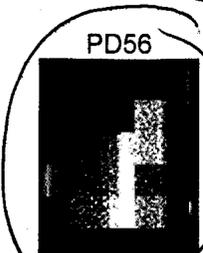
PD425

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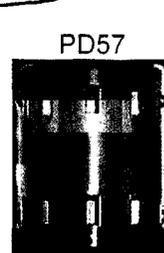
PD426

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PD56

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PD57

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PD53

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PD52

PD54

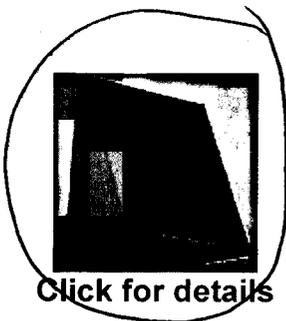
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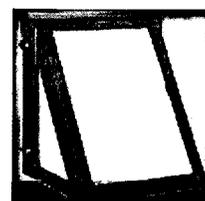
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PD50



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PD51



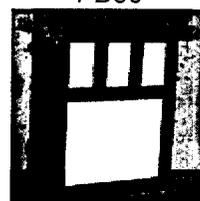
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PD59



[Click for details](#)

PD60



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Page last updated on Friday, July 12, 2002

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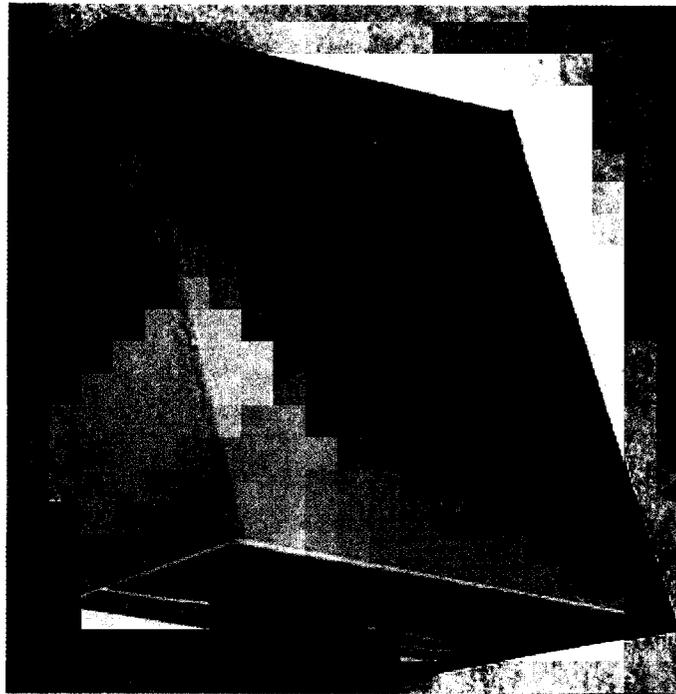
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MODEL #PD54



**Solid Brass Unit Shown Here in Black Finish.
Click here for available finishes.**

Only \$25.99!

Includes 12v Bulb!

Size: 3 1/8" W x 4.5" H x 2.5" Deep

MADE IN THE USA - LIFETIME GUARANTEE *

MATERIAL AND FEATURES:

- Heavy Gauge Solid Brass Construction. (finished in the color of your choice)
This unit is shown in Black Finish. Click Here for available finishes
- UL Listed Wedge Socket (12v Bulb included!)
- For 12v Applications: Uses a 13W or 18W 12v Wedge Bulb
- Mounting: Surface
- Because of its size and sleek design this unit can be used for many applications!

**Click Here to find out why you should buy
our fixture instead of the competitors!**

**Click Here to find out the difference between
12v Low Voltage and 120v Standard Voltage.**

[Click Here to buy it](#)

OR

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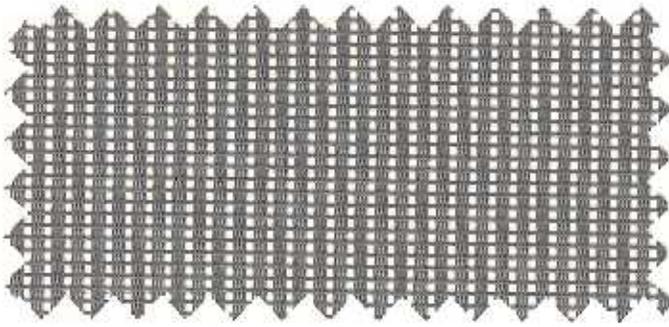
*Click Here for details on our lifetime guarantee

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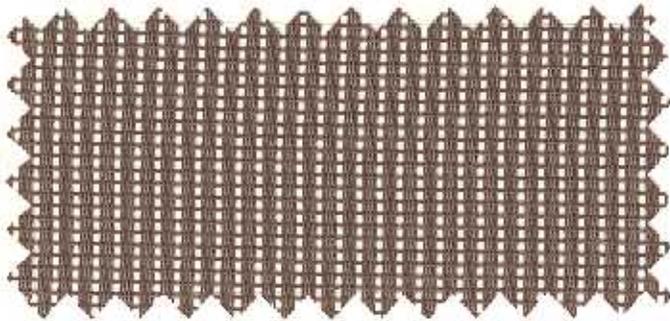
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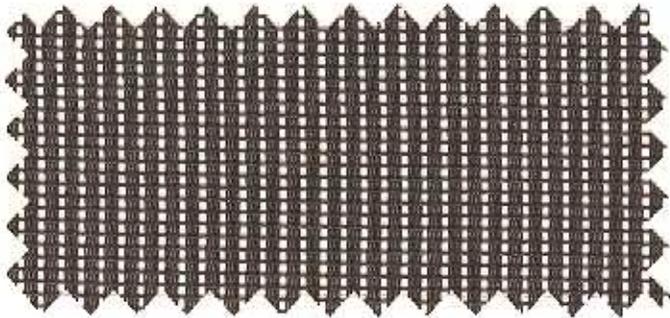
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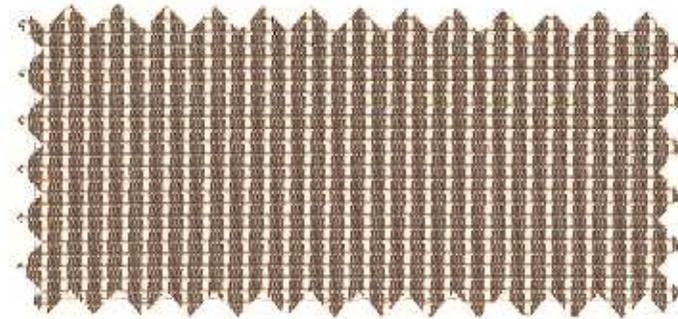
SILVER GRAY



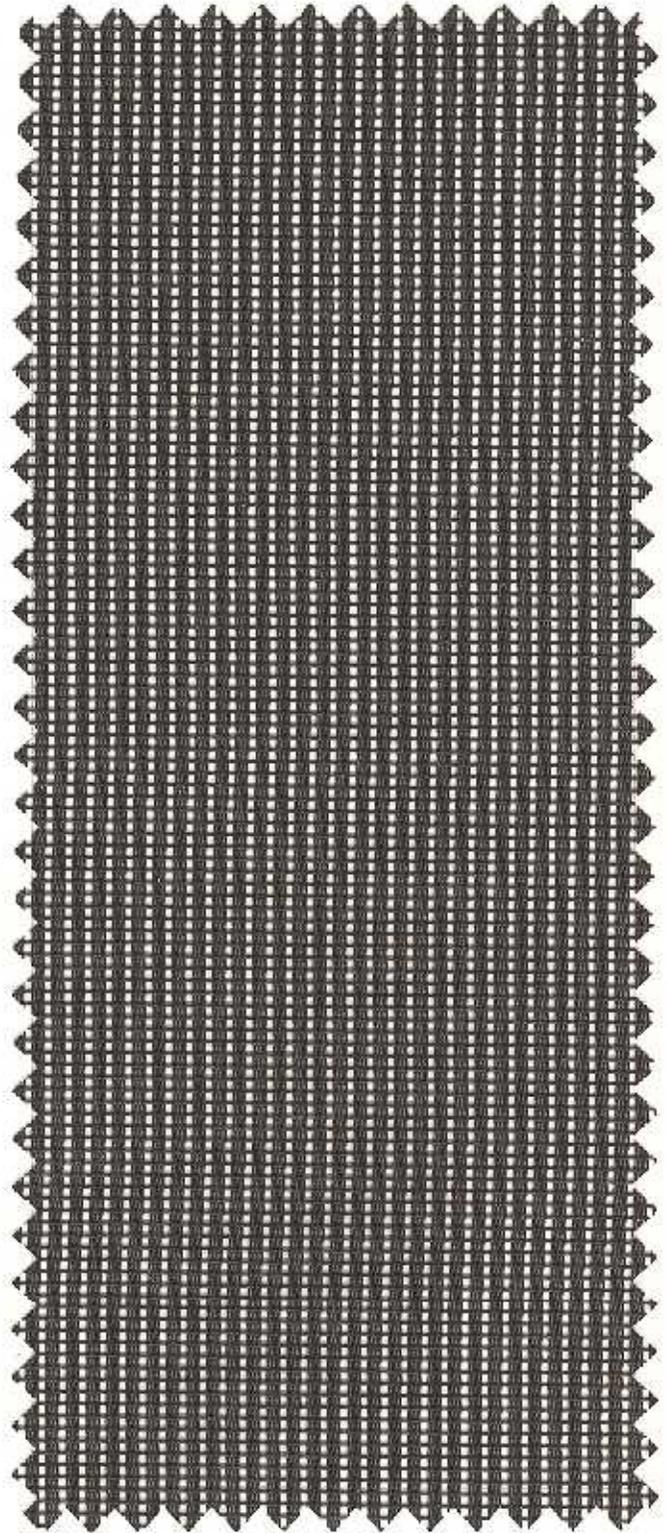
BRONZE



DARK BRONZE



GOLD



CHARCOAL

Contact: Pat Kozma 1-800-234-1662
 Ashley Aluminum
 9310 Waring Rd
 Pensacola, FL

SPECIFICATIONS

■ Phifer SunScreen is woven vinyl-coated fiberglass screening manufactured for the primary use of reducing solar heat gain in the summer and reducing heat loss in the winter. It also performs as an insect screening.

Standard Colors: Charcoal, Bronze, Dark Bronze, Silver Gray and Gold.

Standard Widths: 24" (60.9cm), 30" (76.2cm), 36" (91.4cm), 48" (121.9cm), 60" (152.4cm), 72" (182.9cm) and 84" (213.4cm). 42" (106.7cm) available in Charcoal only.

Standard Roll Length: 100 linear feet (30.48M)

Mesh/in.: 57 Warp, 16 Fill
 Mesh Weight: 8.5 (oz./yd²)
 Yarn Diameter (in.): .011 Warp, .013 Fill
 Fabric Thickness (in.): .019
 Openness Factor: Approximately 25%
 UV Blockage: Approximately 75%
 Breaking Strength (lb.): 190 Warp, 105 Fill
 Stiffness (Mg.): 275 Warp, 95 Fill
 Stretch: 1.0% Warp, 1.0% Fill

\$39.16 a ft (width)
 100 ft long rolls

Table I. Solar Heat Control Properties of Phifer SunScreen Fabrics Installed As Screens, 30-Degree Profile Angle

Color	*Solar Optical Properties				Shading Coefficient w/		
	T _S	R _S	A _S	T _V	¼CL	¼CL	¼H.A.
Charcoal	24	5	71	28	0.33	0.33	0.31
Silver Gray	24	13	63	26	0.32	0.32	0.30
Bronze	26	14	60	27	0.34	0.34	0.31
Dark Bronze	24	9	67	26	0.33	0.32	0.30
Gold	27	13	60	29	0.35	0.35	0.32

Table II. Solar Heat Control Properties of Phifer SunScreen Fabrics Installed Internally, Zero-Degree Profile Angle

Color	*Solar Optical Properties				Shading Coefficient w/		
	T _S	R _S	A _S	T _V	¼CL	¼CL	¼H.A.
Charcoal	25	6	89	29	0.77	0.73	0.53
Silver Gray	22	16	62	24	0.70	0.66	0.49
Bronze	26	14	60	27	0.72	0.68	0.51
Dark Bronze	24	9	67	26	0.75	0.71	0.52
Gold	27	13	60	29	0.73	0.69	0.51

Performance evaluations conducted by Matrix, Inc., Mesa, Arizona.

*T_S - Solar Transmittance T_V - Visual Transmittance ¼ CL ¼" Clear Glass
 R_S - Solar Reflectance ¼ CL ¼" Clear Glass ¼ H.A. ¼" Heat Absorbing Glass
 A_S - Solar Absorptance

The solar optical properties are used to calculate the shading coefficient. The shading coefficient represents the percentage of solar heat gain that is transmitted to the interior through the glass and shading system. Darker colors provide maximum glare reduction and visibility. For complete technical information, test results, performance specifications and larger samples, contact our Sun Control Marketing Department.

P. O. BOX 1700 • TUSCALOOSA, ALABAMA 35403-1700 U.S.A.
 PHONE: 205/343-2120 • TOLL FREE 1/800-633-5955
 IN CANADA TOLL FREE 1/800-547-8797
 FAX: 205/759-4450 • TELEX: 261326 (PHIF UR)



PHIFER WIRE PRODUCTS, INC.
 P. O. BOX 1700 • TUSCALOOSA, ALABAMA 35403-1700 U.S.A.

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 Founded 1952 by REESE PHIFER

Phifer SunScreen®

ENERGY-SAVING SOLAR SCREENING

THE AFFORDABLE EXTERIOR SHADING

Replaces regular insect screening...SunScreen solar screening is a leading choice for sun control among architects, builders and homeowners.

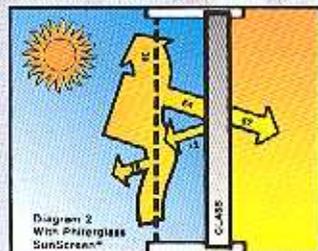
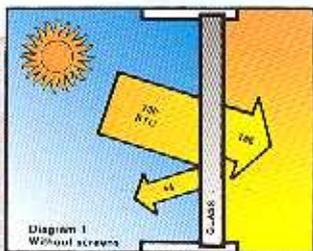
Unlike interior window treatments, like drapes, blinds or even double glazing (which can absorb and then reradiate the sun's heat), SunScreen absorbs and dissipates up to 70 percent of the sun's heat and glare before it reaches the window.



SunScreen solar screens cost less than most other sun shading methods, and, as a result, usually show a much shorter payback period. They are easily installed on any type and size of window and may be removed and stored if full heat gain is wanted during winter months.

SunScreen solar screens save energy... SunScreen solar screens offer an easy and practical method for improving the energy efficiency of windows and glass doors.

In the summer, most unwanted heat gain comes in the form of sunlight radiating through unprotected glass. This glass is a building's most vulnerable area for heat



In Diagram 1, at 40° N. latitude in mid-summer as much as 230 Btu in fall hit each square foot of window glass. Although 44 Btu are reflected away by the 1/4" clear plate glass, 186 Btu penetrate into the work space.

In Diagram 2, adding a solar screen makes a big difference. Of original 230 Btu, 28 are reflected away by the screen, 138 are absorbed and dissipated, only 64 reach glass and only 52 pass through into interior space.



gain. In fact, 60 square feet (5.5 M²) of glass can admit as much as 12,000 Btu of heat each hour, requiring one extra ton of air conditioning (East facing, 8 a.m., Latitude 40° N.).

Controlling this solar heat is extremely important in energy conservation and passive solar design.

Phiferglass® SunScreen is a specially woven exterior solar screen that blocks up to 70 percent of the sun's heat and glare before it reaches the glass surface.



PHYSICAL ATTRIBUTES OF SUNSCREEN

Beauty and privacy... During the daytime, SunScreen appears virtually opaque from the outside while permitting natural light and visibility for people on the inside.

Attractive building exteriors... SunScreen oftentimes enhances building appearance, lending a look of architectural uniformity. SunScreen is available in a variety of colors to harmonize with architectural designs.

Reduces fading... Penetration of ultraviolet radiation to the interior is significantly reduced.

Insect protection... The mesh of Phiferglass SunScreen's unique weave is designed to replace regular insect screening. The openings in the mesh are small enough



to stop even tiny insects.

Works with windows open or closed... Since SunScreen is normally installed outside the window, it performs equally with windows open or closed...an important factor in summer months. The open mesh of SunScreen allows cool breezes to flow through.

Does not come in contact with glass surface... SunScreen is installed inches away from the glass and not directly on the glass surface. SunScreen cannot cause cracking, bubbles or streaking sometimes associated with other sun control products.

Reduces window washing... SunScreen protects windows from dirt and rain streaks. Many users report time intervals between washings are greatly lengthened with SunScreen installed.

SPECIFICATIONS

Screening shall be Phiferglass SunScreen, vinyl-coated fiberglass produced in a ribbed-weave configuration, using yarns as directed in ASTM D-3374 specifications. Materials must also meet Screen Manufacturers Association standards 4001 or 5001 for vinyl-coated fiberglass solar screening.

Widths: 24," 30," 36," 48," 60," 72" and 84." (60.9 cm, 76.2 cm, 91.4 cm, 121.9 cm, 152.4 cm, 182.9 cm and 213.4 cm)

Colors: Silver Gray, Charcoal, Bronze, Dark Bronze and Gold.

Packaging: rolls individually wrapped in paper.



PHIFER WIRE PRODUCTS, INC.

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AFTER



BEFORE

Works in winter

too... Tests by an independent laboratory show a 15 percent improvement in the thermal performance of 1/4" (6 mm) clear plate glass by simply installing a SunScreen

solar screen in front of the exterior of the glass during winter.

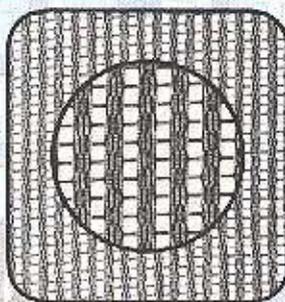
The close weave of the fabric enables SunScreen solar screens to do an excellent job in reducing the wind chill factor on the glass surface to maintain warmer, more constant glass temperatures.

If a building is not designed to receive, store and distribute solar energy, sun coming through a window during the winter months may actually be of little or no value. Consequently, most building owners elect to leave solar screens in place year-round. However, framed SunScreen solar screens may be easily removed during winter months to allow full solar heat gain if desired.

Pays for itself... The savings in energy costs alone will usually pay for the installation of SunScreen in a few short years.

SUNSCREEN'S UNIQUE PATENTED WEAVE

Phiferglass SunScreen is an open weave made of durable vinyl-coated fiberglass yarn. After weaving, SunScreen is heat-treated so as to ensure a stable and quality product.



(U.S. Patent No. 4,002,188)
SunScreen is manufactured exclusively by Phifer Wire Products, Inc.

Turtle Glass or Window Film Helps Sea Turtles and Saves YOU Money & the World Energy!

- ▶ Windows account for approximately 70 % of air conditioning cooling load and up to 40% of the heating load
- ▶ Window tint rejects 12 to 95% of incoming light, eliminates up to 99.5% of UV radiation and reduce to 81% of the heat gain through the glass
- ▶ Window film can pay for itself within 6 months

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Title XXXVIII
BANKS AND BANKING

Chapter 655
Financial Institutions Generally

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655.962 Lighting; mirrors; landscaping.--

(1) Each operator, or other person responsible for an automated teller machine pursuant to ss. 655.960-655.965, shall provide lighting during the hours of darkness with respect to an open and operating automated teller machine and any defined parking area, access area, and the exterior of an enclosed automated teller machine installation, as follows:

(a) There shall be a minimum of 10 candlefoot power at the face of the automated teller machine and extending in an unobstructed direction outward 5 feet.

(b) There shall be a minimum of 2 candlefoot power within 50 feet in all unobstructed directions from the face of the automated teller machine. If the automated teller machine is located within 10 feet of the corner of the building and the automated teller machine is generally accessible from the adjacent side, there shall be a minimum of 2 candlefoot power along the first 40 unobstructed feet of the adjacent side of the building.

(c) There shall be a minimum of 2 candlefoot power in that portion of the defined parking area within 60 feet of the automated teller machine.

(2) The operator shall provide reflective mirrors or surfaces at each automated teller machine which provide the customer with a rear view while the customer is engaged in using the automated teller machine.

(3) The operator, or other person responsible pursuant to ss. 655.960-655.965 for an automated teller machine, shall ensure that the height of any landscaping, vegetation, or other physical obstructions in the area required to be lighted pursuant to ¹subsection (2) for any open and operating automated teller machine shall not exceed 3 feet, except that trees trimmed to a height of 10 feet and whose diameters are less than 2 feet and manmade physical obstructions required by statute, law, code, ordinance, or other governmental regulation shall not be affected by this subsection.

History.--s. 1, ch. 94-343; s. 85, ch. 2000-158.

¹Note.--Redesignated as subsection (1) to conform to the repeal of former subsection (1) by s. 85, ch. 2000-158.

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04/97

International Dark-Sky Association -- Information Sheet 32

Telling the Difference Between Different Lighting Sources

For those new to the issues, this information sheet is about how to tell the difference between the most common outdoor light sources, as well as to discuss some of the basic issues about lighting.

First, moonlight. We all know that one. It lights up the ground, and the sky, for about two weeks a month; it is brightest on the nights nearest full moon, of course.

Next, the candle. There are many types of candles, of course, and it is interesting that the candle was used as the standard light source for many, many years. Similar in intensity were oil lights, burning various types of natural oils, including whale oil.

Gas lighting was the next to be used. This one was sometimes used in interesting looking lighting fixtures, and these fixtures are still used today, particularly in historic districts, places that want to preserve the look of the old days. The problem comes where modern lamps are used in these fixtures, lamps with much greater light output than the old sources. If that is the situation, then the fixtures don't look like they did at night in the old days. Now they produce a great deal of glare, and visibility is compromised. They don't look at all like they used to. How to get what's wanted? Put only a very low wattage lamp in the fixture so as to preserve the old time "ambiance". Then light the ground with a separate lighting system, one using modern fixtures with good light control and no glare. One sees the old time fixture, and likes it. But one also sees a properly illuminated landscape, with no glare.

Then came the incandescent lamps: more efficient than the earlier sources. By today's standard, these are not efficient sources. They are OK if used in low wattage (not much energy waste) or when used infrequently (switched on by manual switch or occupancy sensor) for some applications. An example is the many low wattage lamps used at Christmas time, on trees and elsewhere. Another disadvantage of incandescent lamps is their relatively short lifetime. They should not be the source of choice for most outdoor lighting applications.

