CLANTON & ASSOCIATES

TOWN OF VIENNA since 1890

Town of Vienna, VA - Lighting Ordinance

Clanton & Associates Project Team

Dane Sanders
Principal & CEO

Justin Sternberg
Project Manager

Rick Utting
Outdoor Lighting Advisor

Kate McBride
Project Planner

Kaiti Phelan
Technical Lead

Project Scope & Presentation

Project Scope

Included in Scope:

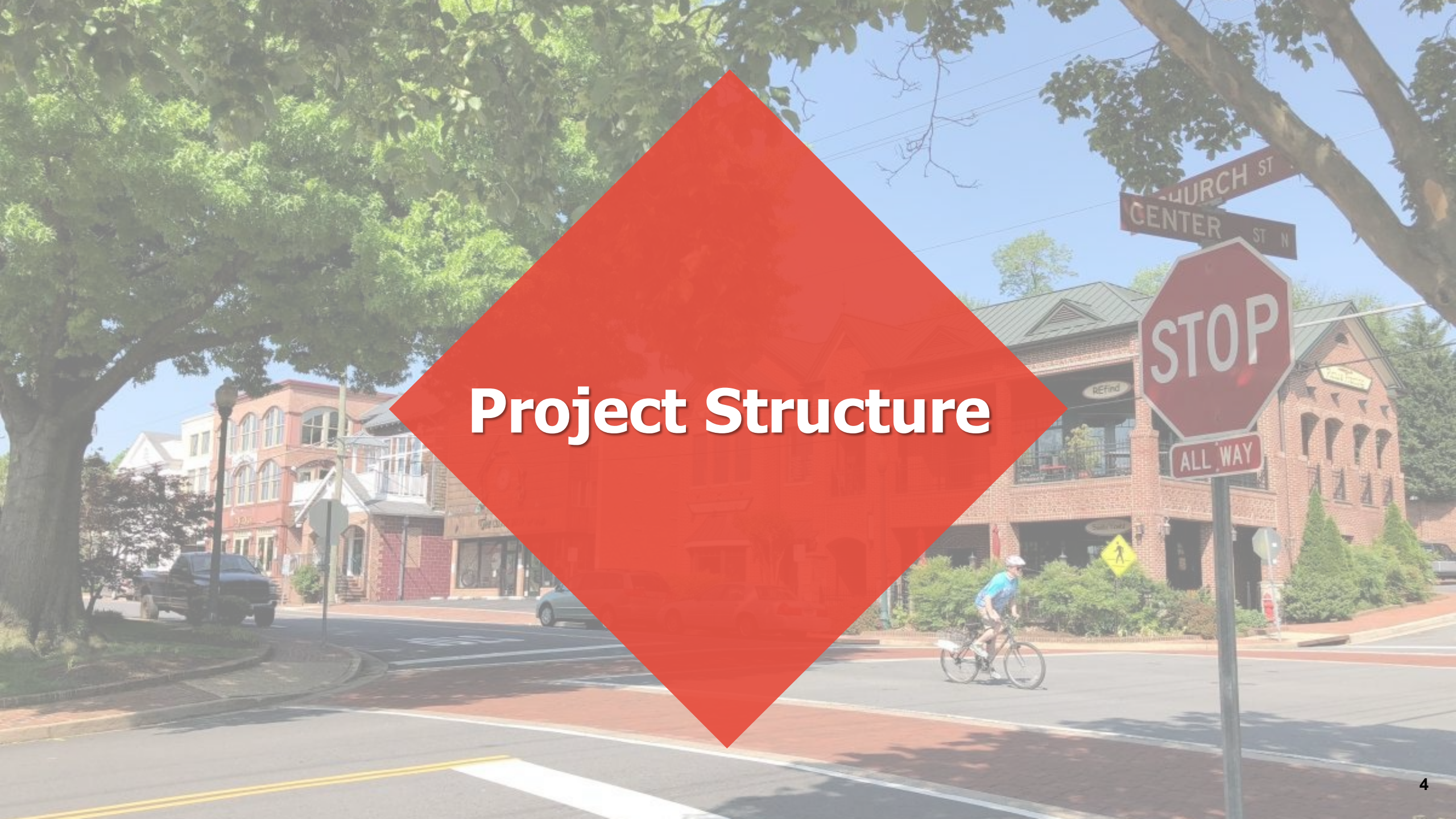
- Privately Owned Lighting
- City Owned/Non-ROW Lighting
- Façade Lighting
- Temporary Lighting

