

The Model Lighting Ordinance

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BENYA LIGHTING DESIGN

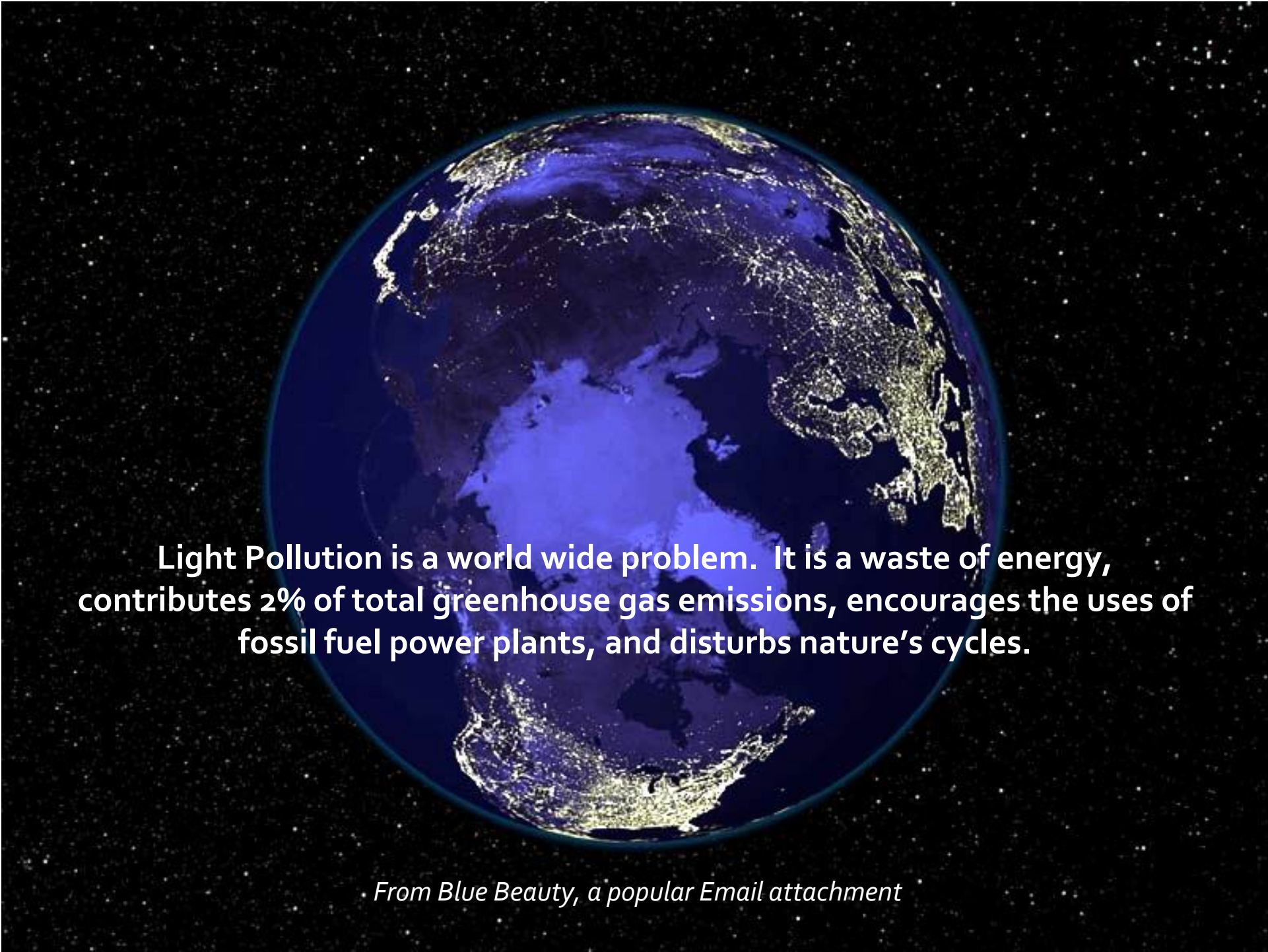
Member of the Board of Directors, International Dark Sky Association

A NEW DAY FOR OUTDOOR LIGHTING

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Thank you!





Light Pollution is a world wide problem. It is a waste of energy, contributes 2% of total greenhouse gas emissions, encourages the uses of fossil fuel power plants, and disturbs nature's cycles.