Quartz/halogen lamps are rather like incandescent lamps, and there are other such lamps that are used for special applications. These are arc or filament lamps, usually with a lot of glare, and only a little more efficient than standard incandescents. Most also have relatively short lifetimes. These types of lamps are most often used today in spotlights and floodlights.

Fluorescent lighting is used occasionally for outdoor lighting; we see it sometimes in car lots and other such applications. It is generally a long tube source, with little or no glare. The control of the light output is often not very good, but often adequate. It has even been used for street lighting. Most all such applications have disappeared, replaced by more efficient and more controllable sources. Of course, it is a very common lighting source for interior lighting. The development of compact fluorescents in recent years will no doubt harbor a comeback in fluorescent lighting for some outdoor lighting applications.

Mercury lamps have been used for many years for outdoor lighting, especially street lighting and rural security lighting. It was the dominant source for such applications for many years. It is an arc source, glary, greenish white, cold looking usually. The light output fades with time, and many present lamps are outputting only a small fraction of the light they used to emit. The major problem with mercury lighting is perhaps the fact that most such lamps are housed in very inefficient fixtures. They were designed in the days of cheap electricity, when energy efficiency was not very important to most people.

Mercury lamps are more efficient than the incandescent lights they replaced, but they are not really an efficient light

source by today's standard. They should no longer be used for most applications. It is usually quite cost effective to replace them with more efficient fixtures and lamps. One still sees them being used in great abundance by the unaware or insensitive. Most of the outdoor lighting control ordinances in Arizona prohibit the installation or use of any new mercury light sources as they are so inefficient; the use of such lighting fixtures, even the older ones, have been prohibited in the Tucson and Pima County area since May 1991.

Metal halide lamps are the other common "white" light source used for outdoor lighting. They are more energy efficient than mercury and, being a more recent light source, are usually in more efficient light fixtures, ones that control the light output distribution much better. One sees these sources in parking lots and car dealer lighting today, and they are usually the white light source seen in well shielded lighting fixtures. Unfortunately, the bulb wattages used are often too high, resulting in a "harsh" and overlit environment. They are a bluish-white arc source and are very glary if not well shielded.

High pressure sodium (HPS) lamps are quite energy efficient, more so than any of the above sources. An HPS lamp is also an arc source, and so it is glary if not in a well shielded fixture. It looks orangish to the eye, and gives only fair color rendering. Many communities and businesses have replaced their older lighting with HPS. Unfortunately, often they replaced only the lamps and ballasts, and continued to use the old inefficient fixtures, and so still have a poor lighting job: poor control of the light, and a great deal of light trespass, glare, and sky glow. Also, many replaced the older lighting with HPS at nearly the same wattage, getting no appreciable energy savings. Certainly they got more light, due to the increased efficiency of the source, but often that additional light was not needed. Waste again. When the correct amount of light (and hence the correct wattage HPS lamp) is used in a modern, efficient, full cutoff lighting fixture (one that has excellent control of the light output), insuring that the light is all used and none wasted, then one usually has a lighting application that is quite good.

Low pressure sodium (LPS) lamps are the most energy efficient light sources yet invented. They should be the source of choice for applications where energy savings is of the highest importance. LPS lamps are not an arc source, and so are not glary under most any condition. They are a tube source, rather like the fluorescent lamps, but not as long. They look yellow, just like the amber color of a traffic signal light. There is no color rendering at all, so they should not be used where color rendering is critical unless some white light is added. It only takes a little; two of the new car sales lots in Tucson are lit primarily with LPS, with a little bit of white light added to provide color rendition. Since LPS is so energy efficient, low wattage lamps, even 18 or 35 watts, put out a remarkable amount of light. Many people install too high a wattage lamp, because they are used to the wattages of incandescent lamps. [See IDA information sheet number 4.] Naturally, LPS light sources should always be used in efficient fixtures, where the light output is adequately controlled and no light is wasted. Such fixtures do exist and are used in all the newer installations in Tucson, for example.

In these days of increasing sensitivity to the environment and of growing awareness of energy waste, it is most important to be aware of the differences in outdoor lighting sources. Some communities are saving millions of dollars while at the same time enhancing both the effectiveness of their outdoor lighting and improving the nighttime environment. Everyone wins.



Shades™

Shades improve the look and light distribution of new, old and mismatched lighting fixtures.



Curved and Rectangular Shades fit over Wallpacks, Floodlights and Vandalproof fixtures

Shade fits existing RAB Yard Blaster and other manufacturer's Barn Lights

Fully covers lamp to cut glare & direct light down

Cover existing fixtures that are worn, unattractive or mismatched. Add vandalproof metal protection.

Field adjustable light distribution

Shades add vandalproof metal protection

Full Cutoff top vents heat, not light

Stainless steel hardware

Easy mounting template



Easy Installation & Relamping



1. Attach hanger brackets to wall on each side of fixture. Template provided.
2. Slide shade onto hanger bracket and tighten bolts.

Stop Glare & Light Pollution



Retrofit old fixtures to comply with new glare and light pollution laws

Fits Over Fixtures For a Great New Look!



Standard top allows some uplight



Cutoff Top for Fully Shielded Full Cutoff lighting (depending on shade mounting location)



Specifications

Material:
Die formed aluminum, 2mm thick

Finish:
Chip and fade resistant architectural bronze or bright white polyester powder coat finish.

Customized Shades:
Consult factory for custom finish colors, sizes, shapes and cut-outs.

Hardware:
Stainless steel nuts, bolts and lock washers. Aluminum "L" brackets.

Fax Info on Demand 24/7
Call RAB FaxBack at 888 722-1236.
Enter document numbers shown below:

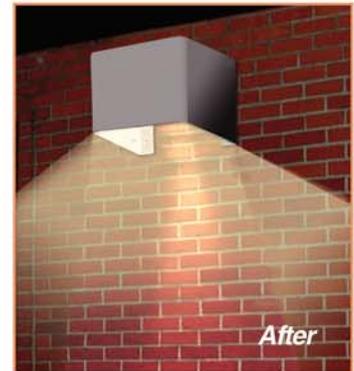
	Catalog Page	Installation Manual
SHC&R 1,2,3	412	421
SHY	412	422

For more info on RAB FaxBack see p.170

Product Info on the Internet:
www.rabweb.com, click "support"



Before



After

New!
Shades Small

Curved and Rectangular Shades to cut glare and improve the looks of smaller lighting fixtures. Die formed aluminum with mounting brackets and stainless steel hardware.

Finish: ● Architectural Bronze
○ White



Shades with Full Cutoff Tops
SHR1WCO



Fits Smaller Fixtures



New!
Shades Medium

Curved and Rectangular Shades to cut glare and improve the looks of medium size lighting fixtures. Die formed aluminum with mounting brackets and stainless steel hardware.

Finish: ● Architectural Bronze
○ White



Fits Medium Fixtures



New!
Shades Large

Curved and Rectangular Shades to cut glare and improve the looks of larger lighting fixtures. Die formed aluminum with mounting brackets and stainless steel hardware.

Finish: ● Architectural Bronze
○ White



Fits Large Fixtures



New!
Barn Light Shades

Cut glare and light pollution from 175 watt Mercury Vapor and 70 watt HPS RAB Yard Blaster and other brand Barn Light fixtures. Die formed aluminum shade attaches with clips or screws. Stainless steel hardware. Finish: ● Natural



Fits screw-on Barn Lights:

- RAB
- Lumark
- American
- Heath-Zenith
- Regent/NCI
- Electripak
- Designer's Edge



Fits clip-on Barn Lights:

- Hubbell
- GE



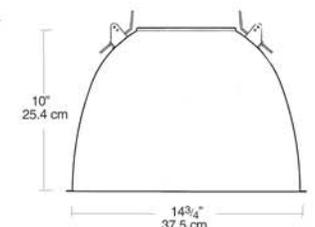
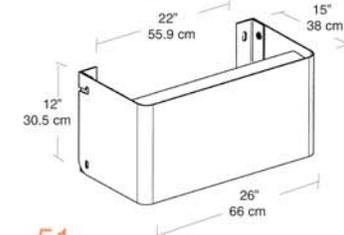
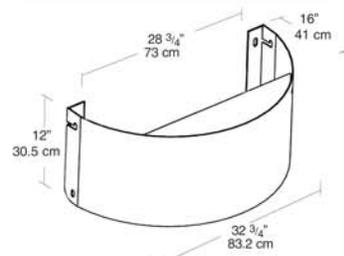
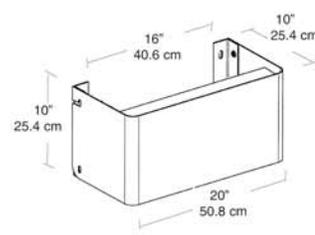
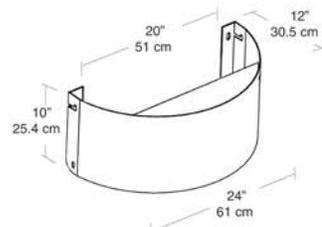
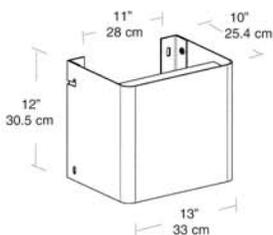
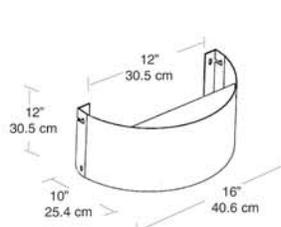
Catalog Numbers

Curved		Rectangular	
Bronze	White	Bronze	White
SHC1A	SHC1W	SHR1A	SHR1W
Add suffix "CO" for full cutoff top			

Curved		Rectangular	
Bronze	White	Bronze	White
SHC2A	SHC2W	SHR2A	SHR2W
Add suffix "CO" for full cutoff top			

Curved		Rectangular		Natural
Bronze	White	Bronze	White	
SHC3A	SHC3W	SHR3A	SHR3W	SHY
Add suffix "CO" for full cutoff top				

Dimensions



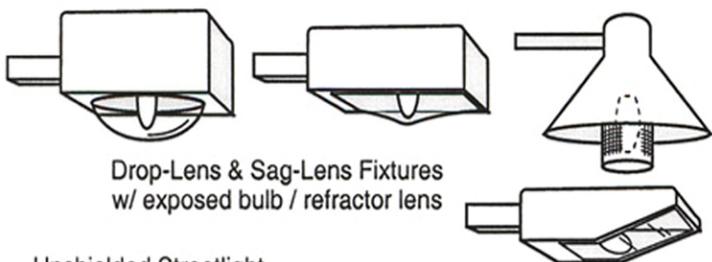
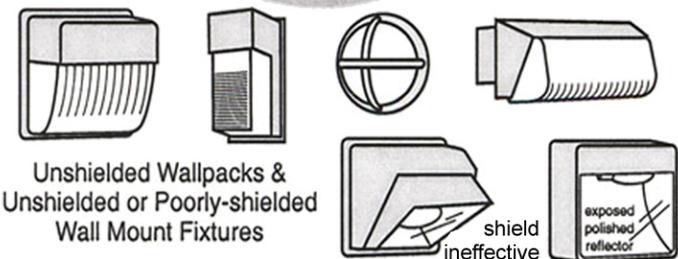
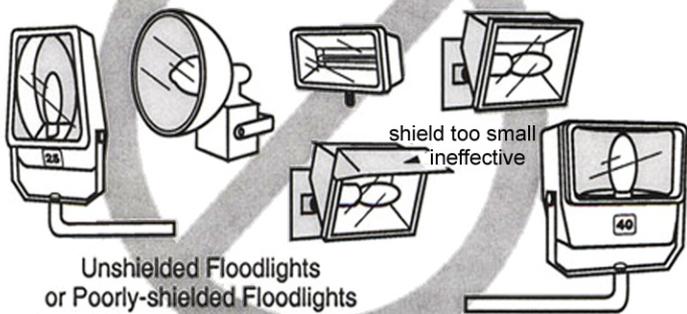


WLF120-2006

EXAMPLE LIGHTING FIXTURES

UNACCEPTABLE

Fixtures that produce glare and light trespass.



Unshielded Streetlight



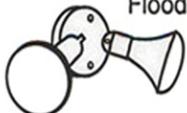
Unshielded Security Light



Unshielded 'Period' Style Fixtures



Unshielded PAR Floodlights



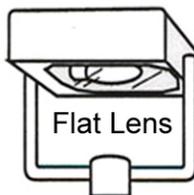
Drop-Lens Canopy Fixtures



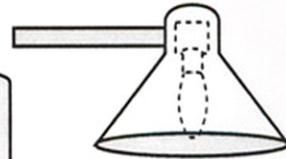
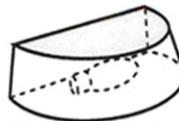
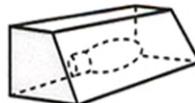
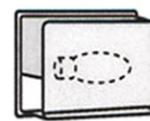
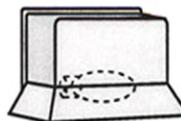
ACCEPTABLE

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

Use yellow (long-wavelength) bug type bulbs or low-pressure sodium (LPS) whenever possible.



Fully Shielded Wallpack & Wall Mount Fixtures

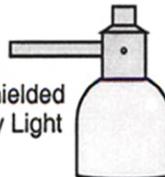


Fully Shielded Fixtures

Full Cutoff Streetlight



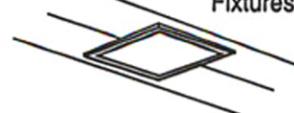
Fully Shielded Security Light



Fully Shielded 'Period' Style Fixtures



Flush Mounted Canopy Fixtures



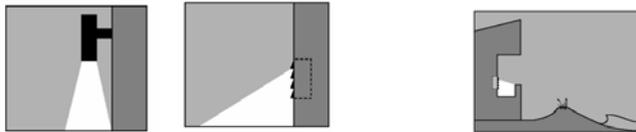
UNACCEPTABLE

ACCEPTABLE

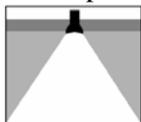
Excerpts from the FDEP - **Chapter 62B-34**, General Permits for Activities Seaward of the Coastal Construction Control Line

62B-34.070 General Permit for a Single Family Dwelling and Associated Minor Structures or Activities

- (4) Turtle Protection Requirements.** All work authorized by this General Permit shall meet the following turtle protection requirements:
- (a) All **windows and glass doors** on the seaward and shore-perpendicular sides of any new dwellings or additions shall be tinted to transmittance value (light transmission from inside to outside) of 45% or less through the use of tinted glass or window film or screens.
 - (b) The following **types of lighting are authorized** under the General Permit. Any departure or deviation from these lighting requirements shall constitute a violation of the General Permit.
 - 1. **Balcony, deck and entranceway lights** shall be canister down-light fixtures or louvered wall lights that adhere to the following standard:
 - a. **Canister** down-light fixtures shall be equipped with black baffles or grates, shall have the light source recessed so that it is not visible from the beach, shall be used with one 480 (or less) lumens output standard incandescent (or equivalent) yellow “bug” bulb, and shall be limited to no more than one fixture per egress.
 - b. **Louvered** wall lights shall be mounted 12 inches or less above the adjacent floor or deck, shall be equipped with louvers that completely hide the light source, shall be used with one 480 (or less) lumens output standard incandescent (or equivalent) yellow “bug” bulb, and shall be limited to no more than one fixture per egress.



- 2. **Underhouse** lights for unenclosed or partially enclosed parking and building access areas shall be canister fixtures, either mounted on piles or recessed into the ceiling. The fixtures shall be equipped with black baffles, shall have the light source recessed so that it is not visible from the beach, shall be used with one 480 (or less) lumens output standard incandescent (or equivalent) yellow “bug” bulb, and shall be limited to no more than one fixture per 100 square feet of parking or building access area.



- 3. **Landscaping and pathway lights** shall be mushroom type fixtures, shall extend no more than 12 inches above the ground, shall be used with 220(or less) lumens output standard incandescent (or equivalent) bulbs or with 400 (or less) lumens output compact fluorescent (or equivalent) bulbs, shall extend no farther seaward than the house, and shall be limited to one fixture per 8 feet of path length or 1 fixture per 100 square feet of ground area.



- (c) No lights shall be permitted on **dune walkovers** or elevated walkovers to the beach.
- (d) No additional lighting shall be authorized.
- (e) No temporary lighting of the construction area is authorized at any time during the marine turtle-nesting season (May 1-Oct 31 all counties except Brevard, Indian River, St. Lucie, Martin, Palm Beach and Broward counties March 1-Oct31)

Disclaimer: The information on this web site is provisional. For matters affecting legal rights, please refer to the printed version of the appropriate official publication.

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION



2006 Request for Temporary Lighting Shield

(PLEASE PRINT OR TYPE)

Name: _____

Residence Owner Business Owner Business Manager Other: _____

Property Name (if applicable): _____

Type of Property:

Private Residence Condominium Hotel/Motel/Resort Business
Parking Lot Roadway County Owned Park

Property Street Address: _____

City: _____ **County:** _____

Telephone Number: (_____) _____ - _____

Number and Location of Problem Light(s):

_____ Attached to Building

How high up? _____ feet / story

Building Face: North South East West

Corner of Building/Intersection: NE NW SE SW

_____ In Parking Lot

_____ In/On Parking Garage

_____ On Roadway

Intersection of _____ and _____

Corner of Intersection: NE NW SE SW

_____ In Pool Area

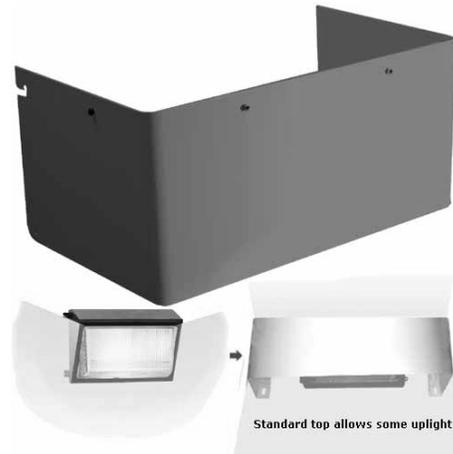
_____ In Courtyard

_____ Other (please explain): _____

NEMA (Open Bottom)



Wall-mounted Wall-Pack



Number of shields requested:

_____ NEMA Shields
_____ Wall-mounted Wall-Pack Shields

Number of Shield Provided (to be filled in by FWC):

_____ NEMA Shields
_____ Wall-mounted Wall-Pack Shields

User Agreement

I agree to install the shield provided to me within 60 days of delivery. I understand it is being loaned to me for the purpose of controlling light pollution in my area. When it becomes necessary to replace this light fixture, I will replace it with an approved "Wildlife Lighting" Certified Fixture and I will arrange to have the shield returned to the FWC. I will contact FWC to conduct an inspection or take a picture of the shielded light on my property.

User's Name (Please Print)

User's Signature

Date

RETURN THIS FORM TO:
FLORIDA FISH & WILDLIFE CONSERVATION COMMISSION
IMPERILED SPECIES MANAGEMENT
P.O. BOX 3478
TEQUESTA, FLORIDA 33469

Good Neighbor OUTDOOR LIGHTING

PRESENTED BY THE NEW ENGLAND LIGHT POLLUTION ADVISORY GROUP (NELPAG) AND SKY & TELESCOPE.

What is good lighting?

Good outdoor lights improve visibility, safety, and a sense of security, while minimizing energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned?

Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the nighttime environment and neighbors' property values. Light directed uselessly above the horizon creates murky skyglow — the "light pollution" that washes out our view of the stars.

Glare Here's the basic rule of thumb: If you can see the bright bulb from a distance, it's a bad light. With a good light, you see lit ground instead of the dazzling bulb. "Glare" is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

Light Trespass Poor outdoor lighting shines onto neighbors' properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

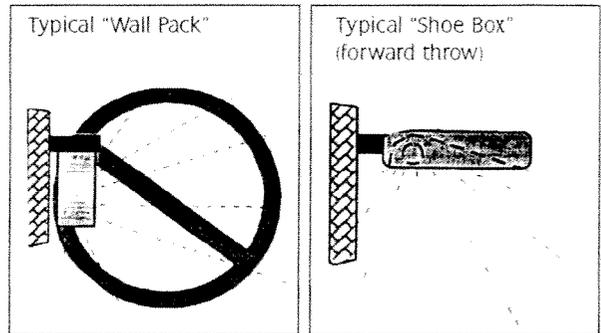
Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

Excess Lighting Some homes and businesses are flooded with much stronger light than is necessary for safety or security.

How do I switch to good lighting?

- 1 Provide only enough light for the task at hand; don't over-light, and don't spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate

Some Good and Bad Light Fixtures

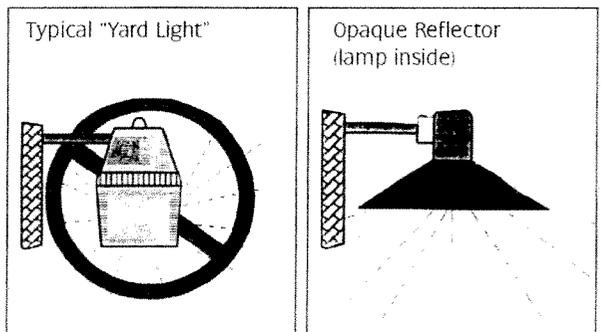


BAD

Waste light goes up and sideways

GOOD

Directs all light down

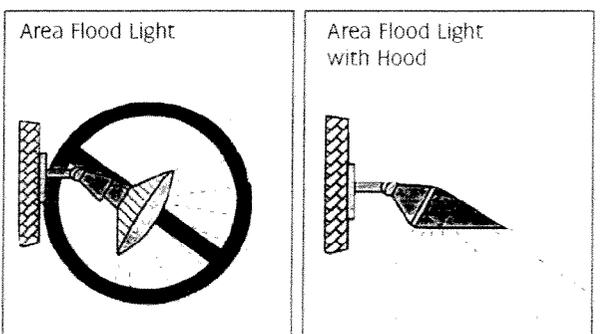


BAD

Waste light goes up and sideways

GOOD

Directs all light down



BAD

Waste light goes up and sideways

GOOD

Directs all light down

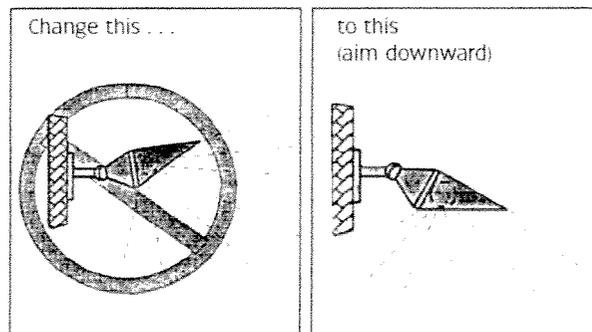
areas 100 times more brightly than the full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbors or polluting the sky.