Excluded from Scope:

- Street & Pedestrian Lighting in the Public ROW

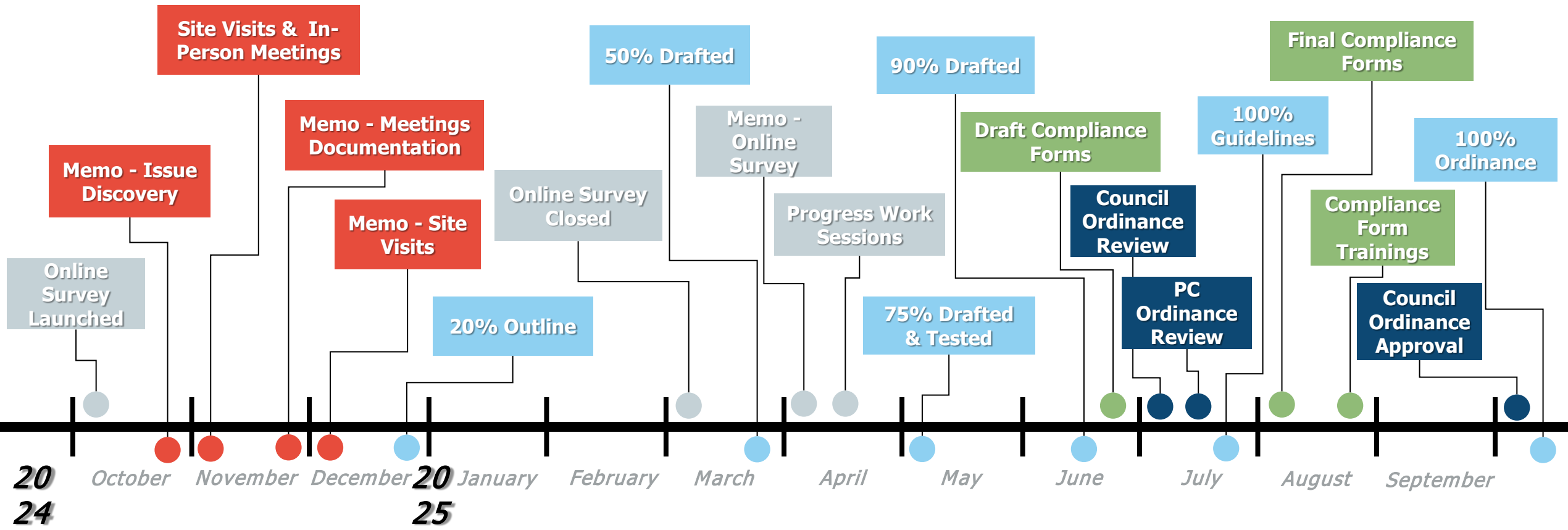
Topics

- Project Structure & Schedule
- Lighting 101
- Impacts of Light Pollution
- Community Survey Results
- Role of Lighting Standards & Criteria