From Blue Beauty, a popular Email attachment

The Opportunity of Outdoor Lighting

- Beauty, discovery, wonder
- Necessary contributions to the functionality of the built environment
- Creative contributions to the enjoyment of life





The Reality of Outdoor Lighting: Light Pollution

Light Pollution

Light Pollution is

- Artificial sky glow
- Obtrusive light (light trespass)
- Offensive light (glare)

How To Control Light Pollution

- Voluntary reductions
- Incentive based programs (LEED)
- **Local ordinance**
- State law
- Federal law

Controlling Light Pollution: Current Lighting Ordinances

- Thousands of different laws
- Each driven by community specific issues
- Within jurisdiction of adopting agency;
can't conflict or supersede state or federal
law

Lighting Ordinances

DO

- Serve as local “code”
- Regulate all lighting on private property
- Address when the code is enforced
- Spell out penalties

DON'T

- Regulate highways, roadways or street lighting systems
- Regulate signs

Typical Ordinance Issues

Nuisance Motivated

- Pole height limits
- Setback requirements

Safety/security motivated

- Footcandle requirements

Astronomer Motivated

- Cut off requirements
- LPS required

Latter Day Dark Sky Motivated

- Lumen-based cutoff requirements

Latter Day Astronomer Motivated

- Lumens per acre limits

Problems with Historic Ordinances

- No national standard
- Technically faulty
- One size does not fit all
- No limit to site lumens but limit pole height
- Require complex calculations for all projects
- Specify light levels
- Don't differentiate between commercial, residential and unique lighting situations
- Fail to address the entire community's lighting

At Long Last: The Model Lighting Ordinance (MLO)

The MLO

- Joint effort of the International Dark Sky Association **IDA** and the Illuminating Engineering Society of North America **IES**
- Under development for three years
- Approved for Public Review January 2009

Basis

- IESNA Lighting Handbook Ninth Edition
- IESNA RP-33 (Outdoor Environmental Lighting)
- IESNA RP-20 (Parking)
- IESNA RP-2 (Retail)
- CIE TC 5.12 (Lighting Zones)
- California Title 24 and ASHRAE/IESNA 90.1 (Energy Code)

Philosophy

- Readable and enforceable by electricians and electrical inspectors
- Easily checked by planning and building officials
- Repeatable results

An International Model Code

- Uses zones to allow community-specific tailoring
- Allows all IES recommendations to be met
- Meets all energy codes
- Scientifically correct in all respects
- Based on latest research papers
- Simple methods for simple projects
- Complex methods for complex projects
- Simple compliance documentation

Benefits of a Standard

- Better Name Recognition
- Common language
- National education
- Ease of adoption
- Standing committee, 3 year revision cycle

Preamble

Curtail and reverse the degradation of the night visual environment and night sky by minimizing artificial sky glow, glare, and obtrusive light

Conserve energy and resources to the greatest extent possible

Permit reasonable uses of lighting for night-time safety, utility, security, productivity, enjoyment and commerce including temporary lighting and seasonal lighting.

Help protect the natural environment from the damaging effects of night lighting from man-made sources.

MLO Applicability

All outdoor lighting on private property and lighting on public property but used to light private property

- Exemptions

- Street & roadway lighting
- Public monuments and statuary
- Signs
- Temporary lighting
- Seasonal lighting

- Exceptions

- Special use permits
- Lighting required by federal, state or provincial laws or regulations

Lighting Zones

New IESNA RP-33 definitions

- **LZ₀**: No ambient lighting
- **LZ₁**: Low ambient lighting
- **LZ₂**: Moderate ambient lighting
- **LZ₃**: Moderately high ambient lighting
- **LZ₄**: High ambient lighting

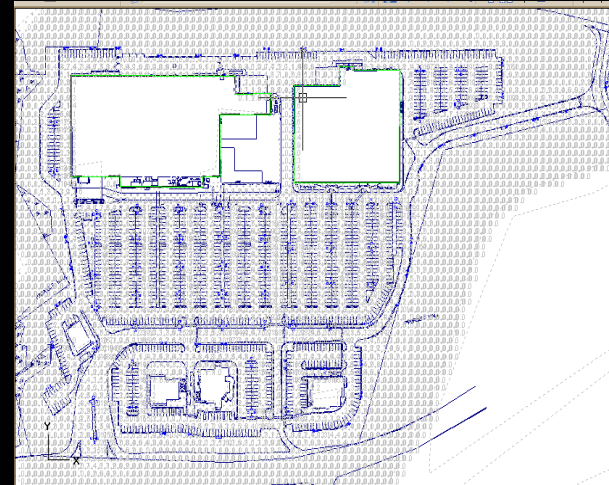
Site Lumen Allowance

- By Lighting Zone
- Parking Space Method (small sites only)
 - Lumen allowance per parking space
- Simple Hardscape Method
 - Lumen per square foot allowance
- Complete Site Method
 - Basic lumen allowance per site *plus*
 - Lumen per lineal foot of perimeter *plus*
 - Lumen per square foot allowance *plus*
 - Specific use allowance

