



Introduction to Outdoor Lighting

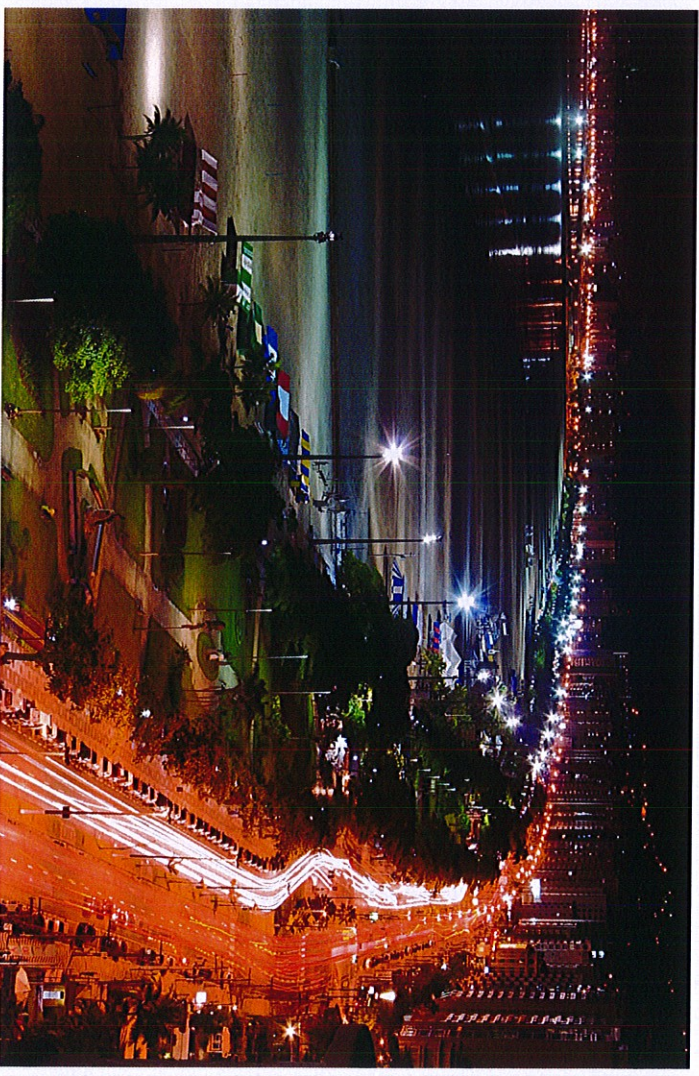
And How it Affects Light Pollution

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Dark Skies Awareness



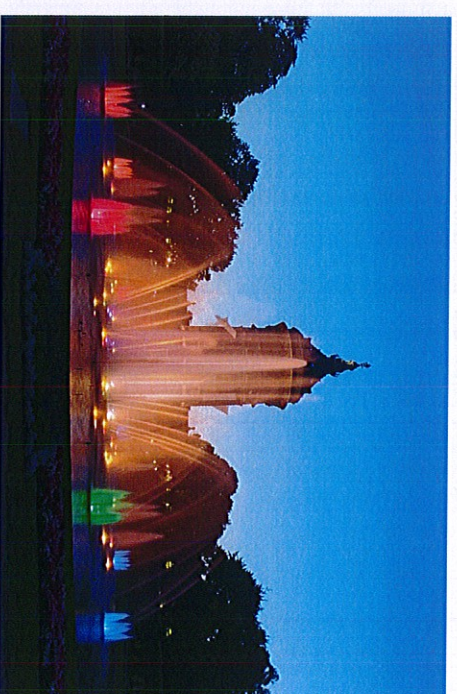
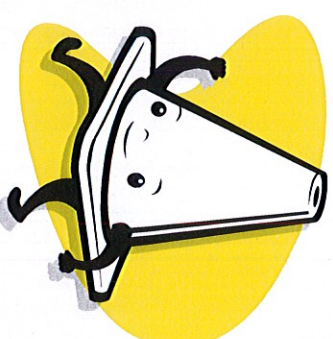
What is outdoor lighting now?