Project Structure

Town of Vienna Outdoor Lighting Regulations & Guidelines Project Schedule



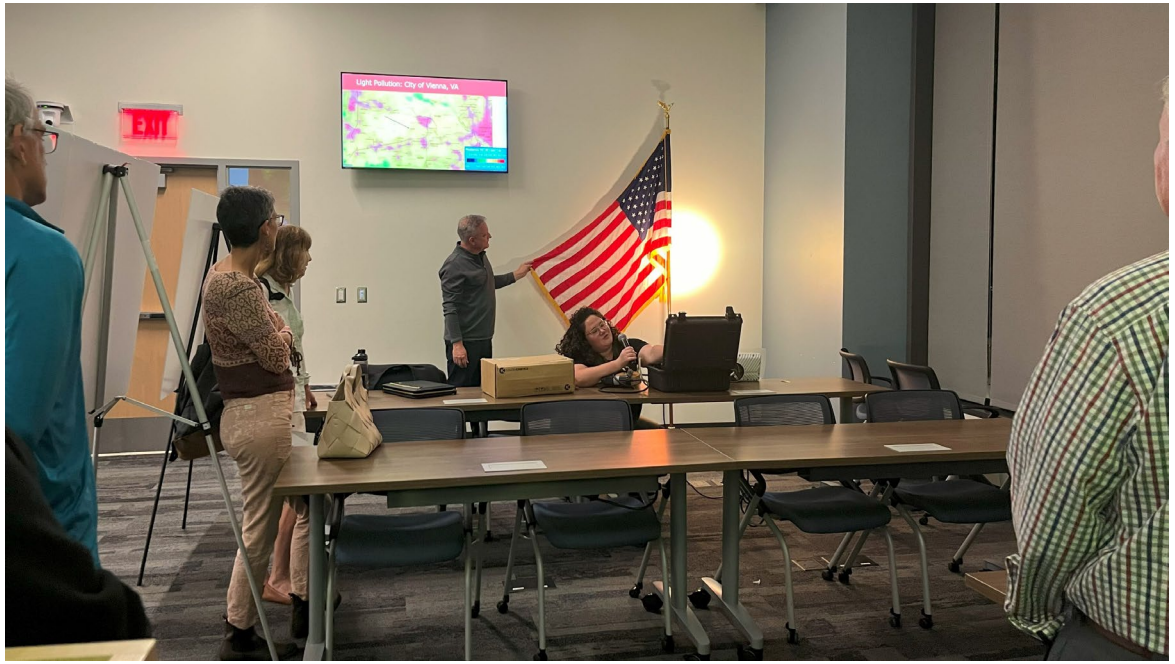
Project Stages

Project Initiation & Assessment

- Review of existing lighting standards
- Site visits to review existing night lighting conditions at 4 sites
- Memo of existing site lighting conditions

Community Outreach & Engagement

- Lighting 101 Presentations
- Online Lighting Preferences & Nighttime Behaviors Survey
- Memo of survey findings



Project Stages

Lighting Ordinance Updates

- Updated language for all land use zones
- Currently around 50% complete
- 75% Draft by mid-May
- Anticipated for Council vote in October

Lighting Design Guidelines

- Design guidance for buildings & illuminated signs
- Identifying quality luminaires for multiple architectural styles
- 50% Completed

Project Stages

Lighting Compliance Forms

- Tool to assist with lighting compliance
- Drafting in May 2025
- Virtual training for staff

Public Hearings & Final Steps

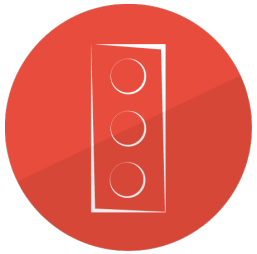
- Ordinance draft provided to Council and PC by July for comment
- Guidelines Draft provided to BAR in June
- Final approvals in October

Lighting 101

Why do we light?

Outdoor lighting is only for the benefit of people. It has no other purpose. It is only beneficial when people are there to use it.