- 2** Aim lights down. Choose "full-cutoff shielded" fixtures that keep light from going uselessly up or sideways. Full-cutoff fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.
- 3** Install fixtures carefully to maximize their effectiveness on the targeted area and minimize their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night, when you can see where all the rays actually go. Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as well as a wasteful light does with a high-wattage bulb.
- 4** If color discrimination is not important, choose energy-efficient fixtures utilizing yellowish high-pressure sodium (HPS) bulbs. If "white" light is needed, fixtures using compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapor bulbs.
- 5** Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!

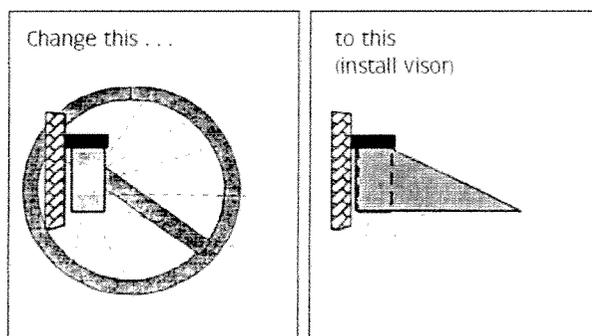
Replace bad lights with good lights.

You'll save energy and money. You'll be a good neighbor. And you'll help preserve our view of the stars.

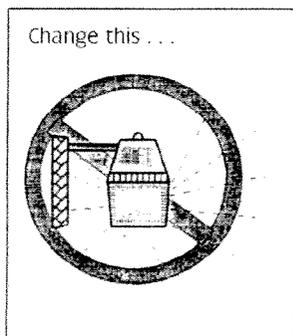
What You Can Do To Modify Existing Fixtures



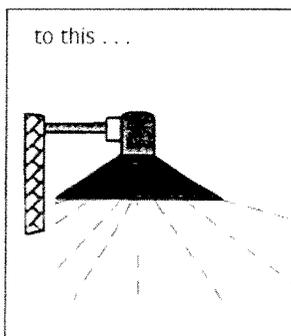
FLOOD LIGHT



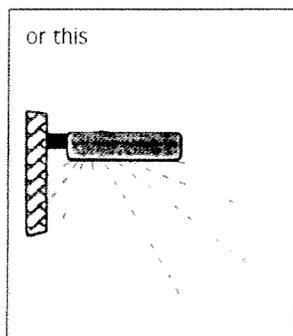
WALL PACK



YARD LIGHT



OPAQUE REFLECTOR



SHOE BOX

Presented by the **New England Light Pollution Advisory Group (NELPAG)** (<http://cfa-www.harvard.edu/cfa/ps/nelpag.html>) and **Sky & Telescope** (<http://SkyandTelescope.com/>). NELPAG and *Sky & Telescope* support the International Dark-Sky Association (IDA) (<http://www.darksky.org/>).

We urge all individuals and groups interested in the problems of light pollution and obtrusive lighting to support the IDA and subscribe to its newsletter. IDA membership costs \$30 per year; send your check to IDA, 3225 N. First Avenue, Tucson, AZ 85719, U.S.A.



Sky Publishing Corp.
49 Bay State Road
Cambridge, MA 02138
SkyandTelescope.com

Discussion and Partial List of Lighting Fixtures

We can look at fixtures in several ways:

Light fixture efficiency: effective control of light output through optical control and shielding

Light source efficiency: using light sources that produce more light per unit of energy consumed

Suppliers: some companies manufacture mostly efficient light fixtures, others produce mostly inefficient ones; many produce both good and bad

This information sheet gives some discussion of each of these.

1. **Lighting control.** An efficient and effective lighting fixture must have included in it elements to control the light output, directing the light to where it is needed. These elements can be reflectors, refractors, louvers, or baffles. One wants to minimize the light loss within the fixture itself as well, so as to maximize the use of the light output.

We strongly recommend *full cutoff* fixtures. By this we mean that there is no light emitted above the horizontal (no up going light). There should also be not much light (generally < 4%) at angles greater than 75 degrees above the vertical. Such light causes a lot of glare.

When there is a need for some up light, such as in a baseball park, then we recommend *sharp cutoff* fixtures, ones in which there is very good beam control of the light output. This means that there will be very little spill light, up light, or light trespass.

Any building facade lighting, landscape lighting, or other such lighting should use as low a wattage lamp as possible, and the beams should be tightly controlled, to minimize waste light.

2. **Lighting source.** Lamps differ greatly in the amount of light output produced for the amount of wattage they use. IDA Information Sheet No. 4 gives specifics, but we can say here that low pressure sodium sources are the most efficient, followed by high pressure sodium, then metal halide. Metal halide is a white light source; fluorescent lamps are also a fairly efficient white light source. For low wattages, there are a number of excellent white light sources, such as "PL" lamps. Neither LPS nor HPS give good color rendering, LPS giving none at all. Many applications of nighttime lighting, however, do not require color rendering, and LPS is an excellent choice for such applications.
3. **Lighting suppliers.** There are many sources of lighting fixtures. Some stock many varieties, some only a few. Some stock a wide range of quality, some only the cheapest. As in anything else, you get what you pay for, and most of the cheap ones are not recommended. They produce much glare and wasted light, and they are not well suited for any lighting application. Buy lighting fixtures from knowledgeable sources. There are many manufacturers of good lighting fixtures. Have your local lighting stores, distributors, or representatives consult the catalogs of, for example, American Electric, Emco, General Electric, Kim, Spaulding, Sylvania, WideLite, and others. Be sure to buy only quality fixtures: ones that are energy efficient and that give excellent control of the light output, minimizing glare, light trespass, and urban sky glow.

08/96

International Dark-Sky Association (IDA) Information Sheet 4

Operating Data and the Economics of Different Lamps

Assume: 4100 hours of use per year (average nighttime hours, dusk to dawn) 8¢ per KWH (typical average cost per kilowatt-hour, the power rate)

Low Pressure Sodium

	180W	135W	90W	55W	35W	18W
Initial Lumens	33000	22500	13500	8000	4800	1800
Mean Lumens	33000	22500	13500	8000	4800	1800
Lamp Wattage	180	135	90	55	35	18
Circuit Wattage	220	180	125	80	60	30
Initial Lum/watt	150	125	108	100	80	60
Mean Lum/watt	150	125	108	100	80	60
Annual KWH Use	902	738	513	328	246	123
Annual Oper Cost	\$72.16	\$59.04	\$41.04	\$26.24	\$19.68	\$9.84

High Pressure Sodium

	400W	250W	200W	150W	100W	70W	50W	35W
Initial Lumens	50000	28500	22000	16000	9500	6300	4000	2250
Mean Lumens	45000	25700	19800	14400	8550	5670	3600	2025
Lamp Wattage	400	250	200	150	100	70	50	35
Circuit Wattage	465	294	246	193	130	88	66	46
Initial Lum/watt	108	97	89	83	73	72	61	49
Mean Lum/watt	97	87	80	75	66	64	55	44
Annual KWH Use	1907	1205	1009	791	533	361	271	189
Annual Oper Cost	\$152.56	\$96.40	\$80.72	\$63.28	\$42.64	\$28.88	\$21.68	\$15.12

Metal Halide

	1000W	400W	250W	175W	150W	100W	70W	50W	32W
Initial Lumens	110000	36000	20500	16600	13000	9000	5500	3500	2500
Mean Lumens	88000	28800	12700	10350	8700	6400	4000	2500	1900
Lamp Wattage	1000	400	250	175	150	100	70	50	32
Circuit Wattage	1070	456	295	215	184	115	88	62	43
Initial Lum/watt	103	79	69	77	71	78	63	56	58
Mean Lum/watt	82	63	58	48	47	56	45	40	44
Annual KWH Use	4387	1870	1210	882	754	472	361	254	176
Annual Oper Cost	\$350.96	\$149.60	\$96.80	\$70.56	\$60.32	\$37.76	\$28.88	\$20.32	\$14.08

Mercury Vapor and Incandescent *

	1000W	700W	400W	250W	175W	100W	150W*	100W*
Initial Lumens	55000	36400	20500	11850	7850	4100	2850	1710
Mean Lumens	46200	29850	18570	10540	7140	3230	2850	1710
Lamp Wattage	1000	700	400	250	175	100	150	100
Circuit Wattage	1090	765	455	285	205	135	150	100
Initial Lum/watt	50	48	45	42	38	30	19	17
Mean Lum/watt	42	39	41	37	35	24	19	17
Annual KWH Use	4469	3137	1866	1169	841	554	615	410
Annual Oper Cost	\$357.52	\$250.96	\$149.28	\$93.52	\$67.28	\$44.32	\$49.20	\$32.80

lined up at nearly equal lumen output, to show the relative energy & cost savings. Definitions and Discussion Points

1. The numbers in the preceding table are approximate. Lumen output depends on the bulb manufacturer and operating conditions. Circuit wattage depends on the ballast manufacturer.
2. The numbers in the preceding table are for clear bulbs. Diffuse coated ("frosted") bulbs are available for most lamp types, and these will have a somewhat lower lumen output. Always use diffuse coated bulbs when the light source is directly visible from normal viewing angles to reduce glare. Use clear bulbs in fully shielded fixtures or when the fixture lens is diffuse or translucent.
3. We use 4100 hours as typical of the annual operating time of a street light or any other fixture controlled by a photosensor that comes on at dusk and goes off at dawn. $4100 / 365 = 11.23$ hours per night. A sampling of several cities indicates that 4100 hours is typical of the hours that their street lighting system is operating each year.
4. The U.S.A. national average for electrical utility rates is close to 8 cents per kilowatt-hour. One can and should use a rate that is representative of local utility rates. The range is from a low of about 4 cents (wouldn't that be nice in your own area?!) to a high of 18 cents or more. Any spreadsheet program makes such comparisons easy. One should allow for future rate changes, which are most generally upwards.
5. Kilowatt-hour (KWH) is a measure of the amount of energy used. Kilowatts measure power. A kilowatt is 1000 watts. A KWH is one kilowatt of power used for a duration of one hour.
6. Initial lumens is a measure of how much light the lamp is emitting near the beginning of its life. Most high-efficiency light sources (except LPS) decline in light output with time. LPS has a lifetime of about four years, and HPS about five, while mercury vapor almost never "burns out"; it just keeps getting fainter and fainter. You can estimate the relative effects by looking at the row titled "mean lumens". This is the average output of the lamp during its usable lifetime.
7. Mean lumens is a measure of how much light the lamp is putting out after about two or three years of usage. We assume a typical lifetime for the lamp, either due to burnout of the lamp or to group replacement. Many communities replace lamps after a specified interval, so as to minimize any outages due to lamp burnout. The cost of a lamp is much less than the cost of an accident or a lawsuit due to a lamp having burned out. The issue of half life and replacement strategy is complicated, and few agree on all aspects.
8. Circuit wattage takes into account the other energy uses besides that of the lamp. The major energy loss occurs in the ballast, a unit needed to start and operate the lamp under conditions that it is designed for. There are many different kinds of ballasts, and what is good for one lamp or wattage is usually not good for another. LPS should be used with a ballast designed for efficient LPS use, for example. The ratio of lamp wattage to circuit wattage is not a constant, even for the same type of lamp. See the table for examples.
9. All these entries have been taken from either lamp manufacturers' catalogs or actual operating experience in different communities. The figures given in the table are sort of an average of all that, and as such should be typical of what is being used in any specific location.
10. Lumens/watt is a measure of operating efficiency: total amount of light from the lamp per power used.
11. Annual KWH use is also a measure of operating efficiency, as it tells how much energy is used each year.

Naturally, don't use more light than one needs (more light is not always better!) as that uses more energy.

12. Typical wattages for major highways or streets would be 180 or 135 or 90 watt LPS, or 400 or 250 or 150 watt HPS, or 1000 or 400 or 250 watt Mercury Vapor. Typical values for residential streets might be 90 or 55 watt LPS, or 150 or 100 or 70 watt HPS, or 175 watt mercury vapor. Typical home security lighting might be 35 or 18 watt LPS, 70 or 50 or 35 watt HPS; please don't use mercury vapor, as it is not very efficient. Always use full-cutoff fixtures for all applications!
13. Annual operating cost is another measure of operating efficiency, of course. It tells how much one must pay for energy usage in order to operate one given fixture for one year. In some cases, the cost of the fixture is less than the annual operating cost! Payback times when replacing inefficient fixtures with energy efficient fixtures can be very short. Quite often, a one-step-lower-wattage bulb (and ballast) can be used, resulting in lower operating costs.
14. Of course, there are other costs for any given installation. Maintenance, lamp replacement, replacements due to accidents and breakages, depreciation, whatever. Generally these are "a wash" as all systems have similar costs.
15. As you look at the table, be sure to notice the bulb wattages that give similar light output for different types of lamps. For example, 35 watt LPS, 70 watt HPS, 100 watt Metal Halide, or 175 watt Mercury Vapor give similar mean lumen outputs. Such comparisons can offer guidance as to the tremendous savings that can be obtained with more efficient light sources. Keep in mind, though, that an inefficient source used infrequently uses less energy than a highly efficient source that burns from dusk to dawn, 365 nights a year. Thus, an incandescent light that is activated by an outdoor occupancy sensor will usually have a lower operating cost than a dusk-to dawn HPS security light, for example.

There are other overall considerations as well. For example, not all fixtures are equally efficient at getting the light produced by the lamp out of the fixture and onto the area needing the light. One should always use efficient fixtures as well as efficient lamps. Many old fixtures are not efficient, as they were designed at a time when energy was cheap and efficiency was low on the priority list. For example, "globes" throw more than half their light output upwards. Today, there is no excuse to use any such inefficient fixtures. Please help stamp them out. Use efficient full-cutoff fixtures for all applications. Install as recommended, of course, to insure that the light output is used, not wasted producing glare and uplight.

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07/98

 International Dark-Sky Association -- Information Sheet 77

Recommended Lighting Levels for Exterior Lighting

The Illuminating Engineering Society of North America (IESNA, or IES) gives in current IES publications quite a number of recommended illumination levels for outdoor lighting. We summarize some of these recommendations below, and in some cases the original tables have been simplified. Some of these illumination levels are currently under discussion by IES technical committees. It is important to note that these values are recommendations, not standards. Standards are set at the federal, state, county, or community level. The IES does not set standards, though IES recommendations are often used by those who set standards.

In fact, recommended illuminance levels are to some degree arbitrary. On p. 93 of the 1993 edition of the **IESNA Lighting Handbook**, it states that

It remains to be determined whether the added accuracy in predicting visual performance will be utilized in the illuminance selection procedure. A model of visual performance, no matter how accurate, is only part of illuminance selection. The cost of equipment and energy will always be an important part of the Society's decision. If electric energy prices were to double, recommended illuminance levels would certainly become lower. Further, there are other, perhaps more important, lighting design factors that the practicing illuminating engineer must consider in setting illuminance levels.

In all outdoor lighting applications, many factors come into play and should be considered: minimizing glare, mounting height and spacing, lighting system depreciation and life-cycle cost, conflict areas (such as between vehicles or between vehicles and pedestrians), access control and vandalism prevention, as well as the mix of commercial, industrial, and residential properties near the area to be illuminated. For example, in the presence of glare, one needs more illumination to try to overcome the adverse impact of the glare; without glare, lower illumination levels are possible, with an actual improvement in visibility. The key is that all outdoor lighting should be carefully done, with consideration given to all the relevant factors.

We give below a summary of the lighting illuminance levels in footcandles, as that is the most common unit used in the United States. However, lux is the preferred international unit, and the IES does officially recommend its use in the United States. A level of ten lux is about one footcandle (10.76 lx = 1 fc, exactly).

Roadway Lighting

	Average Maintained Illuminance (fc)	Uniformity (Avg/Min)
Freeway Class A	0.6 - 0.8	3/1
Freeway Class B	0.4 - 0.6	3/1
Expressway	0.6 - 1.3	3/1
Major road	0.6 - 1.6	3/1

<http://www.darksky.org/~ida/infoshts/is077.html>

3/5/2005

Collector road	0.4 - 1.1	4/1
Local road	0.3 - 0.8	6/1

Parking Lots

Level of Activity:	Horizontal Illuminance (Footcandles)		Uniformity Ratio
	Avg	Min	
High	3.6	0.9	4/1
Major League Athletic Events Major Cultural or Civic Events Regional Shopping Centers Fast Food facilities			
Medium			
Community Shopping Centers Cultural, Civic, or Recreational Events Office Parking Airports, Commuter Lots, etc. Residential Complex Parking Hospital Parking	2.4	0.6	4/1
Low	0.8	0.2	4/1
Neighborhood Shopping Industrial Employee Parking Educational Facilities Churches			

IES also states that the "Low" values are appropriate wherever there is a requirement to maintain security at any time in areas where there is a low level of nighttime activity.

Recommendations for other outdoor lighting levels (footcandles)

Building exteriors

Entrances

Active (pedestrian and/or conveyance)	5
Inactive (normally locked, infrequently used)	1
Vital locations or structures	5
Building surrounds	1

Floodlit Buildings and Monuments	Dark surroundings	Bright surroundings
Light surfaces	5	15
Medium light surfaces	10	20
Medium dark surfaces	15	30
Dark surfaces	20	50
Loading and Unloading Platforms	20	
Service Stations		
Approach	1.5	5
Driveway	1.5	5

Pump Island	20	30
Service Areas	3	7
Storage Yards		
Active	20	
Inactive	1	

Retail Outdoor Lighting

		Illumination Level of Surrounding Area		
		High	Medium	Low
Seasonal	Circulation	10	7	5
	Marketing area	30	20	10
	Feature display	60	40	20

Auto Lots

Circulation	10	7	5
Merchandise	50	30	20
Feature display	75	50	35

IES states that the illuminance in exterior retail selling areas should not exceed 10 times that of the surrounding area. Measurements should be referenced from the roadway.

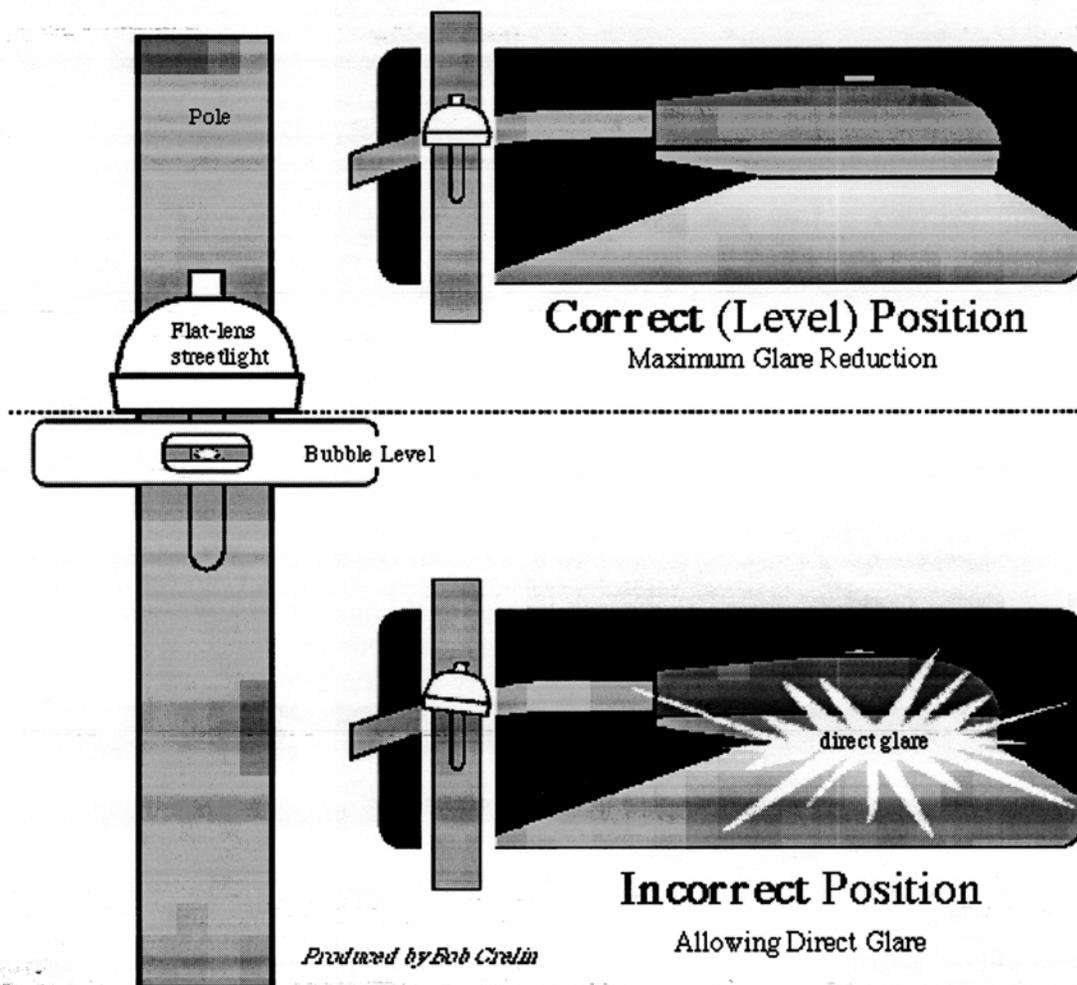
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11/98

 International Dark-Sky Association -- Information Sheet 144

Leveling Flat-Lens Cobrahead Streetlights for Optimum Glare Reduction

One of the most important benefits of the flat-lens, full-cutoff cobrahead streetlight is the reduction of direct glare to drivers, pedestrians, and nearby homeowners. The correct positioning of the flat-lens cobrahead is key to achieving optimum glare reduction and performance. Using a bubble level across the base (glass-lens side) of the fixture and parallel to the roadway during installation (as shown below) will determine the proper position before tightening in place. Even a slight tilt in either direction can cause some unnecessary glare, so achieving a level position for the flat-lens cobrahead is desired.





Light Shields & Modifications

09 MAR 2002

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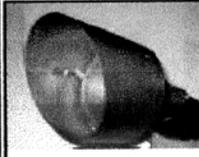
	Manufacturer:	Hubbell Lighting, Inc. & Outdoor Lighting Associates
	Model:	NPU-BI (Hubble Sky Cap)
	Lamp/Wattage:	NA
	Notes:	Full Cutoff, Fits on all Dusk to Dawn Luminaires, available as NITE-TO-LITEtm SKYCAP
	Additional Links:	Hubbell SkyCap shield page , Information Sheet 103

	Manufacturer:	LUMINAIRE TECHNOLOGIES & Outdoor Lighting Associates
	Model:	Lite-Blocker
	Lamp/Wattage:	NA
	Notes:	Fits on all Dusk to Dawn Head Luminaires, Low Cost
	Additional Links:	see how this shield in installed

This is a collection of "home made" modifications found and photographed in different areas.
 They are presented here to show what others have done.
 In some cases modifications may make the UL rating invalid.
 Therefore we cannot suggest or recommend any modifications.