- Street lighting
- Roadway lighting
- Parks
- Stadiums
- Parking lots
- Landscaping
- Residential
- Buildings
- Pedestrian and Bicycling Pathways



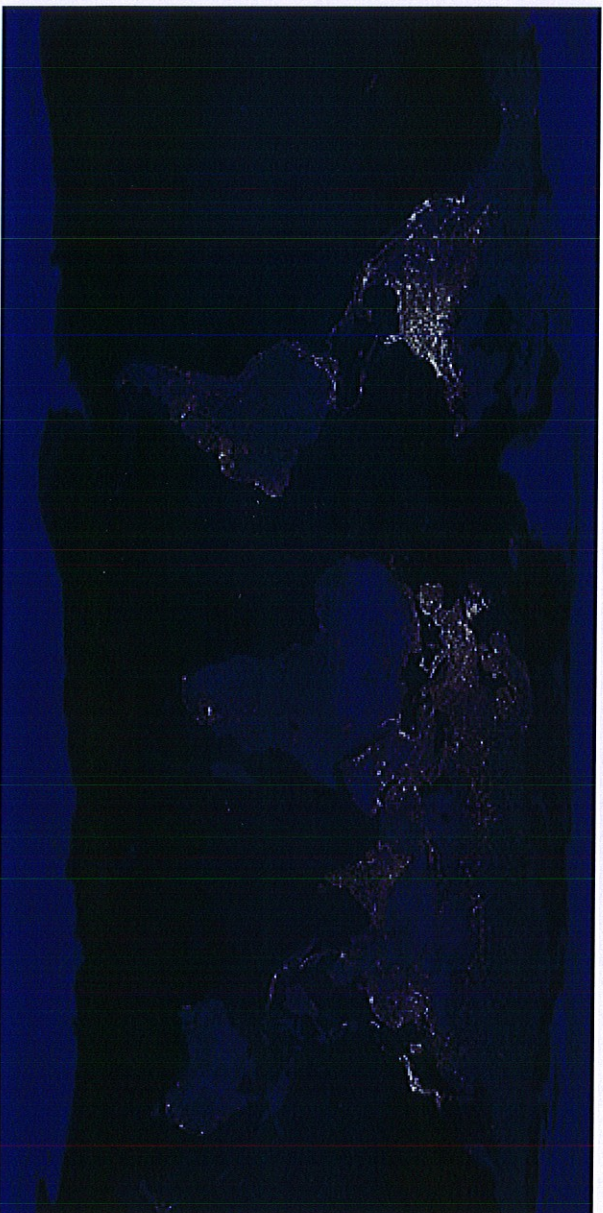
Purpose of outdoor lighting

- Provide a safe and secure environment at night.
- Extend the use of parks and walkways into the night.
- To enhance historic/notable features
- To enhance travel on the roads and at intersections.



What is light pollution?

- It is wasted light that performs no function or task
 - Such as sky glow
 - Glare
- It is artificial light that goes where it's not supposed to go
 - Neighbor's window
 - Into the sky



Outdoor Lighting



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Outdoor lighting should...

- Enhance visibility, not impede it
- Not produce glare
- Be a part of the total nightscape, not all of it
- Not allow light trespass on other's property
- Have a master plan



Outdoor lighting should...