Site Lumen Allowance

Additional lumens for:

- Building Entrances and Exits
- Special use entrances
- Facades
- Outdoor sales lots and frontage
- Ornamental lighting
- Drive up windows
- Guard stations
- Outdoor dining
- Vehicle service hardscape and canopies
- All other canopies



Two Compliance Methods



Prescriptive method

- Site lumen limits by Zone
- BUG shielding requirements by Zone

■ Performance method



- Site lumen limits by Zone
- Automated calculation of uplight, glare and trespass compliance using standard lighting software

The “B U G” System

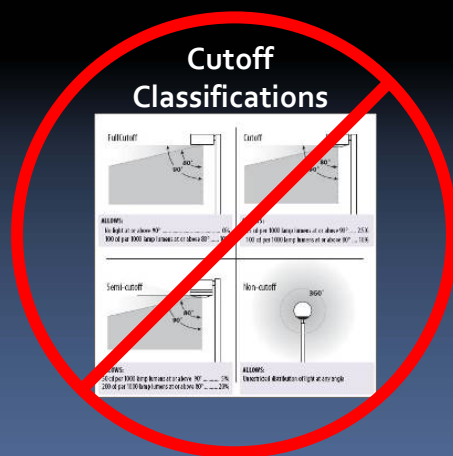


- A prescriptive method to categorize lighting equipment based on product optical control
- 3 digit identification system for lighting products
 - **“B rating”** Backlight or “light trespass” component
 - **“U rating”** Upward light or “skyglow” component
 - **“G rating”** High angle zone or “glare” component
- BUG angles relate directly to the LCS solid angles defined in TM-15

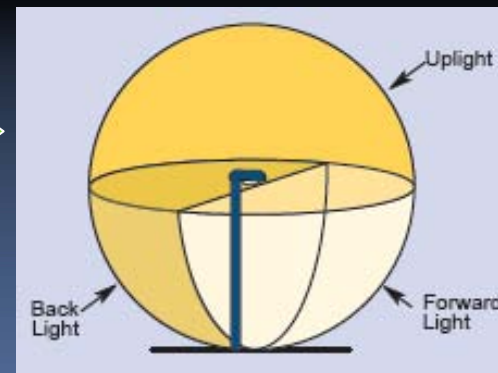
Luminaire Classification System

IESNA TM-15-07

- New techniques to describe the performance of outdoor lighting.
 - Cutoff Classifications are no longer valid
 - The LCS system addresses more than just high angle brightness