	This is a shield placed over an old style unshielded wall pack. The shield should be painted a light color on the underside so as to reflect more light down to the ground. Click on picture for a 400x600 size view (32K).
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	Effectively Shielding Outdoor Lighting by Cliff Haas -- This is an important resource for the do-it-your-selfer. The site provides a number of examples of easy and inexpensive ideas to improve outdoor lighting. The example to the left is from PAR (Parabolic Aluminized Reflector) Floodlight Shields Plans. See IDA Information Sheet 159 - Shielding Floodlights, contributed by Bob Crelin
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	Another and more effective PAR Floodlight Shield developed by IDA Member Susan Harder. This shield is available through Outdoor Lighting Associates as the "PARSHIELD". This shield would also be less prone to breaking the glass reflector because of the flexible mounting tabs. See a Larger View See IDA Information Sheet 159 - Shielding Floodlights, contributed by Bob Crelin
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[Manufactures](#)

[A-Road Utility](#)

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Light Pollution — Theft of the Night

I. Introduction: Have you looked up at night lately? The universe is going away, gone already for many. The universe is an important part of the environment, to astronomy and to the general public.

For most people on earth, the dark skies our ancestors had have disappeared. The problem is urban sky glow, due mostly to too much bad lighting.

With good lighting, we all win. We help preserve the dark skies, we see better (and are safer and more secure), we have a more pleasant and comfortable nighttime environment, and we save a great deal of energy and money doing so. Neither astronomers nor the public, anywhere, need any of the adverse environmental effects of poor lighting.

II. Why night lighting? To see at night, for security, safety, utility, and for an attractive nighttime environment around us. But not all lighting is good lighting.

III. What are the adverse impacts of poor nighttime lighting?

A. Urban sky glow (the brightening over our heads), destroying our view of the universe. We don't live up there in the sky; we don't need all that light up there.

B. Glare. Glare never helps visibility, but it is far too common in all our cities. We should strive for a glare free environment.

C. Light trespass. Many present lighting installations bother us much more than they help. The wasted light shines into our yards, our windows, even our telescope buildings. As with noise pollution, we don't need any of this bad light.

D. A trashy looking, confusing nighttime environment. We should, all of us, be striving for a good looking nighttime environment, just as we should be doing in the daytime. Such poor environments are part of the stress of today's life. We should help with the problem, not compound it. Remember, the night is part of the environment too.

E. Energy waste. We waste an astronomical amount of energy and money by all this bad lighting, shining it where it is not needed nor wanted (including up into the sky) and by using energy inefficient light sources and lighting designs. Better to use such money for improving our world, not mucking it up.

We all suffer from these problems. But we need not.

IV. So what to do?

A. Use good lighting. Such quality designs are really all just common sense approaches to lighting. Let's not tolerate all the bad lighting; let's get rid of it.

B. Shine the light down, where it is needed. Control the light output to locations where it is needed; don't waste it. Use quality lighting fixtures.

C. Use time controls (or dimmers or other controls) to insure that light is there when needed, and not there when it is not.

D. Design and install lighting to insure that glare is minimized. Most all glare comes from poor fixtures or poor installations. There is no need for any of it.

E. Use the right amount of light for the task, not overkill. "More light" is not the approach to use. When not blinded by glare, the eye is a marvelous instrument and can see very well at what seems to be quite low lighting levels. In addition, going from over lit areas to darker areas means that we don't see too well (transient adaptation), and the opposite holds as well.

F. Use energy efficient light sources, Light sources vary greatly in their efficiency. Consider especially the use of low pressure sodium lamps; they are most efficient of all, and they are also strongly preferred by astronomers as the light output by LPS is essentially all one color and can be filtered out quite well. LPS is excellent for street lighting, parking lots, security lighting, and other applications where color rendering is not critical. Careful lighting design can be done using LPS for essentially any application.

continued

V. It all works! Such quality lighting design has been used for some time now in many locations. Such cities are benefitting by better lighting for their citizens, by a great deal of energy savings, and by darker skies (but not darker streets). We all really do win.

One way to effectively begin is for cities to appoint an Outdoor Lighting Working Group to consider the issues and to recommend specific solutions (including lighting control ordinances) tailored to local needs. Such "committees" have been quite effective in a number of locations. Most of those active in both the astronomy and the lighting communities appreciate the advantages of good lighting and are eager to help implement them. Organizations in both these communities have commitments on this topic.

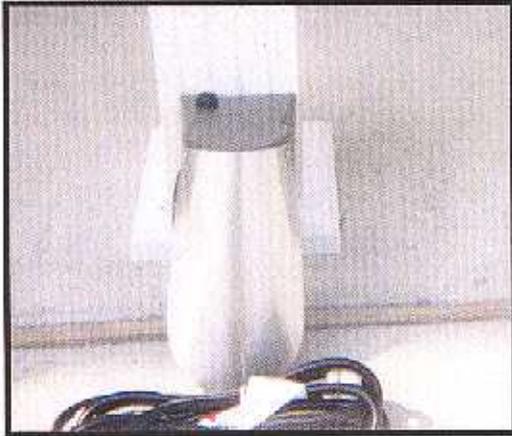
VI. So what's the problem? The main problem is that there is still a vast lack of awareness of the issues, the problem, and the common sense solutions. Education is the main thrust of most current activities. The second large problem is apathy. Even with awareness, action is needed. Some consider it too big an issue to become involved with, others feel that it is not important enough. Neither is a good enough reason for apathy.

VII. Help is available. The relatively new International Dark-Sky Association, a non-profit organization, has been formed to help with the educational efforts. It is a membership based organization with members now in 70 countries. IDA has produced many information sheets discussing the issues, as well as slide sets and other material available for those who want to become informed and who want to help spread the word to others. Check out IDA's web page on the Internet: <http://www.darksky.org>. There is a slowly growing awareness of the problems, and of the solutions, but much more educational outreach is needed.

VIII. Conclusion. There is a problem, and it is still getting worse most everywhere. However, there are solutions, and they work. They also improve the quality of our nighttime lighting, and they help us save a great deal of energy and money. Lack of awareness and apathy are the main problems. Action is called for. The conclusion is that: WE ALL WIN.

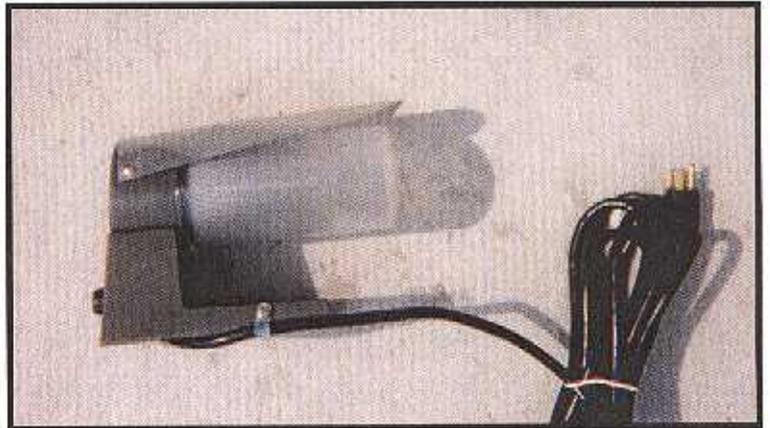
IX. Thanks! Please do help us build awareness and overcome apathy, everywhere. The stars and the universe need our help. Help us save the stars! Join us as a member!

Light Shields



Front or seaward view

Tin flashing can be easily cut and attached to existing fixtures (available at home improvement stores) Use 40 watt or lower bug bulb



Side view

Depending on the orientation to the beach, shields on the sides of the light may be needed too.



Lighting for Conservation of Protected Coastal Species

To prevent adverse impacts to nesting and hatchling sea turtles, nocturnal movements of beach mice, and disturbance resting shorebirds, the minimal amount of exterior lighting for human safety and security shall be installed.

1. Lights shall not be placed within the developed footprint such that the light is visible outside the developed area.
2. Lights on dune walkovers or boardwalks shall not be located seaward of the landward toe of the dune (or its equivalent).
3. The light source or any reflective surface of a light fixture shall not be visible from any point beyond the developed footprint. There should be no illumination of any area outside the developed footprint, either through direct illumination, reflective illumination, or cumulative illumination.
4. Exterior wall light fixtures shall be either low pressure sodium lamps or low wattage (i.e., 480 lumens or less) "bug" type bulbs florescent bulbs. The light fixtures should be completely shielded without interior reflective surfaces and directed downward. Lights may also be louvered and/or recessed, with black baffles or without interior reflective surfaces as appropriate.
5. Light fixtures shall be mounted as low as feasible to provide light where it is needed (i.e. patios, balconies, pedestrian paths). This can be accomplished through the use of low bollards, ground level fixtures, or low wall mounts.
6. Lights for purely decorative or accent purposes shall not be visible outside of the developed footprint and shall be limited in number and intensity. Up-lights shall not be used.
7. Roadway lighting shall use shielded low pressure sodium (LPS) lamps. The height and number of fixtures should be kept to a minimum and should be positioned and mounted in a manner such that the point source of light or any reflective surface of the fixture is not visible on the development outside of the developed footprint.
8. Lighting in parking areas shall use shielded low pressure sodium (LPS) lamps, have a height of 20 feet or less and shall not be visible from any point outside the developed footprint. The lighting shall be positioned and shielded such that the point source of light or any reflective surface of the light fixture is not visible outside of the developed area. The light emanating from such fixtures may not directly or indirectly illuminate the area outside of the developed footprint.
9. Car and other vehicle parking areas shall be designed or positioned such that vehicular headlights do not cast light outside the developed footprint. Native dune vegetation, and/or other ground-level barriers may be used to meet this objective.

Project Lighting Restrictions for Conservation of Protected Species (Page 2)

10. Minimal temporary lighting during construction should only be used for security and safety. The lights should be completely shielded and low-mounted. Low pressure sodium lights or low wattage yellow "bug" type bulbs (480 lumens or less) shall be used. The lights should not directly or indirectly illuminate any area outside the construction site.
11. Light fixtures using natural gas as the light source shall not be used for fixtures unless they are fully shielded and the lighting is not visible outside the developed footprint.
12. Tinted glass or window film that meets a transmittance value of 45% or less (inside to outside transmittance) shall be used on all windows and glass doors throughout the development.
13. All ceiling-mounted light fixtures in the interior of the condominium units that could be visible from the outside shall minimize the amount of exposed light bulbs.

References:

- Bird, B. L. 2004. Effects of coastal lighting on foraging behavior of beach mice. *Conservation Biology* 18: 1435-1439.
- Bird, B. L. 2002. Effects of predatory risk, vegetation structure, and artificial lighting on the foraging behavior of beach mice. Masters thesis. University of Florida, Gainesville.
- Bowers, M.A and H.D. Smith. 1979. Differential habitat utilization by sexes of the deer mouse, *Peromyscus maniculatus*. *Ecology*, Vol. 60 (5). pp 869-875.
- Brillhart, D.B. and D. W. Kauman. 1991. Influence of illumination and surface structure on space use by prairie deer mice (*Peromyscus maniculatus bairdii*). *Journal of Mammalogy* 72(4):764-768.
- Clarke, J.A. 1983. Moonlight's influence on predator/prey interactions between short-eared owls (*Asio flammues*) and deer mice (*Peromyscus maniculatus*). *Behavioral Ecology and Sociobiology* 13:205-209.
- Florida Department of Environmental Protection Chapter 62B-34, General Permit for Activities Seaward of the Coastal Construction Control Line, Chapter 62B-55 Model Lighting Ordinance for Marine Turtle Protection.
- Witherington, B.E. and R.E. Martin. 1996. Understanding, assessing, and resolving light-pollution problems on sea turtle nesting beaches. Florida Marine Research Institute Tech. Rep. TR-2. 73 pp.



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Twist Lock Photocontrol attached to area light.

This standard twist-lock DPN photocontrol turns one or more lights on at dusk and off at dawn on the first night, but every night thereafter the lights are turned off exactly halfway through the night. The DPN automatically keeps track of the times of dusk and dawn as they change throughout the year, always turning the lights off halfway between dusk and dawn. The energy savings provided by half-night operation will quickly pay for this handy little device.

Turn the lights off when you're not there to use them. Don't give criminals the light they need to come onto your property!

Do not attempt to install any shield or fixture until all electrical current is turned OFF. If you have any installation problems, contact a licensed electrician.

SECTION 424 SWIMMING POOLS AND BATHING PLACES

424.1 Public Swimming Pools and Bathing Places. Public swimming pools and bathing places shall comply with the following design and construction standards as described in Chapter 64E-9 Florida Administrative Code.

Exceptions:

- A. Private pools and water therapy facilities connected with facilities connected with hospitals, medical doctors' offices, and licensed physical therapy establishments shall be exempt from supervision under this chapter.
- B. (a) Pools serving no more than 32 condominium or cooperative units which are not operated as a public lodging establishment shall be exempt from supervision under this chapter, except for water quality.
(b) Pools serving condominium or cooperative associations of more than 32 units and whose recorded documents prohibit the rental or sublease of the units for periods of less than 60 days are exempt from supervision under this chapter except that the condominium or cooperative owner or association must file applications with the department and obtain construction plans approval and receive an initial operating permit. The department shall inspect the swimming pools at such places annually, at the fee set forth in s. 514.033(3), or upon request by a unit owner, to determine compliance with department rules relating to water quality and life-saving equipment. The department may not require compliance with rules relating to swimming pool life-guard standards.
- C. A private pool used for instructional purposes in swimming shall not be regulated as a public pool.
- D. Any pool serving a residential child care agency registered and exempt from licensure pursuant to s. 409.176 shall be exempt from supervision or regulation under this chapter related to construction standards if the pool is used exclusively by the facility's residents and if admission may not be gained by the public.
- E. The department may grant variances from any rule adopted under this chapter pursuant to procedures adopted by department rule.

64E-9.001—General.

- (2) This chapter prescribes minimum design, construction, and operation requirements.
 - (a) The department will accept dimensional standards for competition type pools as published by the National Collegiate Athletic Association,

1998; Federation Internationale de Natation Amateur (FINA), 1998-2000 Handbook; 1998-1999 Official Rules of Diving & Code of Regulation of United States Diving Inc.; 1998 United States Swimming Rules and Regulation, and National Federation of State High School Associations, 1997-1998, which are incorporated by reference in these rules.

- (b) Where adequate standards do not exist and these rules do not provide sufficient guidance for consideration of innovations in design, construction, and operation of proposed swimming pools or water recreation attractions, the department will establish requirements necessary to protect the health and safety of the pool patrons.
- (3) All pools which do not meet the definition of private pools are public pools.
- (4) The Americans with Disabilities Act of 1990 may relate to public pools and should be reviewed by the design engineer and the pool owner.

64E-9.013(3)

- (j) Sanitary facilities shall be provided and shall be as near to the bathing area as prudent to ensure patron use.
 - 1. Women's restrooms shall have a fixture set including a water closet and a lavatory.
 - 2. Men's restrooms shall have a fixture set including a urinal, a water closet and a lavatory.
 - 3. Additional restroom fixtures shall be provided based on stated usage. A second water closet, urinal and lavatory shall be provided in the men's restroom if the stated usage exceeds 50 patrons, but is less than 150 patrons. Another urinal, water closet and lavatory shall be provided for each additional 100 patrons. The number of water closets in the women's restroom shall be based on a three to two ratio with three water closets being provided in the women's restroom for every two fixtures in the men's restroom. For this purpose of establishing the men's restroom fixture count, both water closets and urinals shall be included. The number of lavatories in the women's restroom shall match the number in the men's restroom.
 - 4. Restroom floors shall be impervious, slip resistant and slope to floor drains.

64E-9.004(1)

- (a) Cross-connection prevention—An atmospheric break or approved back flow prevention device shall be provided in each pool water supply line that is connected to a public water supply. Vacuum breakers shall be installed on all hose bibbs.

64E-9.006 — Construction Standards.

(1) Pool Structure — Pools shall be constructed of concrete or other impervious and structurally rigid material. All pools shall be watertight, free from structural cracks and shall have a nontoxic smooth and slip resistant finish.

(a) Floors and walls shall be white or light pastel in color and shall have the characteristic of reflecting rather than absorbing light. A minimum 4-inch tile line shall be installed at the water line, but shall not exceed 12 inches in height if a dark color is used. Gutter type pools may substitute 2-inch tile along the pool wall edge of the gutter lip.

1. Any design or logo on the pool floor or walls shall be such that it will not hinder the detection of a human in distress, algae, sediment, or other objects in the pool and written approval must be obtained from the department prior to installation.

2. Pools that are not intended to be utilized for officially sanctioned competition may install lap lane markings provided they meet the following criteria: The markings must be four inches wide, they must terminate five feet from the end wall in a “T” with the “T” bar at least 18 inches long, they must be placed at 7 foot intervals on center and be no closer than 4 feet from any side wall, steps or other obstructions. Up to 4 inch wide 18 inch x 18 inch target (+) may be installed on the pool wall. Tile used in less than 5 feet of water must be slip resistant except for bull-nose tile when utilized as step, bench or swimout markings. Floating rope lines associated with lap lanes must not obstruct the entrance or exit from the pool and are prohibited when the pool is open for general use.

(b) Sizing—The bathing load for conventional swimming pools and special purpose pools shall be computed on the basis of one person per 5 gpm of recirculation flow. The bathing load for wading pools and interactive water features shall be established by averaging one person per 10 square feet of pool area and one person per 5 gallons per minute of filter rate. The bathing load for spa type pools shall be based on one person per each 10 square feet of surface area. The filtration system shall be capable of meeting all other requirements of these rules while providing a flowrate of at least 1 gallon per minute for each living unit at transient facilities and 3/4 gal-

lon per minute at non-transient facilities. All other types of projects shall be sized according to the anticipated bathing load and proposed uses. For the purpose of determining minimum pool size only, the pool turnover period used cannot be less than 3 hours.

(c) Dimensions

1. Walls and corners—All pool walls shall have a clearance of 15 feet perpendicular to the wall. Offset steps and spa coves are exempt from this clearance requirement. The upper part of pool walls in areas 5 feet deep or less shall be within 5 degrees of vertical for a minimum depth of 2¹/₂ feet from which point the wall may join the floor with a maximum radius equal to the difference between the pool depth and 2¹/₂ feet. The upper part of pool walls in areas over 5 feet deep shall be within 5 degrees of vertical for a minimum depth equal to the pool water depth minus 2¹/₂ feet from which point the wall may join the floor with a maximum radius of 2¹/₂ feet. Corners shall be a minimum 90 degree angle. The corner intersections of walls which protrude or angle into the pool water area shall be rounded with a minimum radius of 2 inches.

2. Pool Floor Slope and Slope Transition—The radius of curvature between the floor and walls is excluded from these requirements. Multiple floor levels in pools are prohibited.

a. Floor slope shall be uniform. The floor slope shall be a maximum 1 foot vertical in 10 feet horizontal and a minimum of 1 foot vertical in 40 feet horizontal in areas 5 feet deep or less. The floor slope shall be a maximum 1 foot vertical in 3 feet horizontal in areas more than 5 feet deep.

b. Any transition in floor slope shall occur at a minimum of 5 feet of water depth. A slope transition must have a 2-inch-wide dark contrasting marking across the bottom and must extend up both sides of the pool at the transition point. A slope transition must have a safety line mounted by use of cup anchors, 2 feet before the contrasting marking, toward the shallow end. The safety line shall have visible floats at maximum 7 foot intervals.

3. Depths and Markings—The minimum

water depth shall be 3 feet in shallow areas and 4 feet in deep areas.

- a. Permanent depth markings followed by the appropriate full or abbreviated words “FEET” or “INCHES” shall be installed in minimum four inch high numbers and letters on a contrasting background. Depth markers shall indicate the actual pool depth, within three inches, at normal operating water level when measured three feet from the pool wall. Symmetrical pool designs with the deep point at the center may be allowed provided a dual marking system is used which indicates the depth at the wall and at the deep point.
- b. The markings shall be located on both sides of the pool at the shallow end, slope break, deep end wall and deep point (if located more than five feet from the deep end wall) with a maximum perimeter distance between depth markings of 25 feet and shall be legible from inside the pool and also from the pool deck. When a curb is provided, the depth markings shall be installed on the inside and outside or top of the pool curb. When a pool curb is not provided, the depth markings shall be located on the inside vertical wall at or above the water level and on the edge of the deck within two feet of the pool water. When open type gutter designs are utilized, depth markers shall be located on the back of the gutter wall.
- c. When deck level perimeter overflow systems are utilized, additional depth markers shall be placed on adjacent fencing or walls and the size shall be increased so they are recognizable from inside the swimming pool. Depth markers on the pool deck shall be within three feet of the water.
- d. Those areas of the pool that are not part of an approved diving bowl shall have dark contrasting, permanent, four inch high “NO DIVING” markings installed on the top of the pool curb or deck within two feet of the pool water on each side of the pool with a maximum distance of 25 feet between markings. A 6-inch tile with a 4-inch or larger red, international “NO

DIVING” symbol may be substituted for the “NO DIVING” markings.

- e. All depth markings shall be tile, except that pools constructed of fiberglass, thermoplastic or stainless steel may substitute other type markings when it can be shown that said markings are permanent and will not fade over time. This exemption does not extend to concrete pools that are coated with fiberglass. All depth and “NO DIVING” markings installed on horizontal surfaces must have a slip resistant finish.
- (d) Access—All pools shall have a means of access every 75 feet of pool perimeter with a minimum of two, located so as to serve both ends of the pool. When the deep portion of the pool is over 30 feet wide both sides of this area shall have a means of access. Access shall consist of ladders, stairs, recessed treads or swimouts and may be used in combination. All treads shall have a slip resistant surface.
1. Ladders—Ladders shall be of the cross-braced type and shall be constructed of corrosion resistant materials and be securely anchored into the pool deck. Clearance between the ladder and pool wall shall be between three to six inches. Ladders shall extend at least 28 inches above the pool deck.
 2. Recessed Treads—Recessed treads shall be installed flush with the wall and shall be a minimum five inches wide, 10 inches long, with a maximum vertical distance of 12 inches between treads.
 3. Stairs—Stairs shall have a minimum tread width of 10 inches for a minimum tread length of 24 inches and a maximum riser height of 10 inches. Treads and risers between the top and bottom treads shall be uniform in width and height. The front three-fourths to two inches of the tread and the top two inches of the riser shall be tile, dark in color, contrasting with the interior of the pool. Tile shall be slip resistant, except when three-fourths inch by 2 inch bullnose tile is used and the $\frac{3}{4}$ inch segment is placed on the tread and the two inch segment is on the riser. All markings shall be tile, except that pools constructed of fiberglass, thermoplastic or stainless steel may substitute other type markings when it can be shown that said markings are permanent and will not fade over time. This exception does not extend to concrete pools that are coated with fiberglass.