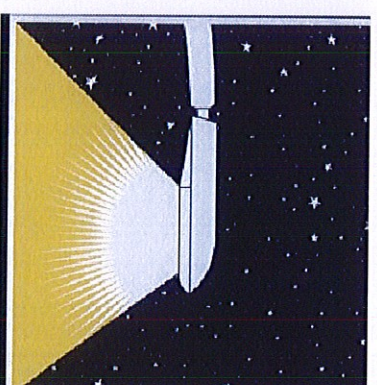
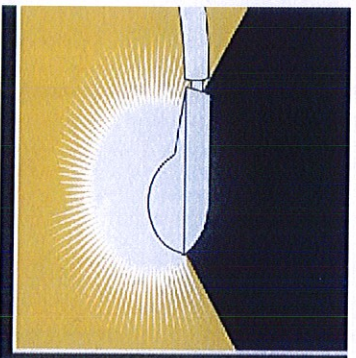
- Provide a safe and secure environment
- Create safe routes for traffic, cyclists and pedestrians
- Facilitate the extended use of outdoor spaces



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Dark Skies Awareness

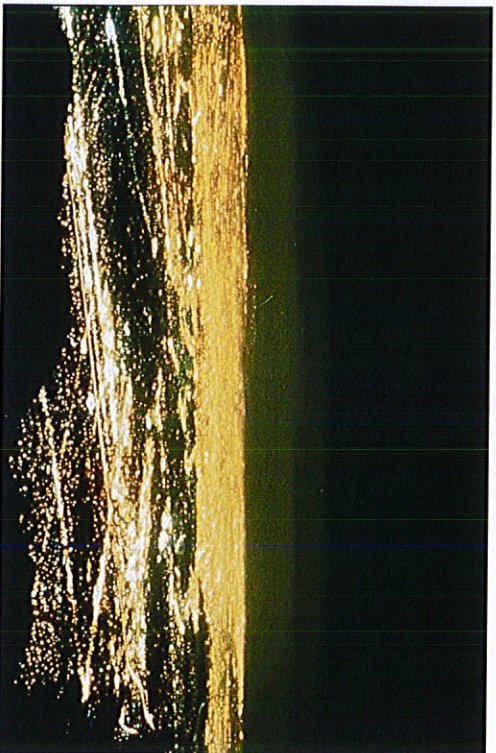
Shielded Luminaires



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Dark Skies Awareness

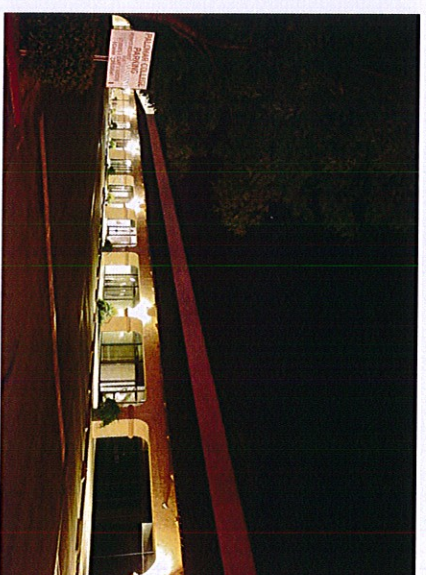
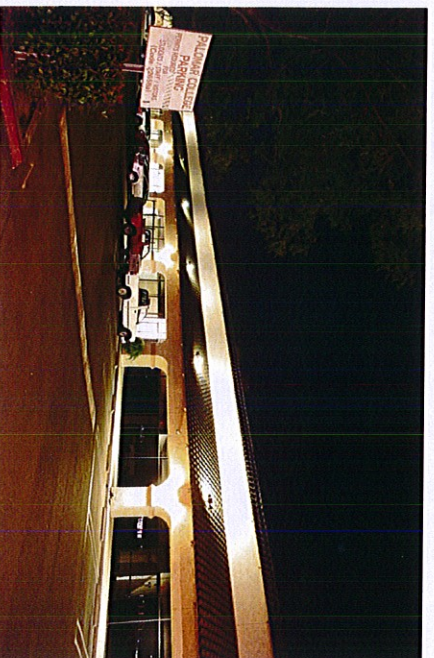
Importance of Shielding Light

- Unshielded lights produce
 - Sky Glow
 - Glare



Unshielded Luminaires Waste Energy

- Light that spills out, away from the task it needs to be used for is wasted energy, and wasted money.
- Environmentally responsible outdoor lighting reduces this waste and costs no more than earlier manufactured light fixtures.
- Below- the Escondido Education Center before on the left and after on the right. Unnecessary lights on the roof only added to their light bill, not to the safety of the parking lot.