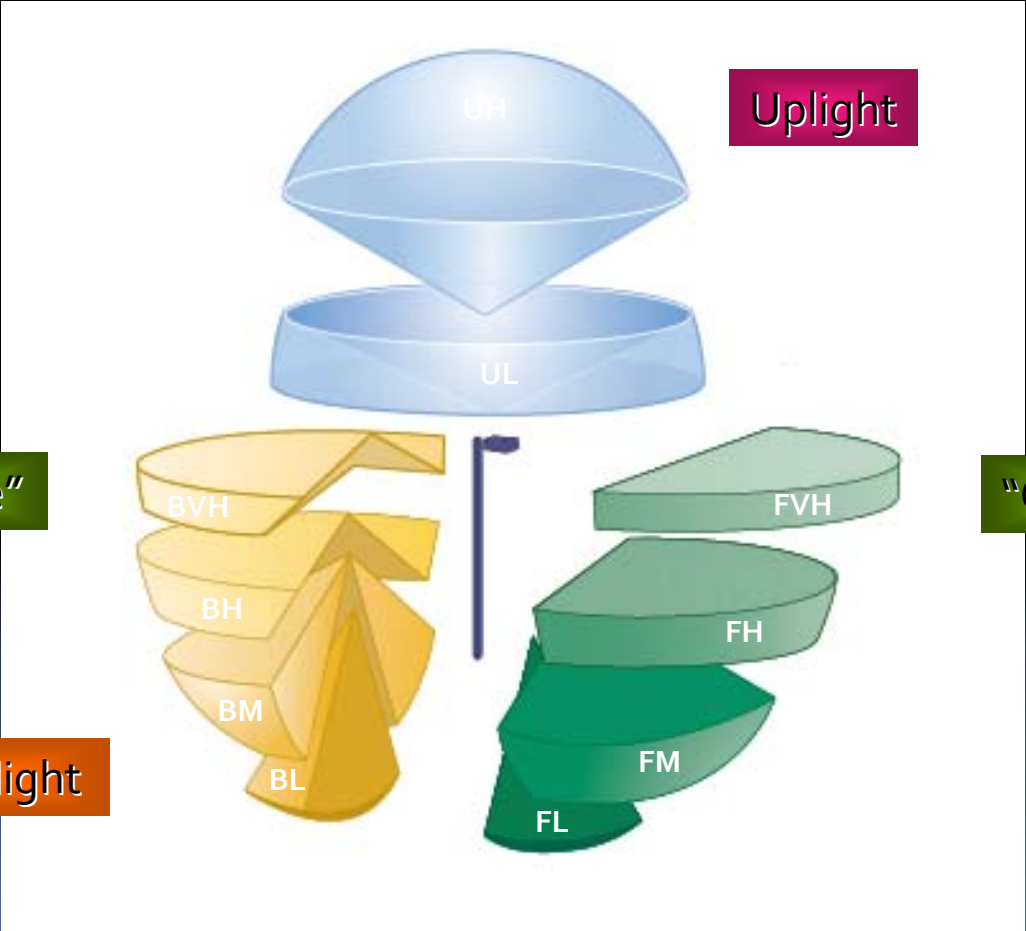
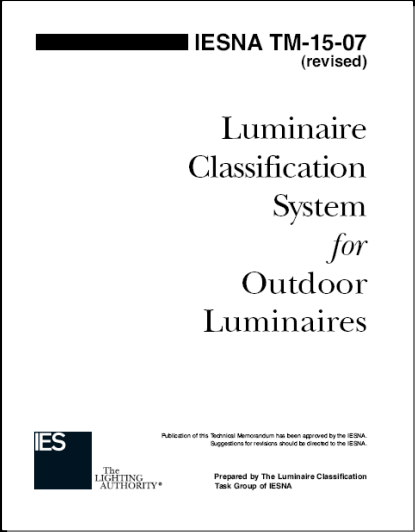


Luminaire Classification System (LCS)



LFI 2007 Innovation Award

*Research, Publications, Software
& Unique Applications*



“Glare”

“Glare”

Backlight

Using the BUG system

Lighting Zone	Backlight Rating					Uplight Rating	Glare Rating
	>2 mounting heights from property line	1 to 2 mounting heights from property line and properly oriented*	0.5 to 1 mounting height to property line and properly oriented*	<0.5 mounting height to property line, adjacent to a street and properly oriented*	<0.5 mounting height to property line and properly oriented*		
LZ0	B0	B0	B0	B0	B0	U0	G0
LZ1	B0-B1	B0-B1	B0	B0	B0	U0-U1	G0-G1
LZ2	B0-B2	B0-B2	B0-B1	B0-B1	B0	U0-U2	G0-G2
LZ3	B0-B3	B0-B3	B0-B2	B0-B2	B0-B1	U0-U3	G0-G3
LZ4	B0-B4	B0-B3	B0-B2	B0-B2	B0-B2	U0-U4	G0-G4

Ratings are currently be evaluated based on designer evaluation of solid angle analysis of luminaire optical performance

- *Based on commercial products – not theoretical photometry*
- *Includes a broad spectrum of manufacturer's lighting products*