4. Swimouts—Swimouts shall extend 18 to 24 inches back from the pool wall, shall be 4 to 5 feet wide, shall be a maximum of 12 inches below the deck, unless stairs are provided in the swimout, and shall be located only in areas of the pool greater than 5 feet deep. Pools that do not utilize a continuous perimeter overflow system must provide a wall return inlet in the swimout for circulation. A permanent dark contrasting colored band of tile shall be installed at the intersection of the pool wall and the swimout and must extend 2 inches on the horizontal and vertical surfaces. Tile must be slip resistant, except that bullnose tile may be substituted and installed in accordance with section 64E-9.006(1)(d)3. above.
 5. Handrails and Grabrails—Handrails shall be provided for all stairs, shall be anchored in the bottom step and the deck. Where “figure 4” deck mounted type handrails are used, they shall be anchored in the deck and extend laterally to any point vertically above the bottom step. A grabrail shall be provided for all swimouts and shall not protrude more than 6 inches over the water surface. Grabrails must be mounted in the pool deck at each side of recessed steps. Handrails and grabrails shall extend at least 28 inches above the step edge and deck.
 6. Permanent or portable steps, ramps, handrails, lifts, or other devices designed to accommodate handicapped individuals in swimming pools may be provided. Lifts mounted into the pool deck shall have a minimum 4-foot-wide deck behind the lift mount.
- (e) The pool water area shall be unobstructed by any type structure unless justified by engineering design as a part of the recirculation system. Engineering design and material specifications shall show that such structures will not endanger the pool patron, can be maintained in a sanitary condition and will not create a problem for sanitary maintenance of any part of the pool, pool water, or pool facilities. Structures in accord with the above shall not be located in a diving bowl area or within 15 feet of any pool wall.
1. Stairs, ladders and ramps, necessary for entrance/exit from the pool are not considered obstructions.
 2. Underwater seat benches may be installed in areas less than 5 feet deep. Bench seats must be 14 to 18 inches wide and must have a dark contrasting marking on the seat edge extending 2 inches on the horizontal and vertical surface. If tile is used it must be slip resistant, except that bullnose tile may be substituted and installed in accordance with section 64E-9.006(1)(d)3.
- (f) The vertical clearance above the pool deck shall be at least 7 feet.
- (g) Diving Areas—Diving facilities shall meet the minimum requirements of the FINA dimensions for diving facilities in accordance with the 1998-2000 FINA Handbook.
1. Diving boards or platforms with heights of less than the established standard shall meet the dimensional requirements of the next greater height.
 2. Diving boards, platforms and ladders shall have a nonabsorbent, slip resistant finish and be of sufficient strength to safely carry the anticipated loads. Diving equipment one meter and greater shall have guard rails which are at least 36 inches above the diving board and extend to the edge of the pool wall. All diving boards over 21 inches from the deck shall be provided with a ladder. Diving boards or platforms shall not be installed on curved walls where the wall enters into the defined rectangular diving area specified in this section. Adjacent platform and diving boards shall be parallel.
 3. The location of pool ladders shall be such that the distance from the ladder to any point on a diving board or platform centerline is not less than the plummet to side wall dimension (b) indicated in the FINA standards. Trampoline type diving facilities are prohibited.
 4. Diving targets may be installed in accordance with FINA standards.
- (2) Pool Appurtenances**
- (a) Decks and Walkways—Wooden decks and walkways are prohibited.
1. Pool wet decks shall have a minimum unobstructed width of 4 feet around the perimeter of the pool, pool curb, ladders, handrails, diving boards, diving towers, and slides, shall be constructed of concrete or other nonabsorbent material having a smooth slip resistant finish and shall be uniformly sloped at a minimum of 2 percent to a maximum of 4 percent away from

the pool or to deck drains to prevent standing water. When a curb is provided, the deck shall not be more than 10 inches below the top of the curb. Wet deck area finishes shall be designed for such use and shall be installed in accordance with the manufacturer's specifications. Traffic barriers shall be provided as needed so that parked vehicles do not extend over the deck area. Walkways shall be provided between the pool and the sanitary facilities, and shall be constructed of concrete or other nonabsorbent material having a smooth slip resistant finish for the first 15 feet of the walkway measured from the nearest pool water's edge. A hose bibb with a vacuum breaker shall be provided to allow the deck to be washed down with potable water.

2. Ten percent of the deck along the pool perimeter may be obstructed. Obstructions shall have a wet deck area behind or through them, with the near edge of the walk within 15 feet of the water. These obstructions must be protected by a barrier or must be designed to discourage patron access. When an obstruction exists in multiple areas around the pool the minimum distance between obstructions shall be 4 feet.
 3. Food or drink service facilities shall not be located within 12 feet of the water's edge.
- (b) Bridges and overhead obstructions over the pool shall be designed so they will not introduce any contamination to the pool water. The minimum height of the bridge or obstruction shall be at least 8 feet from the bottom of the pool and at least four feet above the surface of the pool. Minimum 42-inch-high handrails shall be provided along each side of the bridge. The walking surfaces shall be constructed of concrete or other nonabsorbent material having a smooth slip resistant finish.
- (c) Lighting—Artificial lighting shall be provided at all swimming pools which are to be used at night or which do not have adequate natural lighting so that all portions of the pool, including the bottom, may be readily seen without glare.
1. Outdoor pool lighting—Overhead lighting shall provide a minimum of 3 foot candles of illumination at the pool water surface and the pool deck surface. Underwater lighting shall be a minimum of $1/2$ watt per square foot of pool water surface area.

2. Indoor pool lighting—Overhead lighting shall provide a minimum of 10 foot candles of illumination at the pool water surface and the pool deck surface. Underwater lighting shall be a minimum of $8/10$ watt per square foot of pool surface area.

3. Underwater lighting—Underwater lighting shall utilize transformers and low voltage circuits with each underwater light being grounded. The maximum voltage for each light shall be 15 volts and the maximum incandescent lamp size shall be 300 watts. The location of the underwater lights shall be such that the underwater illumination is as uniform as possible and shall not be less than 18 inches below the normal operating water level. All underwater lights which depend upon submersion for safe operation shall have protection from overheating when not submerged. Underwater lighting requirements can be waived when the overhead lighting provides at least 15 foot-candles of illumination at the pool water surface and pool deck surface. Alternative lighting systems which do not utilize electricity in the pool or on the pool deck, such as fiber optic systems, may be utilized if the applicant demonstrates to reasonable certainty that the system development has advanced to the point where the department is convinced that the pool illumination is equal to the requirements in subparagraph 1. and 2. above.

4. Overhead wiring—Overhead service wiring shall not pass within an area extending a distance of 10 feet horizontally away from the inside edge of the pool walls, diving structures, observation stands, towers, or platforms.

(d) Electrical Equipment and Wiring—

1. Electrical equipment wiring and installation including the grounding of pool components shall conform with the *National Electrical Code*[®], 1996 Edition, which is incorporated by reference in these rules and shall comply with applicable local codes. Written evidence shall be provided from the electrical contractor or the electrical inspector of compliance with the *National Electrical Code*[®].

(e) Equipment Area or Rooms—Equipment designated by the manufacturer for outdoor use may be located in an equipment area, all other equipment must be located in an equipment room.

Plastic pipe subject to a period of prolonged sunlight exposure must be coated to protect it from ultraviolet-light degradation. An equipment area shall be 4-sided fencing provided it is at least 4 feet high with a self-closing and self-latching gate with a permanent locking device. An equipment room shall be protected on at least 3 sides and overhead. The fourth side may be a gate, fence, or open if otherwise protected from unauthorized entrance. The equipment area or room floor shall be of concrete or other nonabsorbent material having a smooth slip resistant finish and shall have positive drainage, including a sump pump if necessary.

1. Ventilation and Access—Equipment rooms shall have either forced draft or cross ventilation. All below grade equipment rooms shall have a stairway access with forced draft ventilation or a fully louvered door and louvered vent on at least one other side. The opening to equipment room or area shall be a minimum 3 feet by 6 feet and shall provide easy access to the equipment. A hose bibb with vacuum breaker shall be located in the equipment room or area.
2. Size and Lighting—The size of the equipment room or area shall provide working space to perform routine operations. Clearance shall be provided for all equipment as prescribed by the manufacturer to allow normal maintenance operation and removal without disturbing other piping or equipment. Equipment rooms or areas shall not be used for storage of chemicals emitting corrosive fumes or for storage of other items to the extent that entrance to the room for inspection or operation of the equipment is impaired. In rooms with fixed ceilings, the minimum height shall be 7 feet. Equipment rooms or areas shall be lighted to provide 30 footcandles of illumination at floor level.

(f) Sanitary Facilities—Separate sanitary facilities shall be provided and labeled for each sex and must be located within a 200 foot radius of the nearest water’s edge of each pool served by the facilities.

1. Fixtures shall be provided as indicated on the following chart:

Men’s Restroom

Size of Pool	Urinals	WC	Lavatory
0 — 2500 sq ft	1	1	1

2501 — 5000 sq ft	2	1	1
5001 — 7500 sq ft	2	2	2
7501 — 10,000 sq ft	3	3	3

Women’s Restroom

Size of Pool	Urinals	WC	Lavatory
0 — 2500 sq ft	0	1	1
2501 — 5000 sq ft	0	5	1
5001 — 7500 sq ft	0	6	2
7501 — 10,000 sq ft	0	9	3

An additional set of fixtures shall be provided in the men’s restroom for every 5,000 square feet or major fraction thereof for pools greater than 10,000 square feet. Women’s restrooms must have a ratio of 3 to 2 water closets provided for women to the combined total of water closets and urinals provided for men.

2. Outside access to facilities shall be provided for bathers at outdoor pools and if they are not visible from any portion of the pool deck, signs shall be posted showing directions to the facilities. These directions shall be legible from any portion of the pool deck and the letters shall be a minimum of 1 inch high.
3. Sanitary facility floors shall be constructed of concrete or other nonabsorbent materials and shall have a smooth slip resistant finish and shall slope to floor drains. Carpets, duckboards and footbaths are prohibited. The intersection between the floor and walls must be covered.
4. Poolside sanitary facilities are not required if all living units are within a 200 foot radius of the nearest water’s edge, are not over 3 stories in height and are each equipped with private sanitary facilities.
5. A hose bibb with vacuum breaker shall be provided near each restroom to allow for ease of cleaning.

(g) Rinse shower—A minimum of one rinse shower shall be provided on the pool deck of all outdoor pools within 20 feet of the nearest pool water’s edge.

64E-9.007—Recirculation and Treatment System Requirements.

- (1) Recirculation and treatment equipment such as filters, recessed automatic surface skimmers, ionizers, ozone generators, disinfection feeders and chlorine generators must be tested and approved using the ANSI/NSF International Standard 50-1996, Circulation System Components and Related Materials for Swimming Pool, Spas/Hot Tubs, dated October 28, 1996, which is incorporated by reference in these rules. If standards do not exist for a specific product, the manufacturer must work with NSF or other American National Standards Institute (ANSI) approved agency to develop such standards.
- (2) The recirculation system shall be designed to provide a minimum of four turnovers of the pool volume per day. Pools that are less than 1000 square feet at health clubs shall be required to provide eight turnovers per day.
- (3) The design pattern of recirculation flow shall be 100 percent through the main drain piping and 100 percent through the perimeter overflow system or 60 percent through the skimmer system.
 - (a) Perimeter overflow gutters—The lip of the gutter shall be uniformly level with a maximum tolerance of $\frac{1}{4}$ inch between the high and low areas. The bottom of the gutter shall be level or slope to the drains. The spacing between drains shall not exceed 10 feet for 2-inch drains or 15 feet for 2½-inch drains, unless hydraulically justified by the design engineer. The gutter lip shall be tiled with a minimum of 2 inch tile on the pool wall, except that stainless steel gutters are exempt from this requirement.
 1. Either recessed type or open type gutters shall be used. Special designs can be approved provided they are within limits of sound engineering practice. Recessed type gutters shall be at least 4 inches deep and 4 inches wide, and no part of the recessed gutter shall be visible from a position directly above the gutter sighting vertically down the edge of the deck or curb. Open type gutters shall be at least 6 inches deep and 12 inches wide. The back vertical wall of the gutter shall be tiled with glazed tile. The gutter shall slope 2 inches, $\pm \frac{1}{4}$ inch, from the lip to the drains. The gutter drains shall be located at the deepest part of the gutter.
 - (b) Recessed Automatic Surface Skimmers—Recessed automatic surface skimmers may be utilized when the pool water surface area is 1,000 square feet or less excluding offset stairs and swimouts and the width of the pool is not over 20 feet.
 1. The recessed automatic surface skimmer piping system shall be designed to carry 60 percent of the pool total design flow rate with each skimmer carrying a minimum 30 gallons per minute. One skimmer for every 400 square feet or fraction thereof of pool water surface area shall be provided.
 2. Prevailing wind direction and the pool outline shall be considered in the selection of skimmer locations and the location of skimmers shall be such that the interference of adjacent inlets and skimmers is minimized. Recessed automatic surface skimmers shall be installed so that there is no protrusion into the pool water area. The deck or curb shall provide for a handhold around the entire pool perimeter and shall not be located more than 9 inches above the mid point of the opening of the skimmer.
 3. Recessed automatic surface skimmers shall be installed with an equalizer valve and an equalizer line when the skimmer piping system is connected directly to pump suc-

tion. The equalizer valve shall be a spring loaded vertical check valve which will not allow direct suction on the equalizer line. The equalizer line inlet shall be installed at least 1 foot below the normal pool water level and the equalizer line inlet shall be protected by a grate. The equalizer line shall be sized to handle the expected flow with a 2 inch minimum line size.

4. A wall inlet fitting shall be provided directly across from each skimmer.
 5. A minimum 6 inch water line tile shall be provided on all pools with automatic skimmer systems. Glazed tile shall be utilized.
- (4) Pumps—If the pump or suction piping is located above the water level of the pool, the pump shall be self-priming. Pumps that take suction prior to filtration shall be equipped with a hair and lint strainer. The recirculation pump shall be selected to provide the required recirculation flow against a minimum total dynamic head of 60 feet unless hydraulically justified by the design engineer. Vacuum D.E. filter systems pumps shall provide at least 50 feet of total dynamic head. Should the total dynamic head required not be appropriate for a given project, the design engineer shall provide an alternative.
- (5) Filters—Filters sized to handle the required recirculation flow shall be provided.
- (a) Filter capacities—The maximum filtration rate in gallons per minute per square foot of filter area shall be: 15 (20 if so approved using the procedure stated in 64E-9.007(1)) for high rate sand filters, 3 for rapid sand filters, 0.075 for pleated cartridge filters and 2 for D.E. filters.
 - (b) Filter Appurtenances.
 1. Pressure filter systems shall be equipped with an air relief valve, influent and effluent pressure gauges with minimum face size of 2 inches reading 0-60 psi, and a sight glass when a backwash line is required.
 2. Vacuum filter systems shall be equipped with a vacuum gauge which has a 2 inch face and reads from 0-30 inches of mercury.
 3. Precoat—A precoat pot or collector tank shall be provided for D.E. systems.
 - (c) Filter tanks and elements—The filter area shall be determined on the basis of effective filtering surfaces with no allowance given for areas of impaired filtration, such as broad supports, folds,

or portions which may bridge. Filter elements shall have a minimum 1 inch clear spacing between elements up to a 4 square foot effective area. The spacing between filter elements shall increase $\frac{1}{8}$ inch for each additional square foot of filter area or fraction thereof above an effective filter area of 4 square feet. All cartridges used in public pool filters shall be permanently marked with the manufacturer's name, pore size and area in square feet of filter material. All cartridges with end caps shall have the permanent markings on one end cap. Vacuum filter tanks shall have covered intersections between the wall and the floor and the tank floor shall slope to the filter tank drain. The filter tank and elements shall be installed such that the recirculation flow draw down does not expose the elements to the atmosphere whenever only the main drain valve is open or only the surface overflow gutter system valve is open.

- (6) Piping—All plastic pipe used in the recirculation system shall be imprinted with the manufacturer's name and the NSF-pw logo for potable water applications. Size, schedule, and type of pipe shall be included on the drawings.
- (7) Valves—Return lines, main drain lines, and surface overflow system lines, shall each have proportioning valves.
- (8) Flow Velocity—Pressure piping shall not exceed 8 feet per second, except that precoat lines with higher velocities may be used when necessary for agitation purposes. The flow velocity in suction piping shall not exceed 6 feet per second except that flow velocities up to 10 feet per second in filter assembly headers will be acceptable. Main drain systems and surface overflow systems which discharge to collector tanks shall be sized with a maximum flow velocity of 3 feet per second. The filter and vacuuming system shall have the necessary valves and piping to allow filtering to pool, vacuuming to waste, vacuuming to filter, complete drainage of the filter tank, backwashing for sand and pressure D.E. filters and precoat recirculation for D.E. filters.
- (9) Inlets—All inlets shall be adjustable with wall inlets being directionally adjustable and floor type inlets having a means of flow adjustment.
 - (a) Pools 30 feet in width or less, with wall inlets only shall have enough inlets such that the inlet spacing does not exceed 20 feet based on the pool water perimeter.

- (b) Pools 30 feet in width or less with floor inlets only shall have a number of inlets provided such that the spacing between adjacent inlets does not exceed 20 feet and the spacing between inlets and adjacent walls does not exceed 10 feet.
 - (c) A combination of wall and floor inlets may be used in pools 30 feet in width or less only if requirements of (a) or (b) are fully met.
 - (d) Pools greater than 30 feet in width with floor inlets only shall have a number of floor inlets provided such that the spacing between adjacent inlets does not exceed 20 feet and the spacing between inlets and an adjacent wall does not exceed 10 feet.
 - (e) Pools greater than 30 feet in width may have a combination of wall and floor inlets provided the number of wall inlets is such that the maximum spacing between wall inlets is 20 feet and floor inlets are provided for the pool water area beyond a 15 feet perpendicular distance from all walls. The number of floor inlets shall be such that the spacing between adjacent inlets does not exceed 20 feet and the distance from a floor inlet and an adjacent wall does not exceed 25 feet. Floor inlets shall be designed and installed such that they do not protrude more than $\frac{5}{8}$ inch above the pool floor and all inlets shall be designed and installed so as not to constitute sharp edges or protrusions hazardous to pool bathers.
 - (f) The flow rate through each inlet shall not exceed 15 gpm.
- (10) Main Drain Outlets—All pools shall be provided with an outlet at the deepest point.
- (a) The depth at the outlet must not deviate more than 3 inches from the side wall.
 - (b) Outlets must be covered by a secured grating which requires the use of a tool to remove and whose open area is such that the maximum velocity of water passing through the openings does not exceed $1\frac{1}{2}$ feet per second at 100 percent of the design recirculation flow.
 - (c) Multiple outlets, equally spaced from the pool side walls and from each other, shall be installed in pools where the deep portion of the pool is greater than 30 feet in width.
 - (d) If the area is subject to high ground water, the pool shall be designed to withstand hydraulic uplift or shall be provided with hydrostatic relief devices.
 - (e) The main drain outlet shall be connected to a collector tank. The capacity of the collector tank shall be at least 1 minute of the recirculated flow unless justified by the design engineer. Vacuum filter tanks are considered collector tanks.
- (11) An automatic and manual water makeup control must be provided to maintain the water level at the lip of the overflow gutter or at the mouth of the recessed automatic surface skimmers and must discharge through an air gap into a fill pipe or collector tank. Over the rim fill spouts are prohibited.
- (12) Cleaning system—A portable or plumbed in vacuum cleaning system shall be provided. All vacuum pumps shall be equipped with hair and lint strainers. When the system is plumbed in, the vacuum fittings shall be located to allow cleaning the pool with a 50 foot maximum length of hose. Vacuum fittings shall be mounted approximately 12 inches below the water level, flush with the pool walls, and shall be provided with a spring loaded safety cover or flush plug cover which shall be in place at all times when the pool is not being vacuumed. Bag type cleaners which operate as ejectors on potable water supply pressure must be protected by a vacuum breaker. Cleaning devices shall not be used while the pool is open to bathers.
- (13) Rate of flow indicators—A rate of flow indicator, reading in gpm, shall be installed on the return line. The rate of flow indicator shall be properly sized for the design flow rate and shall be capable of measuring from $\frac{1}{2}$ to at least $1\frac{1}{2}$ times the design flow rate. The clearances upstream and downstream from the rate of flow indicator shall comply with manufacturer's installation specifications.
- (14) Heaters—Pool heaters shall comply with nationally recognized standards acceptable to the department and to the design engineer. Pools equipped with heaters shall have a fixed thermometer mounted in the pool recirculation line downstream from the heater outlet. Thermometers mounted on heater outlets do not meet this requirement. A sketch of any proposed heater installation including valves, thermometer, pipe sizes, and material specifications shall be submitted to the department and permitted prior to installation. Piping and influent, effluent and bypass valves which allow isolation or removal of the heater from the system shall be provided. Materials used in solar and other heaters shall be non-toxic and acceptable for use with potable water. Heaters shall not prevent the attainment of the required turnover rate.
- (15) Pool waste water disposal—Pool waste water shall be discharged through an air gap; disposal shall be to sanitary sewers, storm sewers, drainfields, or by other means, in accordance with local requirements including obtaining all necessary permits. Disposal of water from pools using D.E. powder shall be accomplished

through separation tanks which are equipped with air bleed valves, bottom drain lines, and isolation valves, or through a settling tank with final disposal being acceptable to local authorities. D.E. separator tanks shall have a capacity as rated by the manufacturer, equal to the square footage of the filter system. All lines shall be sized to handle the expected flow. There shall not be a direct physical connection between any drain from a pool or recirculation system and a sewer line.

- (16) Disinfection and pH adjustment shall be added to the pool recirculation flow using automatic feeders meeting the requirement of NSF Standard 50-1996. All chemicals shall be fed into the return line after the pump, heater and filters unless the feeder was designed by the manufacturer and approved by the NSF to feed to the collector tank or to the suction side of the pump.

(a) Gas chlorination—When gas chlorination is utilized, the chlorinator shall be capable of continuously feeding a chlorine dosage of 4 mg/L to the recirculated flow of the filtration system. The application point for chlorine shall be located in the return line downstream of the filter, recirculation pump, heater, and flow meter, and as far as possible from the pool.