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Dark Skies Awareness

Negative Impact on Human Health

- Light trespass into bedrooms disrupts sleep patterns.
- Glare in our eyes can be blinding and reduce our night vision.
- New research is being done to discover the impact to our biological clocks.



Negative Impact on Astronomy

- Light pollution negatively affects one of our greatest natural laboratories, the night skies.
- This is an important industry that has given us
 - Cell phone technology
 - X-rays, MRI's, and medical imaging
 - Satellite communications



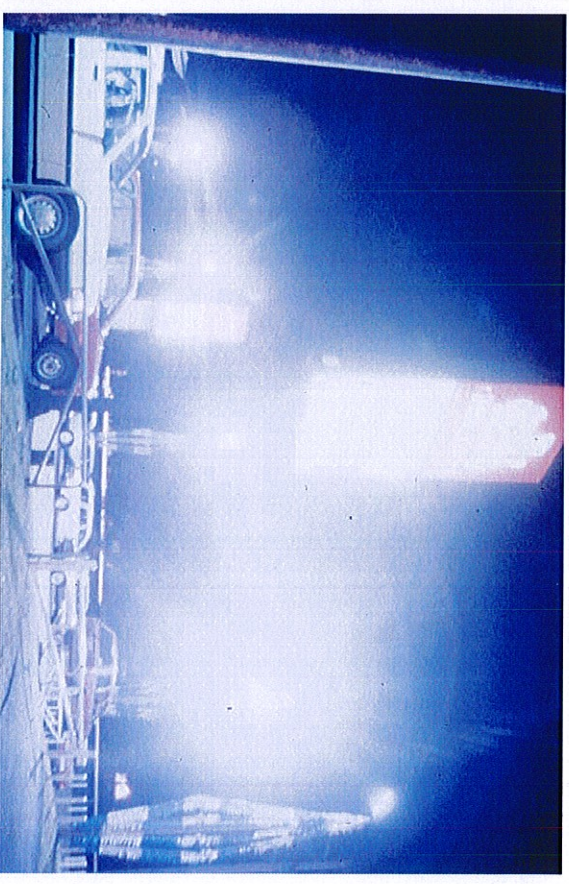
Solutions



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Solutions

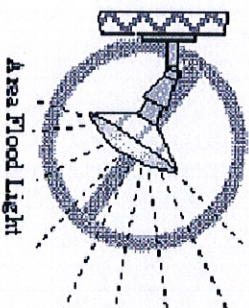
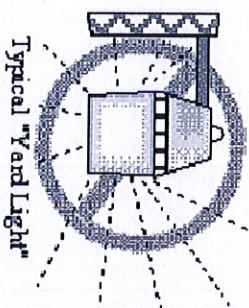
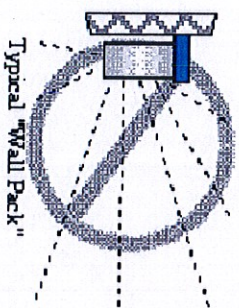
- Outdoor lights should be “full cut-off” or “fully shielded.” That means no light above the 90 degree angle.
- Fully shielded lighting can be purchased or retrofitted
- Use timers, dimmers, and motions sensors.
- Motion sensors in a parking lot or on a house provide an alert to after hours activity that a dusk to dawn sensor does not.