Practical Impacts

- Shielded luminaires will need to be used almost everywhere



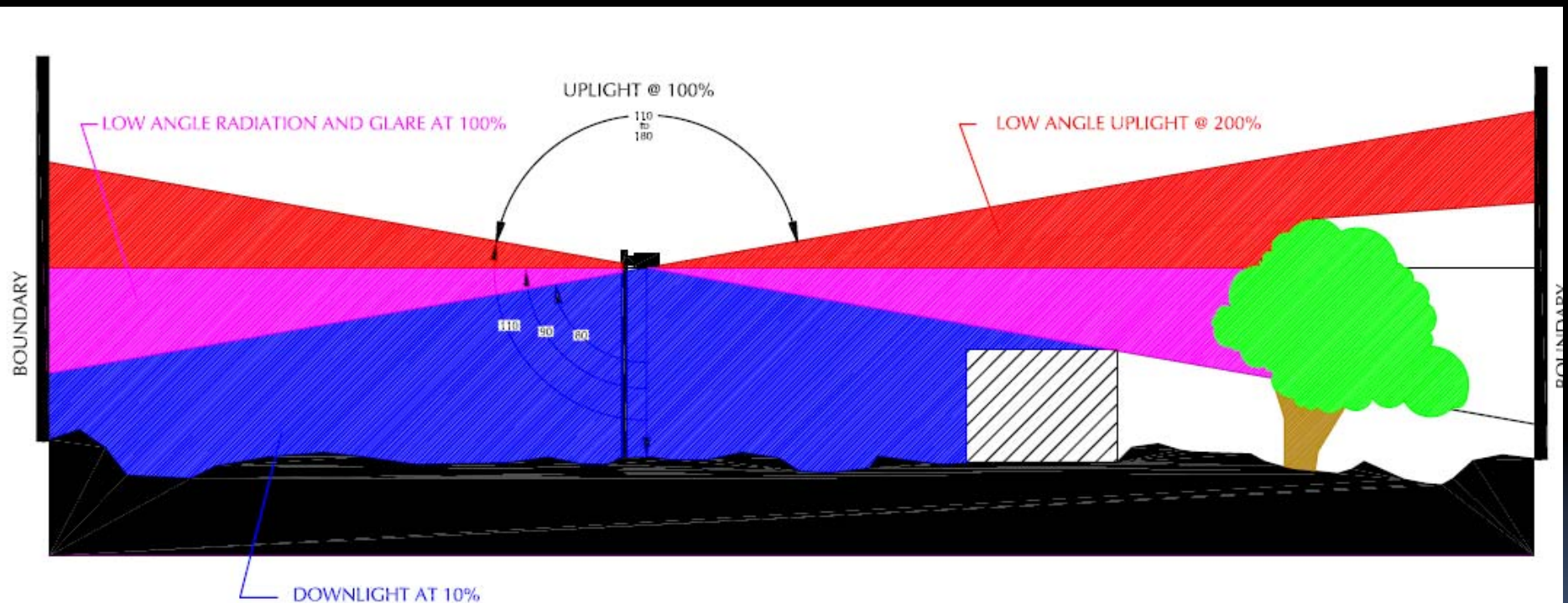
- Post Top luminaires will either need to be modern hidden source type or very low wattage



Performance Method

- Computer analysis using radiosity or raytracing (supported by major software systems)
- Checks for skyglow contribution using Baddiley weighting
- Checks for light trespass using OSP method
- Checks for glare using modified DeBoer value system
- Less dependent on equipment performance, more dependent on application design
- Provides more flexibility to meet requirements, but requires a more complex analysis process

Direction of Light Makes a Difference



SECTION THROUGH SITE SHOWING OFF SITE IMPACTS

Practical Impact

- For very small sites, it will be better to use the prescriptive method
- For medium and large sites, this method will permit more flexibility for the site interior
- Most lighting will be shielded and downward



Special Lighting Applications

Sports, industrial, transportation and other high light level installations will require certification of mitigation and approval by the authority



Controls

- Automatic shut off
- Automatic curfew with minimum of 30% reduction after use hours

Use and Enforcement

Procedures for

- New projects
- Additions and Improvements
- Maintenance and Repairs
- Abandonment
- New Uses

Amortization

- Time frame
- Severity of rule

Future Measures

Street Lighting Standards

Current Regulatory Structure

- IES RP-8
- AASHTO GL-6-2005
- Various city, state and federal requirements

Opportunities

1. Eliminate continuous roadway lighting
2. Reduce recommended light levels
3. Move to a luminance based standard

Model Sign Ordinance (MSO)

Current Regulatory Structure

- Local laws (nuisance, appearance)
- Regional laws (preservation)

Opportunities

- Restrictions on lumen density
- Restrictions on sign luminance
- Separate day and night limits
- Methods to address the glare potential of dynamic and LED signs

Sports Lighting Standards

Impacts

- Sky glow: everything bounces up
- Light trespass: large localized volume of light
- Glare: often seriously offensive

MLO Restrictions

- Limited to best practices determined by the AHJ

Opportunity

- New standards
- Installed lighting measurements and approval

IDA / IESNA Model Outdoor Lighting Ordinance

- Ready for Public Review
- 60% Version Awaits Software procedures

www.iesna.org

www.darksky.org