1. Gas chlorinators shall be located in above grade rooms and in areas which are inaccessible to unauthorized persons.
 - a. Chlorine rooms shall have: continuous forced draft ventilation capable of a minimum of 1 air change per minute with an exhaust at floor level to the outside, a minimum of 30 foot-candles of illumination with the switch located outside and the door shall open out and shall not be located adjacent to the filter room entrance or the pool deck. A shatter-proof gas tight inspection window shall be provided.
 - b. Chlorine areas shall have a roof and shall be enclosed by a chain-link type fence at least 6 feet high to allow ventilation and prevent vandalism.
2. A gas mask, or a self-contained breathing apparatus, approved for use in chlorine gas contaminated air, shall be provided and shall be located out of the area of possible contamination.
3. When booster pumps are used with the chlorinator, the pump shall use recirculated pool water supplied via the recirculation

filtration system. The booster pump shall be electrically interlocked with the recirculation pump to prevent the feeding of chlorine when the recirculation pump is not operating.

4. A means of weighing chlorine containers shall be provided. When 150 pound cylinders are used, platform type scales shall be provided and shall be capable of weighing a minimum of 2 full cylinders at 1 time. The elevation of the scale platform shall be within 2 inches of the adjacent floor level, and the facilities shall be constructed to allow easy placement of full cylinders on the scales.
5. Each cylinder shall be secured at all times, with 150 pound cylinders maintained in an upright position. A protective cap shall be in place at all times when the cylinder is not connected to the chlorinator.

(b) Hypohalogenation and Electrolytic chlorine generators—The hypohalogenation type feeder and electrolytic chlorine generators shall be adjustable from 0 to full range. A rate of flow indicator is required on erosion type feeders. The feeders shall be capable of continuously feeding a dosage of 6 mg/L to the minimum required turnover flow rate of the filtration systems. Solution feeders shall be capable of feeding the above dosage using a 10 percent sodium hypochlorite solution, or 5 percent calcium hypochlorite solution, whichever disinfectant is to be utilized at this facility. To prevent the disinfectant from siphoning or feeding directly into the pool or pool piping under any type failure of the recirculation equipment, an electrical interlock with the recirculation pump shall be incorporated into the system for electrically operated feeders. The minimum size of the solution reservoirs shall be at least 50 percent of the maximum daily capacity of the feeder. The solution reservoirs shall be marked to indicate contents.

(c) Feeders for pH adjustment—Feeders for pH adjustment shall be provided on all pools, except spa pools of less than 100 square feet of pool water surface area and pools utilizing erosion type chlorinators feeding chlorinated isocyanurates. pH adjustment feeders shall be positive displacement type, shall be adjustable from 0 to full range, and shall have an electrical interlock with the circulation pump to prevent discharge when the recirculation pump is not operating. When soda ash is used for pH adjustment, the

maximum concentration of soda ash solution to be fed shall not exceed $\frac{1}{2}$ pound soda ash per gallon of water. Feeders for soda ash shall be capable of feeding a minimum of 3 gallons of the above soda ash solution per pound of gas chlorination capacity. The minimum size of the solution reservoirs shall not be less than 50 percent of the maximum daily capacity of the feeder. The solution reservoirs shall be marked to indicate the type of contents.

(d) Ozone generating equipment may be used for supplemental water treatment on public swimming pools subject to the conditions of this section.

1. Ozone generating equipment electrical components and wiring shall comply with the requirements of the *National Electrical Code*[®] and the manufacturer shall provide a certificate of conformance. The process equipment shall be provided with an effective means to alert the user when a component of this equipment is not operating.
2. Ozone generating equipment shall meet the NSF's Standard Number 50-1996.
3. The concentration of ozone in the return line to the pool shall not exceed 0.1 mg/L.
4. The injection point for ozone generating equipment shall be located in the pool return line after the filtration and heating equipment, prior to the halogen injection point, and as far as possible from the nearest pool return inlet with a minimum distance of 4 feet. Injection methods shall include a mixer, contact chamber, or other means of efficiently mixing the ozone with the recirculated water. The injection and mixing equipment shall not prevent the attainment of the required turnover rate of the recirculation system. Ozone generating equipment shall be equipped with a check valve between the generator and the injection point. Ozone generating equipment shall be equipped with an air flow meter and a means to control the flow.
5. Ventilation requirements—Ozone generating equipment shall be installed in equipment rooms with either forced draft or cross draft ventilation. Below grade equipment rooms with ozone generators shall have forced draft ventilation and all equipment rooms with forced draft ventilation shall have the fan control switch located outside the equipment room door. The exhaust fan intake for forced draft ventila-

tion and at least one vent grille for cross draft ventilation shall be located at floor level.

6. A self-contained breathing apparatus designed and rated by its manufacturer for use in ozone contaminated air shall be provided when ozone generator installations are capable of exceeding the maximum pool water ozone contact concentration of 0.1 milligram per liter. The self-contained breathing apparatus shall be available at all times and shall be used at times when the maintenance or service personnel have determined that the equipment room ozone concentration exceeds 10 mg/L. Ozone generator installations which require the self-contained breathing apparatus shall also be provided with Draeger type detector tube equipment which is capable of detecting ozone levels of 10 mg/L and greater.
7. In lieu of the above self contained breathing apparatus an ozone detector capable of detecting 1 mg/L may be used. Said detector must be capable of stopping the production of ozone, venting the room and sounding an alarm once ozone is detected.

(e) Ionization units may be used as supplemental water treatment on public pools subject to the condition of this paragraph.

1. Ionization equipment and electrical components and wiring shall comply with the requirements of the *National Electrical Code*[®] and the manufacturer shall provide a certification of conformance.
2. Ionization equipment shall meet the NSF's Standard 50-1992, Circulation System Components and Related Materials for Swimming Pools, Spas/Hot Tubs, or equivalent, shall meet UL standards and shall be electrically interlocked with recirculation pump.

64E-9.009—Wading Pools.

- (1) Wading pools shall meet the requirements of sections 64E-9.001 through 64E-9.008, unless otherwise indicated. Wading pools and associated piping shall not be physically connected to any other swimming pools and have no minimum width dimensions requirements.
- (2) Depths—Wading pools shall have a maximum of 2 feet. The depth at the perimeter of the pool shall be uniform and shall not exceed 12 inches. Where recessed automatic surface skimmers are used, the pool floor shall not be more than 12 inches below the deck unless steps and

handrails are provided. Depth and NO DIVING markers are not required on wading pools.

- (3) Recirculation—Wading pools shall have a minimum of one turnover every hour. Lines from main drains shall discharge into a collector tank.
 - (a) Skimmer equalizer lines when required shall be installed in the pool floor with a grate covering.
 - (b) The grate cover shall be sized so as not to allow the flow to exceed 1½ feet per second when the equalizer line is operating.
- (4) Inlets—Wading pools with 20 feet or less of perimeter shall have a minimum of two equally spaced adjustable inlets.
- (5) Emergency drainage—All wading pools shall have drainage to waste without a cross-connection through a quick opening valve to facilitate emptying the wading pool should accidental bowel or other discharge occur.
- (6) Vacuuming—Wading pools with 200 square feet or more of pool water surface area shall have provisions for vacuuming.
- (7) Wading pool decks—When adjacent to swimming pools, wading pools shall be separated from the swimming pool by a fence or other similar type barrier. Wading pools shall have a minimum 10 foot wide deck around at least 50 percent of their perimeter with the remainder of the perimeter deck being at least 4 feet wide. There shall be at least 10 feet between adjacent swimming pools and wading pools.
- (8) Wading pools are exempt from underwater lighting requirements but do require overhead lighting for night use.

64E-9.010—Spa Pools.

- (1) Spa pools shall meet the requirements of sections 64E-9.001 through 64E-9.008, unless specifically indicated otherwise.
- (2) The color, pattern or finish of the pool interior shall not obscure the existence or presence of objects or surfaces within the pool.
- (3) Water depths—Spa type pools shall have a minimum water depth of 2½ feet and a maximum water depth of 4 feet, except that swim spa pools may have a maximum water depth of 5 feet. Depth markers and NO DIVING markers are not required on spa type pools with 200 or less square feet of water surface area.
- (4) Steps and handrails—Steps or ladders shall be provided and shall be located to provide adequate entrance to and exit from the pool. The number of sets of steps or ladders required shall be on the basis of 1 for each 75 feet, or major fraction thereof, of pool perimeter. Step sets for spa type pools with more than 200 square feet of pool water surface area shall comply with section 64E-9.006(1)(d)3. Step sets for spa type pools with 200 square feet or less of pool water surface area shall comply with the following: Step treads shall have a minimum width of 10 inches for a minimum continuous tread length of 12 inches. Step riser heights shall not exceed 12 inches except when the bottom step is used for a bench or seat, the bottom riser may be a maximum of 14 inches. Intermediate treads and risers between the top and bottom treads and risers shall be uniform in width and height, respectively. Contrasting markings on the leading edges of the submerged benches and the intersections of the treads and risers are required to be installed in accordance with 64E-9.006(1)(d)3.
 - (a) Handrails shall be provided for all sets of steps and shall be anchored in the bottom step and in the deck. Handrails shall be located to provide maximum access to the steps and handrails shall extend 28 inches above the pool deck.
 - (b) Where “figure 4” handrails are used, they shall be anchored in the deck and shall extend laterally to any point vertically above the bottom step. Handrails shall be located to provide maximum access to the steps and handrails shall extend 28 inches above the pool deck.
- (5) Decks—Decks shall have a minimum 4 foot wide unobstructed width around the entire pool perimeter except that pools of less than 120 square feet of pool water surface area shall have a minimum 4 foot wide unobstructed continuous deck around a minimum of 50 percent of the pool perimeter. Decks less than 4 feet wide shall have barriers to prevent their use. Decks shall not be more than 10 inches below the top of the pool.
- (6) Therapy or jet systems
 - (a) The return lines of spa type therapy or jet systems shall be independent of the recirculation-filtration and heating systems.
 - (b) Therapy or jet pumps shall take suction from the collector tank. Collector tank sizing shall take this additional gallonage into consideration.
- (7) Filtration system inlets—Spa type pools with less than 20 feet of perimeter shall have a minimum of 2 equally spaced adjustable inlets.
- (8) Filtration recirculation—Spa type pools shall have a minimum of one turnover every 30 minutes. The piping, fittings, and hydraulic requirements shall be in

accordance with section 64E-9.007. All recirculation lines to and from the pool shall be individually valved with proportional flow type valves in order to control the recirculation flow.

- (9) Vacuuming—Spa type pools of over 200 square feet of pool water surface area shall have provisions for vacuuming.
- (11) When spa pools are part of a conventional swimming pool, the spa pool area shall be offset from the main pool area with the same water depth as the main pool area. The spa pool shall meet all the spa pool requirements of this chapter, and the deck area at the spa shall be protected by connected 30 inch high stanchions. The deck perimeter at the offset spa area shall not exceed 15 percent of the entire swimming pool perimeter. All benches shall have contrasting markings on the leading edges of the intersection of the bench seats. If tile is used, it shall be slip resistant.
- (12) Portable and wooden type spa pools are prohibited.

64E-9.011—Water Recreation Attractions and Specialized Pools.

- (1) General—Water recreation attraction projects shall be designed and constructed within the limits of sound engineering practice. Design engineers may consult with the department in reference to concepts of design variations and to areas where potential problems may exist. In addition to the requirements of this section, compliance is required with sections 64E-9.001 through 64E-9.008 and 64E-9.017 of this chapter depending upon the pool design and function. Additionally, all pools listed in this section shall have a 3 hour turnover rate unless otherwise noted.
- (2) Water slides.
- (a) Water slide plunge pool—Plunge pools shall be constructed of concrete or other structurally rigid impervious materials with a non-toxic, smooth and slip resistant finish. The plunge pool design shall be as follows:
1. Plunge pool water depth—The minimum plunge pool operating water depth at the slide flume terminus shall be 3 feet. This depth shall be maintained for a minimum distance of 10 feet in front of the slide terminus from which point the plunge pool floor may have a constant upward slope to allow a minimum water depth of 2 feet at the base of the steps. The floor slope shall not exceed 1 foot in 10 feet. The plunge pool water depth shall be commensurate with safety and the ease of exit from the plunge pool.
 2. Plunge pool dimension—The plunge pool dimension between any slide flume exit or terminus and the opposite side of the plunge pool shall be a minimum of 20 feet excluding steps.
 3. Slide flume terminus.
 - a. The slide flume terminus shall be designed by the design engineer who can demonstrate to the department's satisfaction that riders will be adequately slowed prior to discharge so as to prevent injury or harm to the rider upon impact with the plunge pool water.
 - b. The minimum distance between any plunge pool side wall and the outer edge of any slide terminus shall be 5 feet. The minimum distance between adjacent slide flumes shall be 6 feet.
 - c. A minimum length of slide flume of 10 feet shall be perpendicular to the plunge pool wall at the exit end of the flumes.
 4. Plunge pool main drains—The plunge pool shall have a minimum of one main drain with separate piping and valve to the filtration system collector tank. The velocity through the openings of the main drain grate shall not exceed 1½ feet per second at the design flow rate of the recirculation pump. The main drain piping shall be sized to handle 100 percent of the design flow rate of the filtration system with a maximum flow velocity of 3 feet per second.
 5. Plunge pool floor slope—The plunge pool floor shall slope to the main drains and the slope shall not exceed 1 foot in 10 feet.
 6. Plunge pool decks.
 - a. Width—The minimum width of plunge pool decks along the exit side shall be 10 feet there shall be a pool deck along the side opposite the plunge pool weir, and this deck shall have a minimum width of 4 feet.
 - b. Curbs—All plunge pool decks shall have a minimum 6 inch high curb or adequate freeboard to contain the water surge generated by the person entering the water via the slide.
 - c. Slopes—All plunge pool decks shall

slope away from the plunge pool unless the curb is located at the outside perimeter of the deck. If the curb is located at the outside perimeter of the deck, the plunge pool deck shall slope to the plunge pool or pump reservoir or to deck drains which discharge to waste. All slopes shall be between 2 and 4 percent grade.

7. Hand holds shall be provided along the sides of the plunge pool in areas where the water depth exceeds 3 feet, except that no hand holds shall be required along the wall where the slide enters the pool nor shall they be required at the pool exit.
- (b) Run out lanes—
1. Run out lanes may be utilized in lieu of a plunge pool system provided they are constructed to the slide manufacturers specifications and are approved by the design engineer of record.
 2. Eight foot wide walkways shall be provided adjacent to run out lanes.
 3. Minimum water level indicator markings shall be provided on both sides of the run out trough to insure adequate water for the safe slowing of pool patrons.
 4. Water park personnel shall be provided at the top of the slides and at the run out.
- (c) Pump reservoirs—Pump reservoirs shall be made of concrete or other impervious material with a smooth slip resistant finish and shall be connected to the plunge pool by a weir. Pump reservoirs shall be for the slide pump intakes. Pump reservoir designs shall be as follows:
1. Pump reservoir volume—The minimum reservoir volume shall be equal to 2 minutes of the combined flow rate in gpm of all filter and slide pumps.
 2. Pump reservoir security—Pump reservoirs shall be accessible only to authorized individuals.
 3. Pump reservoir maintenance accessibility—Access decks shall be provided for the reservoir such that all areas are accessible for vacuuming, skimming, and maintenance. The decks shall have a minimum width of 3 feet and shall have a minimum slope of 3 inches in 10 feet away from the reservoir.
 4. Pump reservoir slide pump intakes—The slide pump intakes shall be located in the pump reservoir and shall be designed to allow cleaning without danger of operator entrapment.
5. Pump reservoir main drains—The pump reservoir shall have a minimum of one main drain with separate piping and valve to the filtration system collector tank and the velocity through the openings of the main drain grates shall not exceed 1½ feet per second at the design flow rate of the filtration system pump. The main drain piping shall be sized to handle 100 percent of design flow rate of the filtration system pump with a maximum flow velocity of 3 feet per second.
- (d) Slide pump check valves—Slide pumps shall have check valves on all discharge lines.
- (e) Perimeter overflow gutters or skimmers—Plunge pools and pump reservoirs shall have perimeter overflow gutter system or skimmer which shall be an integral part of the filtration system.
1. Perimeter overflow gutter systems—Perimeter overflow gutter systems shall meet the requirements of Section 64E-9.007(3)(a) except that gutters are not required directly under slide flumes or along the weirs which separate plunge pools and pump reservoirs.
 2. Surface skimmers—Surface skimmers may be used in lieu of perimeter overflow gutters and shall be appropriately spaced and located according to the structural design. Unless an overflow gutter system is used, surface skimmers shall be provided in the plunge pool and in the pump reservoir and the skimmer system shall be designed to carry 60 percent of the filtration system design flow rate with each skimmer carrying a minimum 30 gallons per minute. All surface skimmers shall meet the requirements for NSF commercial approval as set forth in NSF Standard 50-1996, Circulation System Components and Related Materials for Swimming Pools, Spas/Hot Tubs, which is incorporated by reference in these rules, including an equalizer valve in the skimmer and an equalizer line to the pool wall on systems with direct connection to pump suction.
- (f) Water slide recirculation—filtration equipment.
1. Recirculation rate—The recirculation-filtration system of water slides shall recirculate and filter a water volume equal to the

total water volume of the facility in a period of 3 hours or less.

2. Filter areas—Minimum filter area requirements shall be twice the filter areas specified for the recirculation rates stipulated in section 64E-9.007(5)(a). The filtration system shall be capable of returning the pool water turbidity to $5/10$ NTU within 8 hours or less after peak bather load.
3. Hair and lint strainer—Any filtration system pump which takes suction directly from the plunge pool and reservoir shall have a minimum 8 inch diameter hair and lint strainer on the suction side of the pump.

(g) Disinfection—The disinfection equipment shall be capable of feeding 12 mg/L of halogen to the continuous recirculation flow of the filtration system.

(3) Water activity pools.

- (a) Water activity pools shall be designed and constructed within the limits of sound engineering practice. The design engineer may consult with the department prior to preparation and submission of engineering plans and specifications for water activity pools.
- (b) Water activity pools shall be constructed of concrete or other structurally rigid impervious materials with a non-toxic, smooth and slip resistant finish. These pools shall be of such shape and design as to be operated and maintained in a safe and sanitary manner.
- (c) The recirculation-filtration system of water activity pools shall be capable of a minimum of one turnover every 3 hours.

(4) Wave pools.

- (a) Wave pools shall be designed and constructed within the limits of sound engineering practice. The design engineer may consult with the department prior to preparation and submission of engineering plans and specifications for wave pools.
- (b) Wave pools shall be constructed of concrete or other impervious materials with a smooth slip resistant finish. These pools shall be of such shape and design as to be operated and maintained in a safe and sanitary manner.
- (c) The recirculation-filtration system of wave pools shall be capable of a minimum of one turnover every 3 hours.

(5) Lazy River Rides.

- (a) Lazy River Rides shall be constructed within the limits of sound engineering practice. The design engineer may consult with the department prior to preparation and submission of engineering plans and specifications for Lazy River Rides.
- (b) Lazy River Rides shall be constructed on concrete or other impervious materials with a non-toxic, smooth and slip resistant finish. These rides shall be of such shape and design as to be operated in a safe and sanitary manner.
- (c) The recirculation-filtration system of the Lazy River Ride shall be capable of a minimum of one turnover every 3 hours.
- (d) The maximum water depth of the Lazy River Ride shall not exceed 3 feet unless justified to the department's satisfaction by the design engineer.
- (e) Decking shall be provided at the entrance and exit points as necessary to provide safe patron access but shall not be smaller than 10 feet in width and length. Additional decking along the ride course is not required except that decking shall be required at lifeguard locations and emergency exit points.
- (f) Access and exit shall be provided at the start and end of the ride only, except that emergency exit locations shall be located along the ride course as necessary to provide for the safety of the patrons.

(6) Zero Depth Entry Pools.

- (a) Zero depth entry pools shall have a continuous floor slope from the water edge to the deep end.
- (b) The deck level perimeter overflow system with grate shall be provided at the water edge across the entire zero depth portion of the pool.
- (c) The pool deck may slope toward the pool for no more than 5 feet, as measured from the overflow system grate outward. Beyond this area the deck shall slope away from the pool in accordance with section 64E-9.006(2)(a)1.
- (d) Barriers and No-entry signs shall be provided along the pool wall edge where the water depth is less than 3 feet deep. No-entry signs shall be slip-resistant, shall have 4 inch high letters, shall be located within 2 feet of the pool edge and shall be spaced no more than 15 feet apart.
- (e) Additional inlets shall be provided in areas of

less than 18 inches deep. The numbers and location shall be such as to double the flow rate into this area.

(7) Special Purpose Pools.

- (a) General—Special purpose pool projects may deviate from the requirements of other sections of these rules provided the design and construction are within the limits of sound engineering practice. Only those deviations necessary to accommodate the special usage shall be allowed and all other aspects of the pool shall comply with the requirements of this section and with section 64E-9.001 through 64E-9.008. The design engineer may consult with the department prior to preparation and submission of engineering plans for special purpose pools.
- (b) A special purpose pool may incorporate ledges which do not overhang into the pool.
- (c) The operating permit shall state the purpose for which the pool is to be used.

(8) Interactive Water Features.

- (a) Waters discharged from all fountain or spray features shall not pond on the feature floor but shall flow by gravity through a maindrain fitting to a below grade sump or collection system which discharges to a collector tank. The minimum size of the sump or collector tank shall be equal to the volume of 2 minutes of the combined flow of all feature pumps and the filter pump. Smaller tanks may be utilized if hydraulically justified by the design engineer. Adequate access shall be provided to the sump or collector tank. Stairs or a ladder shall be provided as needed to ensure safe entry into the tank.
- (b) When an underground sump is utilized, an automatic skimmer system shall be provided. A variable height skimmer may be used or a custom surface skimmer device may be substituted if deemed appropriate by both the design engineer and the department.
- (c) Chemical feeders shall be provided in accordance with section 64E-9.007; except that the disinfection feeder shall be capable of feeding 12 ppm of free chlorine to the filter return piping.
- (d) If night operation is proposed, 6 footcandles of light shall be provided on the pool deck and the water feature area. Lighting that may be exposed to the feature pool water shall not exceed 15 volts, shall be installed in accordance with manufacturer's specifications and be approved for such use by UL or NSF.
- (e) All electrical work shall comply with the NFPA

70, *National Electrical Code*®, 1996 Edition that is incorporated by reference.

(f) Hydraulics.