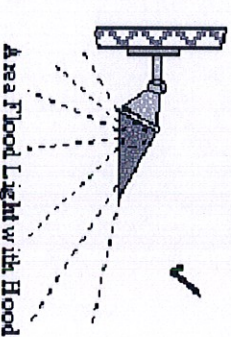
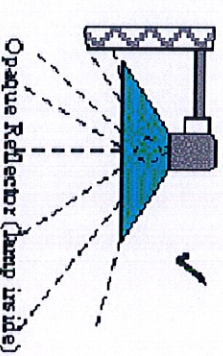
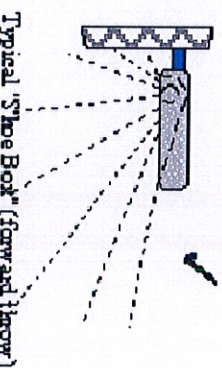
Lamps

EXAMPLES OF SOME COMMON LIGHTING FIXTURES

POOR

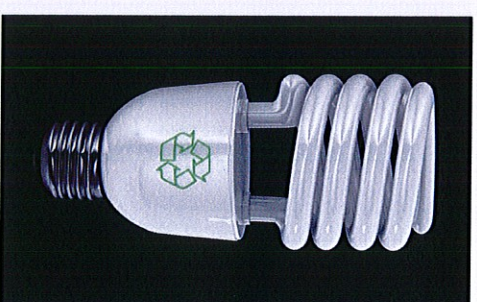


GOOD

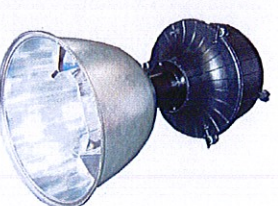


Types of Lamps

- There are four basic types:
 - Incandescent
 - Fluorescent
 - High-intensity discharge
 - Including: Mercury Vapor, Metal Halide, High Pressure Sodium and Low Pressure sodium
 - Light Emitting Diode (LED)
- LED technology is still relatively new



CFL



High-Pressure
Sodium



Low-Pressure Sodium

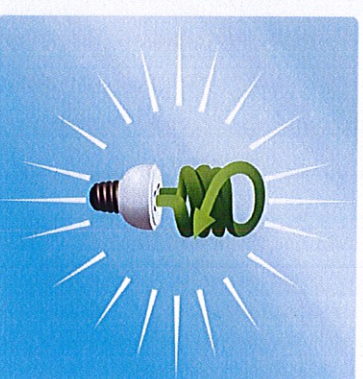
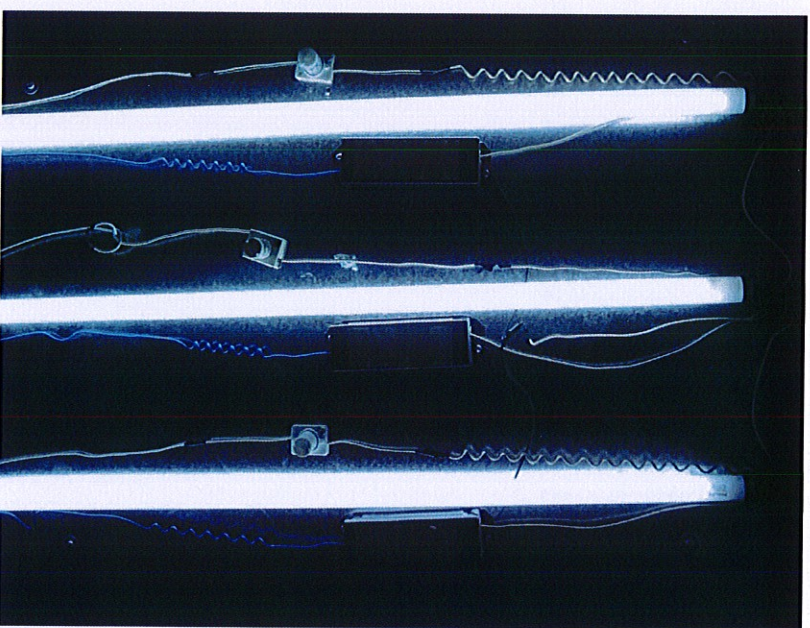
Incandescent

- Most common in homes
- It uses electric current to heat a tiny coil of tungsten metal inside a glass bulb to produce light.
- Have short lives
- Convert most of their energy into heat rather than light



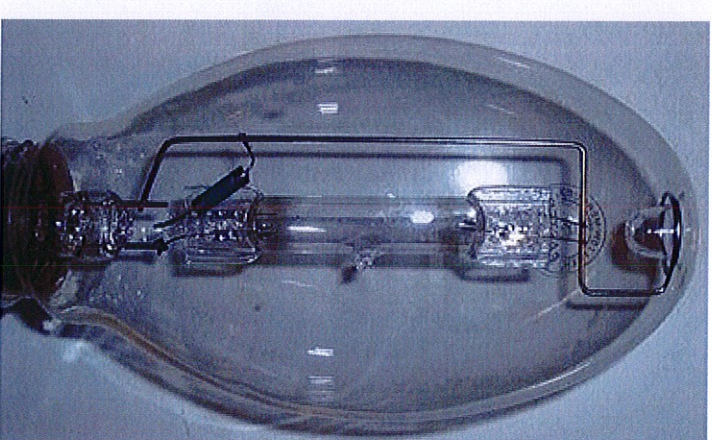
Fluorescent

- Used mostly in commercial settings
- It produces light when electric current is conducted through mercury an inert gases.
- 3 to 4 times more efficient than incandescent, and lasts 10 times longer
- Produces up to 100/lumens per watt (approximately)



High-Intensity Discharge

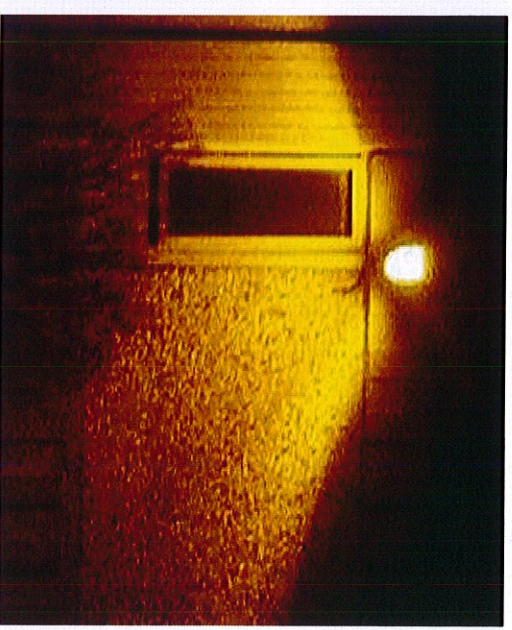
- Used mainly for large area applications
- Provide higher efficacy and longer service life
- Most common types are mercury vapor (MV), metal halide (MH), and high-pressure sodium (HPS)
 - Metal Halide – 100/lumens per watt
 - HPS – up to 150/lumens per watt
 - MV – being phased out



HID continued

Low-Pressure Sodium

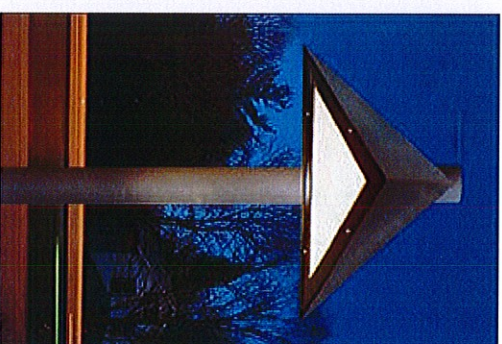
- Also considered a high intensity discharge lamp, but it has some unique characteristics.
- Used in outdoor applications
- Most efficient form of artificial lighting
- Maintain their light output better than other lamps
- Older technology, not many manufacturers producing new product
- Produces up to 200/lumens per watt