1. The filter system shall be capable of filtering and treating the entire water volume of the water feature within 30 minutes. The filter system shall draft from the collector tank and return filtered and treated water to the tank via equally spaced inlet fittings. The flow rate through these fittings shall not exceed 20 gpm.
2. The water feature pump shall draft from the collector tank.
3. An automatic water level controller shall be provided.
4. The flow rate through the feature nozzles of the water features shall be such as not to harm the patrons and shall not exceed 20 feet per second unless justified by the design engineer and by the fountain system manufacturer.

424.2 Private Swimming Pools

424.2.1 - Definitions - General

424.2.1.1 Tense, Gender and Number. For the purpose of this code, certain abbreviations, terms, phrases, words, and their derivatives shall be construed as set forth in this section. Words used in the present tense include the future. Words in the masculine gender include the feminine and neuter. Words in the feminine and neuter gender include the masculine. The singular number includes the plural and the plural number includes the singular.

424.2.1.2 Words Not Defined. Words not defined herein shall have the meanings stated in the Standard Building Code, Standard Mechanical Code, Standard Plumbing Code, Standard Gas Code or Standard Fire Prevention Code. Words not defined in the Standard Codes shall have the meanings stated in the Webster's Ninth New Collegiate Dictionary, as revised.

424.2.2 Definitions

ABOVEGROUND/ONGROUND POOL. (See Swimming Pool.)

ADMINISTRATIVE AUTHORITY. The individual official, board, department or agency established and authorized by a state, county, city or other political subdivision created by law to administer and enforce the provisions of the swimming pool code as adopted or amended.

APPROVED. Accepted or acceptable under an applicable specification stated or cited in this code, or accepted as suitable for the proposed use under proce-

dures and power of the administrative authority.

APPROVED TESTING AGENCY. An organization primarily established for the purpose of testing to approved standards and approved by the administrative authority.

BACKWASH PIPING. See Filter Waste Discharge Piping.

BARRIER. A fence, wall, building wall or a combination thereof which completely surrounds the swimming pool and obstructs access to the swimming pool.

BODY FEED. Filter aid fed into a diatomite-type filter throughout the filtering cycle.

CARTRIDGE FILTER. A filter using cartridge type filter elements.

CHEMICAL PIPING. Piping which conveys concentrated chemical solutions from a feeding apparatus to the circulation piping.

CIRCULATION PIPING SYSTEM. Piping between the pool structure and the mechanical equipment. Usually includes suction piping, face piping and return piping.

COMBINATION VALVE. A multipart valve intended to perform more than one function.

DESIGN HEAD. Total head requirement of the circulation system at the design rate of flow.

DIATOMITE (DIATOMACEOUS EARTH). A type of filter aid.

DIATOMITE TYPE FILTER. A filter designed to be used with filter aid.

FACE PIPING. Piping, with all valves and fittings, which is used to connect the filter system together as a unit.

FILTER. Any apparatus by which water is clarified.

FILTER AID. A non-permanent type of filter medium or aid such as diatomite, alum, etc.

FILTER CARTRIDGE. A disposable or renewable filter element which generally employs no filter aid.

FILTER ELEMENT. That part of a filter which retains the filter medium.

FILTER MEDIUM. Fine material which entraps the suspended particles and removes them from the water.

FILTER RATE. Average rate of flow per square foot of filter area.

FILTER ROCK. Specially graded rock and gravel used to support filter sand.

FILTER SAND. A specially graded type of permanent filter medium.

FILTER SEPTUM. That part of the filter element in a diatomite type filter upon which a cake of diatomite or other non-permanent filter aid may be deposited.

FILTER WASTE DISCHARGE PIPING. Piping that conducts waste water from a filter to a drainage system. Connection to drainage system is made through an air gap or other approved methods.

FRESH WATER. Those waters having a specific conductivity less than a solution containing 6000 ppm of sodium chloride.

HIGH RATE SAND FILTER. A sand filter designed for flows in excess of 5 gpm per sq ft.

HOT TUB. (See Swimming Pool.)

INGROUND POOL. (See Swimming Pool.)

INLET FITTING. Fitting or fixture through which circulated water enters the pool.

MAIN OUTLET. Outlet at the deep portion of the pool through which the main flow of water leaves the pool when being drained or circulated.

POOL. (See Swimming Pool.)

POOL DEPTHS. The distance between the floor of pool and the maximum operating water level.

POOL PLUMBING. All chemical, circulation, filter waste discharge piping, deck drainage and water filling system.

PORTABLE POOL. A prefabricated pool which may be erected at the point of intended use and which may be subsequently disassembled and re-erected at a new location. Generally installed on the surface of the ground and without excavation.

PRECOAT. In a diatomite-type filter, the initial coating or filter aid placed on the filter septum at the start of the filter cycle.

RAPID SAND FILTER. A filter designed to be used with sand as the filter medium and for flows not to exceed 5 gpm per sq ft.

RECEPTOR. An approved plumbing fixture or device of such material, shape and capacity as to adequately receive the discharge from indirect waste piping, so constructed and located as to be readily cleaned.

RETURN PIPING. That portion of the circulation piping which extends from the outlet side of the filters to the pool.

SALINE WATER. Those waters having a specific conductivity in excess of a solution containing 6000 ppm of sodium chloride.

SEPARATION TANK. A device used to clarify filter rinse or waste water. Sometimes called a reclamation tank.

SKIM FILTER. A surface skimmer combined with a vacuum diatomite filter.

SPA, NONPORTABLE. (See Swimming Pool.)

SPA, PORTABLE. Non-permanent structure intended for recreational bathing, in which all controls, water heating and water circulating equipment are an integral part of the product and which is cord-connected (not permanently electrically wired).

SUCTION PIPING. That portion of the circulation piping located between the pool structure and the inlet side of the pump and usually includes main outlet piping, skimmer piping, vacuum piping and surge tank piping.

SURFACE SKIMMER. A device generally located in the pool wall which skims the pool surface by drawing pool water over a self adjusting weir.

SWIMMING POOL. Any structure intended for swimming or recreational bathing that contains water over 24 inches deep. This includes inground, aboveground, and onground swimming pools, hot tubs, and spas.

SWIMMING POOL, INDOOR. A swimming pool which is totally contained within a structure and surrounded on all four (4) sides by walls of said structure.

SWIMMING POOL, OUTDOOR. Any swimming pool which is not an indoor pool.

PUBLIC SWIMMING POOL or PUBLIC POOL.

A watertight structure of concrete, masonry, fiberglass, stainless steel or plastic which is located either indoors or outdoors, used for bathing or swimming by humans, and filled with a filtered and disinfected water supply, together with buildings, appurtenances and equipment used in connection therewith. A public swimming pool or public pool shall mean a conventional pool, spa-type pool, wading pool, special purpose pool or water recreation attraction, to which admission may be gained with or without payment of a fee and includes, pools operated by or serving camps, churches, cities, counties, day care centers, group home facilities for 8 or more clients, health spas, institutions, parks, state agencies, schools, subdivisions; or the cooperative living-type projects of 5 or more living units, such as apartments, boarding houses, hotels, mobile home parks, motels, recreational vehicle parks and townhouses.

SWIMMING POOL, RESIDENTIAL. That which is intended for noncommercial use.

TURNOVER TIME. The time in hours required for the circulation system to filter and recirculate a volume of water equal to the pool volume.

VACUUM FITTING. A fitting in the pool which is used as a convenient outlet for connecting the underwater suction cleaning equipment.

VACUUM PIPING. The piping from the suction side of a pump connected to a vacuum fitting located at the pool and below the water level.

WASTE PIPING. See Filter Waste Discharge Piping.

WIDTH AND/OR LENGTH. Actual water dimension taken from wall to wall at the maximum operating water level.

424.2.3 Mechanical Requirements. Unless otherwise specified in this code, all piping, equipment and materials used in the plumbing system of swimming pools that are built in place shall conform to the *Florida Building Code, Plumbing*.

424.2.4 Approvals

424.2.4.1 Compliance. All materials, piping, valves, equipment or appliances entering into the construction of swimming pools or portions thereof shall be of a type complying with this code or of a type recommended and approved by a nationally recognized testing agency or conforming to other recognized standards acceptable to the administrative authority.

424.2.4.2 Items not covered. For any items not specifically covered in these requirements, the administrative authority is hereby authorized to require that all equipment, materials, methods of construction and design features shall be proven to function adequately, effectively and without excessive maintenance and operational difficulties.

424.2.4.3 Applicant responsibility. It shall be the responsibility of the applicant to provide such data, tests or other adequate proof that the device, material or product will satisfactorily perform the function for which it is intended, before such item shall be approved or accepted for tests.

424.2.5 Alternate Materials and Methods of Construction

424.2.5.1 Approval and authorization. The provisions of this code are not intended to prevent the use of any alternate material, method of construction, appliance or equipment, provided any such alternate has been first approved and its use authorized by the administrative authority.

424.2.5.2 Required tests. When there is insufficient evidence to substantiate claims for alternates, the administrative authority may require tests, as proof of compliance, to be made by an approved agency at the expense of the applicant.

424.2.6 Engineering Design.

424.2.6.1 Conformance standard. Design, construction and workmanship shall be in conformity with ANSI/NSPI-4 1992, "Standard for Aboveground/Onground Residential Swimming Pools; and NSPI-5," Standard for Residential Swimming Pools; published by the National Spa and Pool Institute, or other accepted engineering practices.

424.2.6.2 Required equipment. Every swimming pool shall be equipped complete with approved mechanical equipment consisting of filter, pump, piping valves and component parts.

Exception: Pools with a supply of fresh water equivalent to the volume of the pool in the specified turnover time will be allowed.

424.2.6.3 Water velocity. Pool piping shall be designed so the water velocity will not exceed 10 ft/s, except that the water velocity shall not exceed 8 ft/s in copper tubing.

Exception: Jet inlet fittings shall not be deemed subject to this requirement.

424.2.6.4 Piping to heater. Water flow through the heater, any bypass plumbing installed, any back-siphoning protection, and the use of heat sinks shall be done in accordance with the manufacturer's recommendations.

424.2.6.5 Piping installation. All piping materials shall be installed in strict accordance with the manufacturer's installation standards.

424.2.6.6 Entrapment Protection for Suction Inlets.

424.2.6.6.1 Location. Suction inlets shall be provided and arranged to produce circulation throughout the pool or spa.

424.2.6.6.2 Testing and Certification. All pool and spa suction inlets shall be provided with a cover that has been tested and accepted by a recognized testing facility and comply with ANSI/ASME A112.19.8M, "Suction Fittings for Use in Swimming Pools, Spas, Hot Tubs, and Whirlpool Bathtub Appliances."

Exception: Surface skimmers.

IMPORTANT SAFETY NOTE: Do not use or operate pool or spa if the suction inlet fitting is missing, broken, or loose.

424.2.6.6.3 Entrapment Avoidance. If the suction inlet system, such as an automatic cleaning system, is a vacuum cleaner system which has a single suction inlet, or multiple suction inlets which can be isolated by valves, then each suction inlet shall protect against user entrapment by either an approved antivortex cover, 12"x12" grate or larger, or other approved means.

In addition, all pools and spas shall be required to have a backup system which shall provide vacuum relief should grate covers be missing. Alternative vacuum relief devices shall include either:

1. Approved Vacuum Release system
2. Approved Vent piping
3. Other approved devices or means

424.2.6.6.4 Suction Inlets Per Pump. A minimum of two suction inlets shall be provided for each pump in the suction inlet system, separated by a minimum of 3 feet or located on two different planes; i.e., one on the bottom and one on the vertical wall, or one each on two separate vertical walls. These suction inlets shall be plumbed such that water is drawn through them simultaneously through a common line to the pump.

424.2.6.6.5 Cleaner Fittings. Where provided, the vacuum or pressure cleaner fitting(s) shall be located in an accessible position(s) at least 6 inches and not greater than 12 inches below the minimum operating water level or as an attachment to the skimmer(s).

424.2.7 Pumps

424.2.7.1 Strainer. Pool circulating pumps shall be equipped on the inlet side with an approved type hair and lint strainer when used with a pressure filter.

424.2.7.2 Mounting. Pumps shall be mounted on a substantial base in a manner that will eliminate strain on piping.

424.2.7.3 Capacity. Pumps shall have design capacity at the following heads.

1. Pressure Diatomaceous Earth—At least 60 ft.
2. Vacuum Diatomaceous Earth—20 inch vacuum on the suction side and 40 ft total head.
3. Rapid Sand—At least 45 ft.
4. High Rate Sand—At least 60 ft.

424.2.7.4 Materials. Pump impellers, shafts, wear rings and other working parts shall be of corrosion-resistant materials.

424.2.8 Valves.

424.2.8.1 General. Valves shall be made of materials that are approved in the *Florida Building Code, Plumbing*. Valves located under concrete slabs shall be set in a pit having a least dimension of five pipe diameters with a minimum of at least 10 inches and fitted with a suitable cover. All valves shall be located where they will be readily accessible for maintenance and removal.

424.2.8.2 Full-Way (gate) valves. Full-way valves shall be installed to insure proper functioning of the filtration and piping system. When the pump is located below the overflow rim of the pool, a valve shall be installed on the discharge outlet and the suction line.

424.2.8.3 Check valves. Where check valves are installed they shall be of the swing or vertical check patterns.

424.2.8.4 Combination valves. Combination valves shall require approval of the administrative authority prior to their installation.

424.2.9 Water supply. Unless an approved type of filling system is installed, any water supply which in the judgment of the administrative authority may be used to fill the pool, shall be equipped with backflow protection. No over

the rim fill spout shall be accepted unless located under a diving board, or properly guarded.

424.2.10 Waste water disposal.

424.2.10.1 Connection limitations. Direct or indirect connections shall not be made between any storm drain, sewer, drainage system, seepage pit underground leaching pit, or sub-soil drainage line, and any line connected to a swimming pool unless approved by the administrative authority.

424.2.10.2 Disposal through public sewer. When the waste water from a swimming pool is to be disposed of through a public sewer, a 3 inch P-trap shall be installed on the lower terminus of the building drain and the tall piece from the trap shall extend a minimum of 3 inches above finished grade and below finished floor grade. This trap need not be vented. The connection between the filter waste discharge piping and the P-trap shall be made by means of an indirect connection.

424.2.10.3 Deviations. Plans and specifications for any deviation from the above manner of installation shall first be approved by the administrative authority before any portion of any such system is installed. When waste water disposal is to seepage pit installation, it shall be installed in accordance with the approval granted by the administrative authority.

424.2.11 Separation tank. A separation tank of an approved type may be used in lieu of the aforementioned means of waste water disposal when connected as a reclamation system.

424.2.12 Tests

424.2.12.1 Pressure test. All pool piping shall be inspected and approved before being covered or concealed. It shall be tested and proved tight to the satisfaction of the administrative authority, under a static water or air pressure test of not less than 35 psi for 15 minutes.

Exception: Circulating pumps need not be tested as required in this section.

424.2.12.2 Drain and waste piping. All drain and waste piping shall be tested by filling with water to the point of overflow and all joints shall be tight.

424.2.13 Drain Piping

424.2.13.1 Slope to discharge. Drain piping serving gravity overflow gutter drains and deck drains shall be installed to provide continuous grade to point of discharge.

424.2.13.2 Joints and connections. Joints and connections shall be made as required by the *Florida Building Code, Plumbing*.

424.2.14 Water Heating Equipment

424.2.14.1 Labels. Swimming pool water heating equipment shall conform to the design, construction and installation requirements in accordance with accepted engineering practices and shall bear the label of a recognized testing agency, and shall include a consideration of combustion air, venting and gas supply requirements for water heaters.

424.2.14.2 Water retention. If a heater is not equipped or designed for an approved permanent bypass or anti-siphon device, an approved permanent bypass or anti-siphon device shall be installed to provide a positive means of retaining water in the heater when the pump is not in operation.

424.2.14.3 Pit Drainage. When the heater is installed in a pit, the pit shall be provided with approved drainage facilities.

424.2.14.4 Connections. All water heating equipment shall be installed with flanges or union connection adjacent to the heater.

424.2.14.5 Relief valve. When water heating equipment which is installed in a closed system has a valve between the appliance and the pool, a pressure relief valve shall be installed on the discharge side of the water heating equipment. For units up to and including 200,000 Btu/hour input, the relief valve shall be rated by the American Gas Association.

424.2.15 Gas Piping. Gas piping shall comply with the *Florida Building Code, Fuel Gas*.

424.2.16 Electrical. Electrical wiring and equipment shall comply with the *National Electrical Code*®.

424.2.17 Residential Swimming Pool Enclosure. Residential swimming pools shall comply with 424.2.17.1 through 424.2.17.3.

Exception: A swimming pool with a power safety cover, or a spa with a safety cover complying with ASTM F 1346-91.

424.2.17.1 Outdoor Swimming Pools. Outdoor swimming pools shall be provided with a barrier complying with 424.2.17.1.1 through 424.2.17.1.10.

424.2.17.1.1 The top of the barrier shall be at least 48 inches above grade measured on the side of the barrier which faces away from the swimming pool. The maximum vertical clearance between grade and the bottom of the barrier shall be 2 inches measured on the side of the barrier which faces away from the swimming pool. Where the top of the pool structure is above grade the barrier may be at ground level or mounted on top of the pool structure. Where the barrier is mounted on top of the pool structure, the maximum vertical clearance between the top of the pool structure and the bottom of the barrier shall be 4 inches.

424.2.17.1.2 Openings in the barrier shall not allow passage of a 4-inch diameter sphere.

424.2.17.1.3 Solid barriers which do not have openings shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints.

424.2.17.1.4 Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 45 inches, the horizontal members shall be located on the swimming pool side of the fence. Spacing between vertical members shall not exceed 1³/₄ inches in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1³/₄ inches in width.

424.2.17.1.5 Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 45 inches or more, spacing between vertical members shall not exceed 4 inches. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1³/₄ inches in width.

424.2.17.1.6 Maximum mesh size for chain link fences shall be a 2¹/₄ inch square unless the fence is provided with slats fastened at the top or bottom which reduce the openings to no more than 1³/₄ inches.

424.2.17.1.7 Where the barrier is composed of diagonal members, the maximum opening formed by the diagonal members shall be no more than 1³/₄ inches.

424.2.17.1.8 Access gates shall comply with the requirements of 424.2.17.1.1 through 424.2.17.1.7 and shall be equipped to accommodate a locking device. Pedestrian access gates shall open outward away from the pool and shall be self-closing and have a self-latching device. Gates other than pedestrian access gates shall have a self-latching device.

Where the release mechanism of the self-latching device is located less than 54 inches from the bottom of the gate, the release mechanism shall be located on the pool side of the gate at least 3 inches below the top of the gate, and the gate and barrier shall have no opening greater than $\frac{1}{2}$ inch within 18 inches of the release mechanism.

424.2.17.1.9 Where a wall of a dwelling serves as part of the barrier, one of the following shall apply:

1. All doors with direct access to the pool through that wall shall be equipped with an alarm which produces an audible warning when the door and its screen are opened. The alarm shall sound continuously for a minimum of 30 seconds immediately after the door is opened and be capable of being heard throughout the house during normal household activities. The alarm shall automatically reset under all conditions. The alarm shall be equipped with a manual means to temporarily deactivate the alarm for a single opening. Such deactivation shall last no more than 15 seconds. The deactivation switch shall be located at least 54 inches above the threshold of the door.
2. Other means of protection, such as self-closing doors with self-latching devices or doors with positive mechanical latching locking devices installed a minimum 54 inches above the threshold, which are approved by the administrative authority, shall be accepted.

424.2.17.1.10 Where an aboveground pool structure is used as a barrier or where the barrier is mounted on top of the pool structure, and the means of access is a ladder or steps, the ladder or steps either shall be capable of being secured, locked or removed to prevent access, or the ladder or steps shall be surrounded by a barrier which meets the requirements of 424.2.17.1.1 through 424.2.17.1.9. When the ladder or steps are secured, locked or removed, any opening created shall not allow the passage of a 4 inch diameter sphere.

424.2.17.2 Indoor swimming pools. All walls surrounding indoor swimming pools shall comply with 424.2.17.1.9.

424.2.17.3 Prohibited locations. Barriers shall be located so as to prohibit permanent structures, equipment or similar objects from being used to climb the barriers.

424.2.18 Ladders and Steps. All pools whether public or private shall be provided with a ladder or steps in the shal-

low end where water depth exceeds 24 inches.

In private pools where water depth exceeds 5 ft, there shall be ladders, stairs or underwater benches/swimouts in the deep end. Where manufactured diving equipment is to be used, benches or swimouts shall be recessed or located in a corner.

424.2.19 Final Inspection. All swimming pool installations must be completed. The pool shall be completely filled with water and in operation before final inspection.

424.2.20 Filters. The entire design of matched components shall have sufficient capacity to provide a complete turnover of pool water in 12 hours or less.

424.2.20.1 Sand Filters.

424.2.20.1.1 Approved types. Rapid sand filters (flow up to 5 gpm/sq ft) shall be constructed in accordance with approved standards. Where high rate sand filters (flow in excess of 5 gpm/sq ft) are used, they shall be of an approved type. The circulation system and backwash piping shall be adequate for proper backwashing of said filter and shall provide backwash flow rates of at least 12 gpm/sq ft for rapid sand filters or 15 gpm/sq ft for high rate sand filters.

424.2.20.1.2 Instructions. Every filter system shall be provided with written operating instructions.

424.2.20.1.3 Filter system equipment. On pressure type filters, a means shall be provided to permit the release of internal pressure. A filter incorporating an automatic internal air release as its principal means of air release shall have lids which provide a slow and safe release of pressure as part of its design. A separation tank used in conjunction with a filter tank shall have as part of its design a manual means of air release or a lid which provides a slow and safe release of pressure as it is opened.

424.2.20.2 Diatomite Type Filters

424.2.20.2.1 Design. Diatomite-type filters shall be designed for operation under either pressure or vacuum. The design capacity for both pressure and vacuum filters shall not exceed 2 gpm/sq ft of effective filter area.

424.2.20.2.2 Filter aid. Provision shall be made to introduce filter aid into the filter in such a way as to evenly precoat the filter septum.

424.2.21 Pool Fittings

424.2.21.1 Approved type. Pool fittings shall be of an approved type and design as to be appropriate for the

specific application.

424.2.21.2 Skimmers. Approved surface skimmers are required and shall be installed in strict accordance with the manufacturer's installation instructions. Skimmers shall be installed on the basis of one per 1000 sq ft of surface area or fraction thereof, and shall be designed for a flow rate of at least 25 gpm per skimmer.

424.2.21.3 Main outlet. An approved main outlet shall be provided at the deepest point in every pool for emptying or circulation, or both, of the water in the pool.