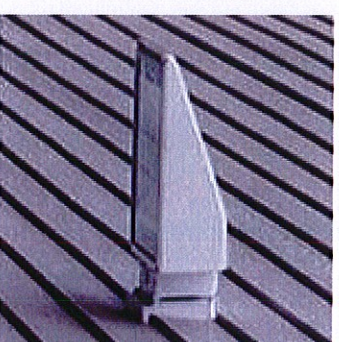
Types of Luminaires

- Column mounted fittings: used for streets, car parking, cycle tracks and pedestrian areas
- Wall mounted lanterns: used most commonly for security

(pictured: Pacific Lighting model TRL)

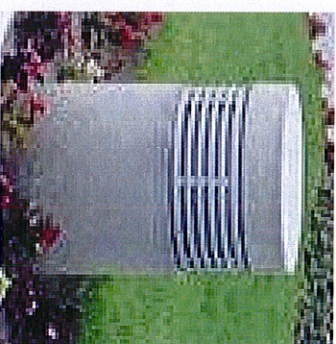


(pictured: Lighting by Brandford model Glarebuster)



Types of Luminaires

- **Lighting bollards: used for pathway and area lighting**
(pictured: Architectural Area Lighting model Concrete bollard)
- **Recessed fittings: used for pathways, or where buried in the ground for uplighting structures, trees and other incidents.** (pictured: Deck-Lighting model deck light)

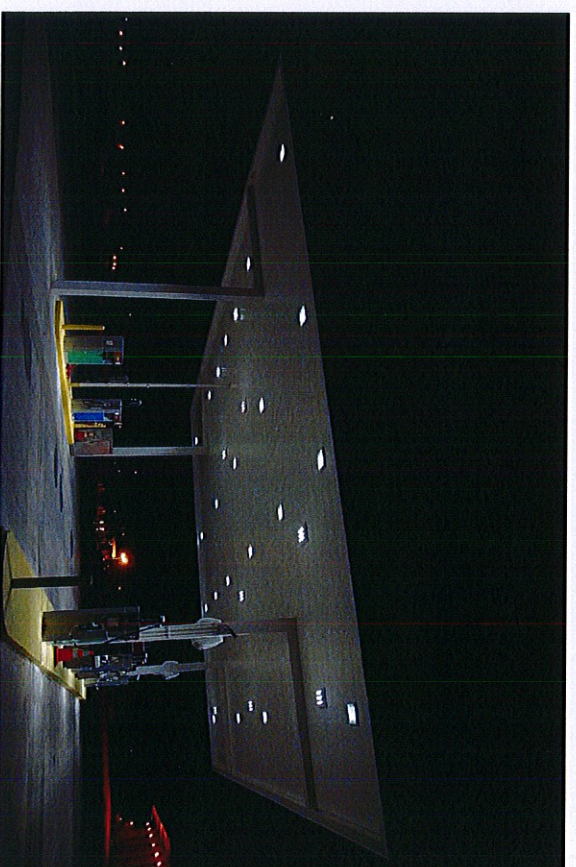


Following six slides show shielded and unshielded outdoor lighting examples



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Recessed
lighting done
badly, and
Recessed
lighting done
well.



Fully shielded lighting at an airport



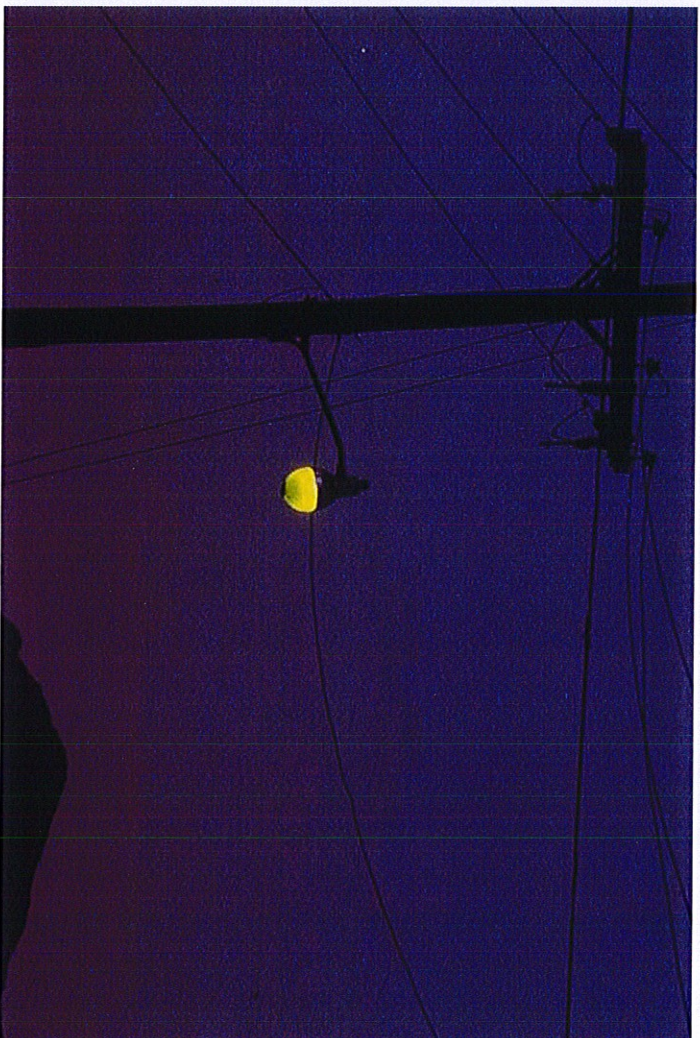
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Unshielded lighting at an ATM



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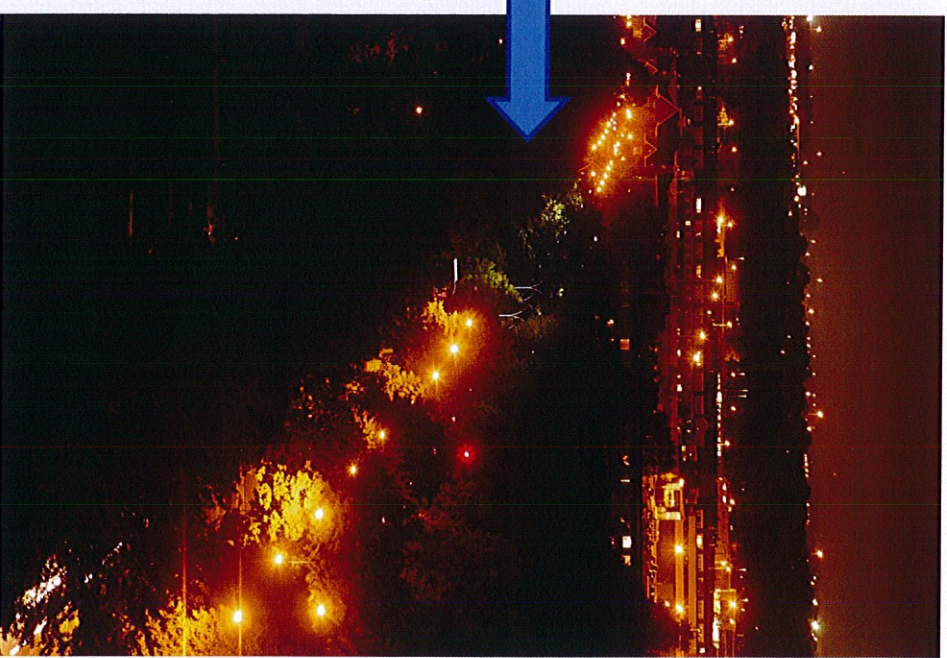
A typical un-shielded mercury vapor luminaire



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How shielded lighting reduces glare

- The image below is a test site for fully shielded street lights. To the right; the same lights shown in comparison to the un-shielded existing lights.



More things to consider

- Luminance: The photometric quantity most closely associated with the perception of brightness.
- Lumens is the overall output of the luminaire.
- Energy Use: The product of power (watts) and time (hours).