424.2.21.4 Hydrostatic relief device. In areas of anticipated water table an approved hydrostatic relief device shall be installed.

Exception: Plastic liner pools (where there is no structural bottom to the pool).

424.2.21.5 Inlet fittings. Approved manufactured inlet fittings for the return of recirculated pool water shall be provided on the basis of at least one per 15,000 gal of pool capacity. Such inlet fittings shall be designed and constructed to insure an adequate seal to the pool structure and shall incorporate a convenient means of sealing for pressure testing of the pool circulation piping. Where more than one inlet is required, the shortest distance between any two required inlets shall be at least 10 ft.

424.2.22 Equipment Foundations And Enclosures. All mechanical equipment shall be set on a single concrete base or slab. All heating and electrical equipment, unless approved for outdoor installation, shall be adequately protected against the weather or installed within a building.

424.2.23 Accessibility and Clearances. Equipment shall be so installed as to provide ready accessibility for cleaning, operating, maintenance and servicing.

Lamp Wattage	Lumen Output		Power Cost	Cost per 100 Lumens
	(initial)	(maintained)	(per year)	(per year)
Low-Pressure Sodium (LPS)				
				
18	1800	1800	\$7.20	\$0.40
35	4800	4800	\$14.00	\$0.29
55	8000	8000	\$22.00	\$0.28
90	13500	13500	\$36.00	\$0.27
135	22500	22500	\$54.00	\$0.24
180	33000	33000	\$72.00	\$0.22
High-Pressure Sodium (Clear) (HPS)				
				
35	2250	1643	\$14.00	\$0.85
50	4000	2920	\$20.00	\$0.68
70	6300	4599	\$28.00	\$0.61
100	9500	6935	\$40.00	\$0.58
150	16000	11680	\$60.00	\$0.51
200	22000	16060	\$80.00	\$0.50
250	29000	21170	\$100.00	\$0.47
310	37000	27010	\$124.00	\$0.46
350	46500	33945	\$140.00	\$0.41
400	50000	36500	\$160.00	\$0.44
	51500	37595	\$172.00	\$0.46

Lamp Wattage	Lumen Output		Power Cost	Cost per 100 Lumens
	(initial)	(maintained)	(per year)	(per year)

Standard Metal Halide (MH)



150	13500	8413	\$60.00	\$0.71
175	15000	9348	\$70.00	\$0.75
250	23000	14333	\$100.00	\$0.70
360	36000	22434	\$144.00	\$0.64
400	40000	24928	\$160.00	\$0.64

Pulse Start Metal Halide (MH)



50	3400	1496	\$20.00	\$1.34
70	5600	2464	\$28.00	\$1.14
100	9000	3960	\$40.00	\$1.01
150	14000	8000	\$60.00	\$0.75
175	17500	11000	\$70.00	\$0.64
200	21000	13800	\$80.00	\$0.58
250	25000	16500	\$100.00	\$0.61
320	33000	21000	\$128.00	\$0.61
350	37000	24000	\$140.00	\$0.58
400	44000	28500	\$160.00	\$0.56
450	50000	33000	\$180.00	\$0.55

Lamp Wattage	Lumen Output		Power Cost	Cost per 100 Lumens
	(initial)	(maintained)	(per year)	(per year)

T12 Cool-White Fluorescent (FL)



21	1190	952	\$8.40	\$0.88
30	2050	1640	\$12.00	\$0.73
36	2450	1960	\$14.40	\$0.73
39	3000	2400	\$15.60	\$0.65
50	3700	2960	\$20.00	\$0.66
52	3900	3120	\$20.80	\$0.67
55	4600	3680	\$22.00	\$0.60
70	5400	4320	\$28.00	\$0.65
75	6300	5040	\$30.00	\$0.60

T12 High-Output (800 ma) Fluorescent (FL)



75	5150	4120	\$30.00	\$0.73
80	5600	4480	\$32.00	\$0.71
85	6900	5520	\$34.40	\$0.62
95	8625	6900	\$38.00	\$0.55
110	9500	7600	\$44.00	\$0.58

Lamp Wattage	Lumen Output		Power Cost	Cost per 100 Lumens
	(initial)	(maintained)	(per year)	(per year)

T8 Fluorescent (FL)



17	1400	1260	\$6.80	\$0.54
25	2225	2003	\$10.00	\$0.50
30	2900	2610	\$12.00	\$0.46
32	3100	2790	\$12.80	\$0.46
40	3725	3353	\$16.00	\$0.48
44	4000	3600	\$17.60	\$0.49
55	5050	4545	\$22.00	\$0.48
65	6100	5490	\$26.00	\$0.47
59	5950	5355	\$23.60	\$0.44
86	8200	7380	\$34.40	\$0.47

Compact Fluorescent (PL)



7	400	320	\$2.80	\$0.88
9	600	480	\$3.60	\$0.75
13	900	720	\$5.20	\$0.72
18	1250	1000	\$7.20	\$0.72
23	1500	1200	\$9.20	\$0.77
26	1710	1368	\$10.40	\$0.76
32	2400	1920	\$12.80	\$0.67
42	3200	2560	\$16.80	\$0.66

Lamp Wattage	Lumen Output		Power Cost	Cost per 100 Lumens
	(initial)	(maintained)	(per year)	(per year)

Incandescent (standard) (INC)				
				
15	120	98	\$6.00	\$6.10
25	210	172	\$10.00	\$5.81
40	490	402	\$16.00	\$3.98
60	855	701	\$24.00	\$3.42
75	1180	968	\$30.00	\$3.10
100	1750	1435	\$40.00	\$2.79
150	2800	2296	\$60.00	\$2.61
200	3850	3157	\$80.00	\$2.53
Tungsten Halogen (Quartz) (TH)				
				
75	1400	1302	\$30.00	\$2.30
100	1800	1674	\$40.00	\$2.39
150	2800	2604	\$60.00	\$2.30
200	3600	2952	\$82.00	\$2.78
250	5000	4650	\$100.00	\$2.15
300	6000	4920	\$123.00	\$2.50
500	10100	9393	\$200.00	\$2.13

References:

- GE Lamp Products Catalog 2001-2002
- Osram/Sylvania Lamp & Ballast Catalog, 1998
- Philips Lighting Company Lamp Specification and Application Guide, 2001/2002
- Venture Lighting International HID Systems Sourcebook, 2000

SEA TURTLES AND BEACHFRONT LIGHTING

The negative effects of beachfront lighting on sea turtles are well documented. Hatchlings emerge during hours of darkness, allowing them to find their way to the sea when sand temperatures are low and terrestrial, avian, and insect predation is comparatively few. Proper hatchling orientation is critical. Under natural conditions, the ocean presents the brightest and most open horizon as a cue to hatchlings in their ocean-finding behavior. Beachfront lighting attracts hatchlings as they emerge from their nests, resulting from the cumulative effects of coastal lights both contribute to this problem. Making their way to the ocean, hatchlings become misoriented and may wander landward through beachfront property or across parking lots and highways to light sources. Most die from desiccation, direct exposure to light, or predation. Furthermore, beachfront lighting has been documented to often result in reduced or abnormal nesting activity.

GENERAL GUIDELINES TO REDUCE IMPACTS TO SEA TURTLES*

To prevent hatchling misorientation and adverse impacts to nesting turtles, installation of the minimal amount of exterior lighting for human safety and security is strongly encouraged.

1. Lights should not be placed on the seaward side of the subject property if they are visible from the nesting beach.
2. Lights should not be located seaward of the landward toe of the dune (or its equivalent).
3. The light source or any reflective surface of a light fixture should not point on the nesting beach. There should be no illumination of the nesting beach, either through direct illumination, reflective illumination, or cumulative illumination.
4. Light bulbs should be either low pressure sodium lamps or low wattage "bug" type bulbs or 7-watt or less fluorescent bulbs. The light fixtures should be shielded without interior reflective surfaces and directed downward. Lights may also be louvered and/or recessed, with baffles or without interior reflective surfaces as long as they do not illuminate the nesting beach.
5. Light fixtures should be mounted as low as feasible (at or below pedestrian paths). This can be accomplished through the use of low bollards, ground level fixtures, or low wall mounts.
6. Lights for purely decorative or accent purposes should not be used on the subject property and, if on the landward side, shall not be used. The up-lights should not be used.
7. High intensity lighting, such as that proposed for roadways, should utilize shielded low pressure sodium (LPS). The number of fixtures should be positioned and mounted in a manner such that the surface of the fixture is not visible from any point on the nesting beach.

Security Lighting: Let's Have Real Security, Not Just Bad Lighting

One of the main goals for nighttime lighting is to have good safety and security at night, both at home and away from home, for ourselves, our families, our homes and property, and indeed for everyone. However, the task is to be safe, not just to feel safe. This means that we need effective and efficient lighting. Good visibility is the goal. We want to be able to see well, rather than just lighting the criminal's way. This goal exists for us at home, on the streets, in parking lots, at work, wherever. Good lighting can be a help; poor lighting always compromises safety.

Most crime actually occurs during the day, or inside buildings. However, we want the feeling and the reality of being safe outside at night. That does not mean putting in the brightest light we can find, blinding everyone in the area, creating light trespass, and lighting up the night sky. What we do need is effective lighting, lighting that puts light where we need it (and nowhere else) and where it will help visibility. That means: no glare, no light trespass, no direct uplight, no harsh shadows, no steep transitions from light to dark, etc. Lighting by itself does not insure safety. Is there more crime in the "well lit" centers of large cities or in smaller towns with much less lighting? A cynic might derive a positive correlation between crime and light: the more light, the more crime. Current and past studies by competent crime authorities can be summarized as follows: "The paucity of data preclude any definitive statement regarding the relationship of lighting and crime, but there is a strong indication that lighting decreases the fear of crime." Quality lighting rather than poor lighting is essential for any real security.

Here are some examples of bad security lighting—lighting that too often compromises safety. These poor quality fixtures can give the illusion of safety or the feeling of security, but in reality they don't add to safety at all; they often make things worse. They are beacons to the criminal: "Come and get me, my lighting will help you, not me." In essence, criminal friendly lighting.

1. The 175-watt dusk-to-dawn "security light". This fixture was designed in the old days when energy was cheap, when there were no good lighting fixture designs, and when the adverse effects of bad lighting were not

well appreciated. It sells for \$29.95 or less, but uses over 200 watts of power. That means it costs about \$70 per year to operate in most locations—much more in high electricity cost areas. A good deal of the light output is wasted, going up or sideways where it does no good at all. It has a great deal of glare, often blinding the homeowner and others. It splatters light everywhere, alienating neighbors. It casts harsh shadows behind trees and buildings, allowing criminals plenty of dark areas to hide in. It is a prime example of bad lighting. But it is in use by the millions throughout the country. Why? It's cheap, and bright. We see lots of glare so we think there is lots of light. But it is a most ineffective and inefficient light. (See IDA Information Sheets No. 3, 26, and 103 for more information.)

2. Globes. Again, light is splattered everywhere. Because it wastes so much light, one must put a high-wattage lamp inside to get any light on the ground. That means a great deal of glare is produced, so much that often one can't easily see the ground! Why are so many of these inefficient fixtures used? Mainly because they look good in the daytime! If one likes that look, then one should use only a very low wattage lamp (as in the days of gas lighting), preserving the daytime appearance and providing a nice nighttime "ambience". One can install a separate, quality lighting system to light the ground. There is no glare or light trespass from this good system, so it doesn't detract from the looks of the globes. One gets the desired attractiveness and also good lighting and safety. It costs more initially, but there is now good lighting.

3. Poorly shielded "wall packs" or similar fixtures. These also splatter light everywhere, some of the light getting where needed but most being wasted. They also create lots of glare. Well-shielded wall packs can be excellent light sources, but one must be sure of what one is buying. Some wall packs have good light control, many nearly none.

4. Poorly designed or installed flood lights. Flood lights can be good, if they have good light control. But they must be well-designed and well installed to

continued

take advantage of their pluses. Often they are poorly installed, aimed at what seems a random direction or, worse, right at the street (causing terrible glare for motorists) or at the neighbor's yard or bedroom window. We have all seen many examples of such bad lighting at night.

Enough of the bad, here now are some examples of good quality security lights:

1. A well-shielded low pressure sodium (LPS) fixture: well-controlled light, energy efficiency, no glare. A lack of color rendering is not a disadvantage for most security lighting. Visibility is excellent with LPS lighting.
2. A similar full-cutoff high pressure sodium (HPS) or metal halide (MH) fixture, or the new low-wattage compact fluorescent (PL) lamps used in good fixtures: no upright and no glare.
3. Well-controlled and installed flood lights or spot lights. These need great care in design and installation to be in the "good" camp, for most all present installations are clearly not that way.
4. The infrared sensor spot lights that come on when someone walks into the field of view of the infrared (IR) detector. (They can activate an alarm too, if wanted.) These are very cost-effective and are effective security lights. They scare intruders away, they offer good visibility to the homeowner when needed (e.g. when taking out the garbage, or when there is an intruder). They must be installed so as to put the light only where it is needed, not shooting up into the sky or onto the neighbor's property. Under the house's eave is often a good location.

To see well, we need adequate light, but not too much. Too much can ruin our adaptation to darker areas at night, blinding us just when we need to see. When we go from too bright to too dark or vice versa, we have poor visibility for a while. This effect is called "transient adaptation", and good designs should minimize its adverse effect on visibility.

To see well, we need to minimize any glare. Glare never helps visibility. To see well, we need to minimize any dark areas near well-lit areas. This means good lighting design is required.

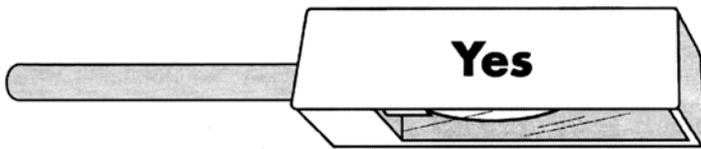
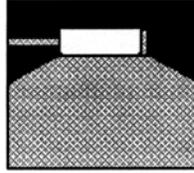
To see well, we must not allow the eye to be flooded with too much light when driving or walking at night. "Luminance overload" can easily compromise vision and dark adaptation.

Think, too, about energy savings. We should not waste light nor use inefficient light sources. We waste far too much energy and money (over a billion dollars annually in the U.S.A., much more throughout the world) due to poor lighting.

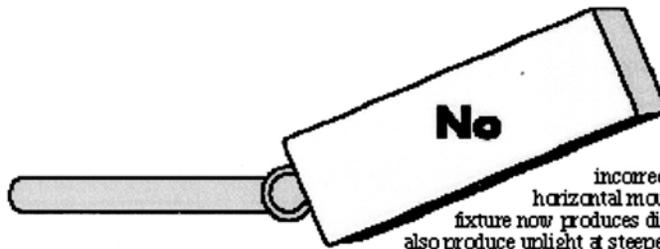
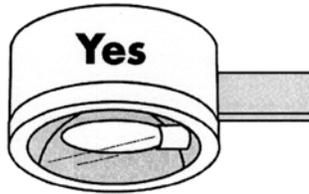
What else can we do to maximize safety at night? Here are some ideas (consult libraries, the local police, companies specializing in security equipment, and others for details and other ideas): Use good locks, use a peep hole in the door to see who is there before answering the door, have an effective alarm system, include motion sensors (such as are used in the IR spotlight mentioned above), have good phone sense (what you say when answering the phone or on your answering machine), play the radio when gone, put indoor lights on a time switch, put good labels on your property (and put security labels on your windows), have a dog, join or promote a neighborhood watch program (one of the best ideas: promote quality outdoor lighting through such a group, too!), and so forth.

Write IDA for a list of additional information sheets about outdoor lighting; we also have excellent slides that illustrate the differences between poor lighting and quality lighting.

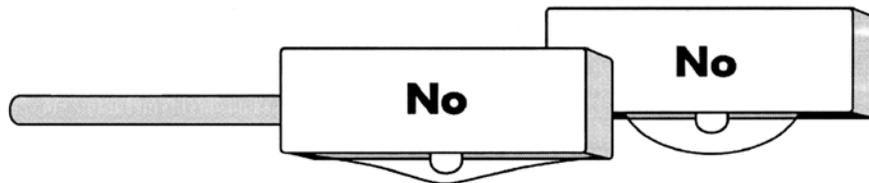
What is a True "Full Cutoff" Outdoor Lighting Fixture?



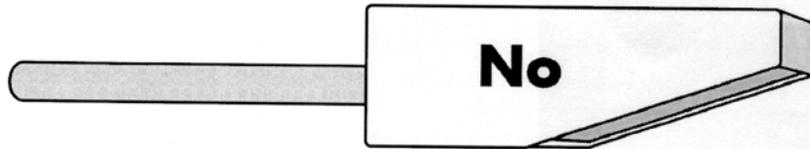
Flat glass lens, eliminates or minimizes direct glare, no upward throw of light. The housing for these fixtures is available in many styles.



Same fixture as above, mounted incorrectly—defeating the horizontal mounting design. The fixture now produces direct glare, and can also produce uplight at steeper mounting angles.



Known as just "Cutoff". Center "drop" or "sag" lens with or without exposed bulb, produces direct glare.



Forward-Throw Style. Exposed bulb in the forward direction produces some direct glare.

Produced by Bob Crelin

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Sources of Sea Turtle Friendly Filter/Film Material for use on flashlights, headlights, and other lights

The filter/film material must filter out the majority of the shorter wavelengths of light. We have located two types: Lee filter, medium red #27 and Rosco filter, medium red #27.

Sources

Orlando Stage, Equipment and Lighting

contact: (407) 425-2010

Rosco part # RX/27

Sheets only

size: 20 by 24 inches

1 sheet = \$6.50 per sheet

2 - 25 sheets = \$5.85 each

26+ = \$5.55 each

Orlando Panavision

contact: (407) 363-0990, Bob Drake or Nick

Lee Filter medium red #27

rolls: 4 by 25 feet = \$149.00 per roll

Sheets: 21 by 24 inches = \$6.25 per sheet

Gov't discount 20% (may give discounts to groups)

ARC Associates

contact: (904) 744-5214 Fred

Roscoe or Lee Filter medium #27

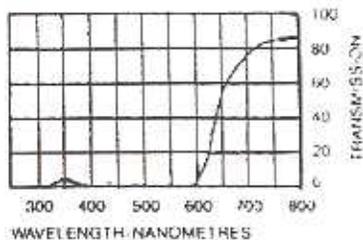
rolls: 4 by 25 feet = \$145.00 gov't price \$95.00 per roll

2 by 25 feet = \$92.00 gov't price \$70.00 per roll

Sheets: 21 by 24 inches = \$6.25 gov't price \$4.35 per sheet

Accepts check or money orders, no credit cards

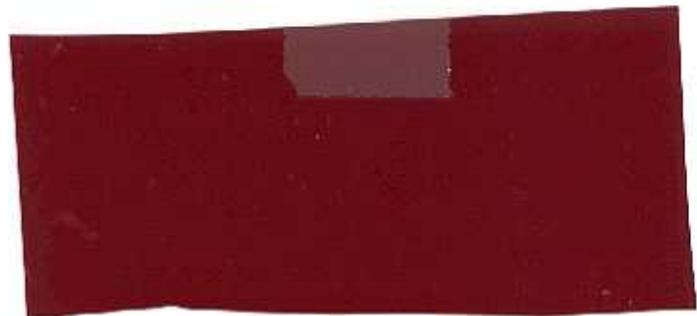
Purchase Orders fax to: (904) 743-5043 attn: Fred, include ship to address and phone number



LEE Filters

(HT)* 027
MEDIUM RED

(Y=3.64%)
(HT) Visible Original



Q: What is the difference between 12v Low Voltage and 120v Standard Voltage?

A: 12v Low Voltage saves energy, is much safer, but you must utilize a transformer which converts higher voltage (120v) electricity to 12v Low Voltage. For 12v, you must also consider voltage drop. For more information on 12v installations, [click here](#).

With 120v, no transformer is required and there is no concern for voltage drop. 120v may not be as safe for outside lighting, especially in a body of water and other considerations must be taken. We strongly recommend consulting a licensed electrical contractor for 120v outdoor lighting installations. We also recommend consulting a licensed electrical contractor for any electrical installations.

We are not licensed contractors, please use this information as a guide ONLY. We do not endorse or recommend any of the above information. We recommend consulting with a licensed electrical contractor for correct installations, and we cannot be held liable for any use or misuse of the information above.

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Measuring Light Output and Usage

Most people readily associate the term wattage with lights, but mistakenly assume it is a measure of the amount of light produced. Wattage is actually a measure of the energy usage of the bulb. The light output of a bulb is measured in lumens. A bulb with a lower wattage can actually have a much higher lumen output. Lighting packaging today must indicate the lumens produced by a bulb.

Improving the efficiency of a bulb requires using less energy (watts) for a given level of light output (lumens). A common measure of the efficiency of a bulb, termed efficacy, is lumens divided by watts. The cost-effectiveness of a bulb also takes into account its cost and life. A comparison of typical bulbs appears below. Be aware that these are representative only; there are variances among specific bulbs, and other factors, including light fixtures, bulb placement, and age of bulb, will affect actual light output.

Comparison of typical bulbs

Standard Incand.	Long life	Energy Miser	Halogen	Compact Fluor.
1,000 hours	2,500 hours	1,000 hours	3,000 hours	10,000 hours
watts (lumens)	watts (lumens)	watts (lumens)	watts (lumens)	watts (lumens)
25 (220)				4 (230)
40 (480)		34 (410)	42 (665)	7 (400)
60 (880)	52 (720)	52 (800)	52 (885)	13 (800)
75 (1200)	67 (940)	67 (1130)	72 (1200)	18 (1175)
100 (1750)	90 (1260)	90 (1620)	100 (1740)	27 (1675)
150 (2850)		135 (2580)		32 (1950)
flood: 75 (760)			45 (700)	18 (800)

Notice, for example, that a 52 watt Energy Miser bulb uses about 13% less energy than its 60 watt incandescent counterpart, but in turn produces over 90% of the light. A comparable long life bulb, however, while lasting 2.5 times as long, will only produce about 82% of the light of the incandescent. On the other hand, a 13-watt Compact Fluorescent produces the same light as the 52-watt Energy Miser but uses only 25% of the energy and lasts 10 times as long. Even given its higher cost, such a bulb would cost approximately \$28 dollars over its life vs. \$72.50 for an incandescent (using a cost per kWh of 10 cents).

Effective May 1995, all bulb manufacturers had to re-label their products under Federal Trade Commission consumer protection regulation. The new labels must provide the light output (measured in lumens), the amount of energy used (watts); and the lifetime (hours). If positioning affects a compact fluorescent's light output by more than 5% (see discussion below) that must be disclosed.