Visibility

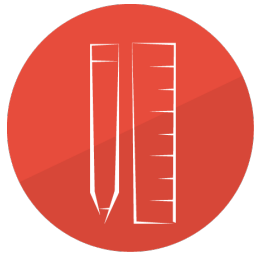


Traffic Safety

Late Night Activity

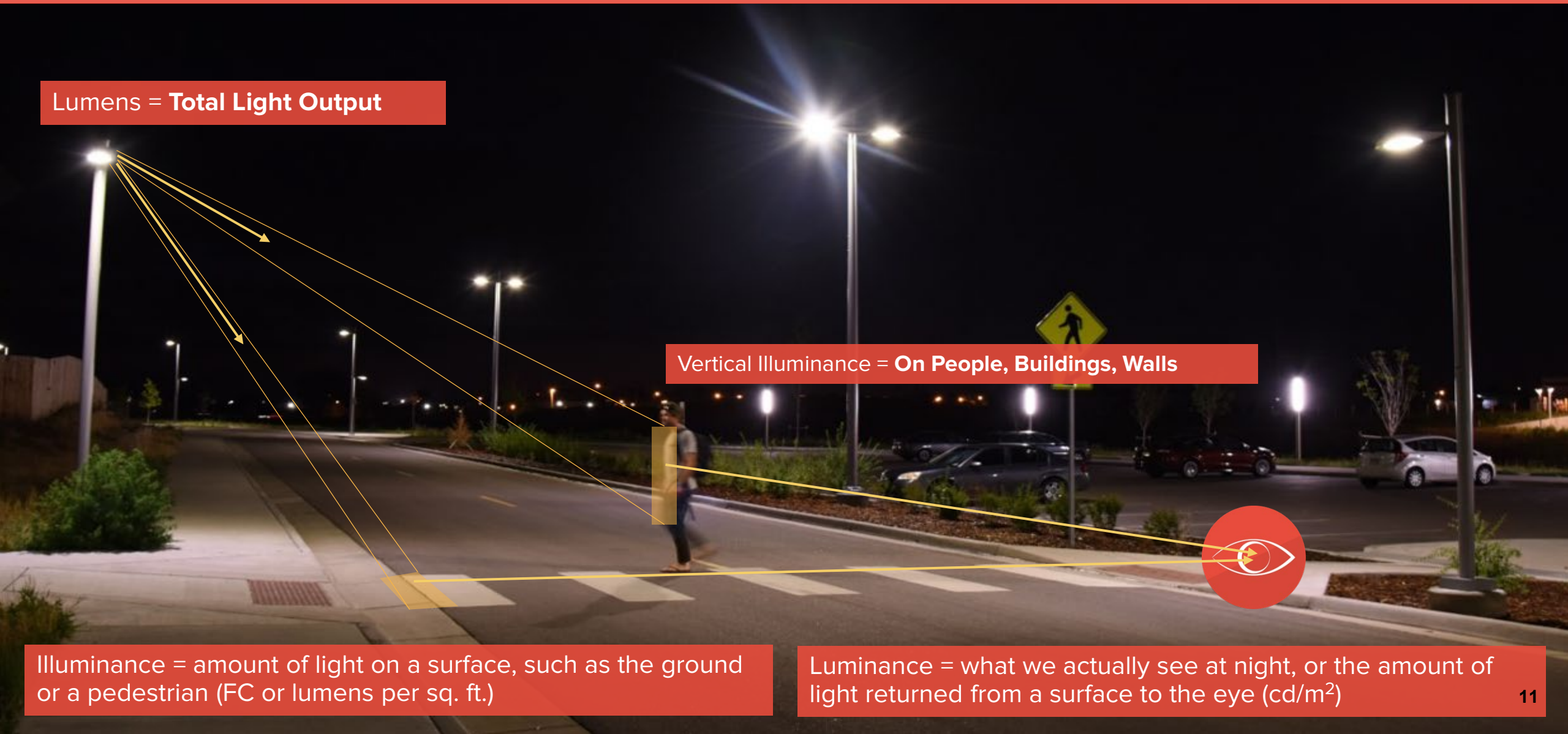
Safety & Security

Transit Accessibility



Design Aesthetics

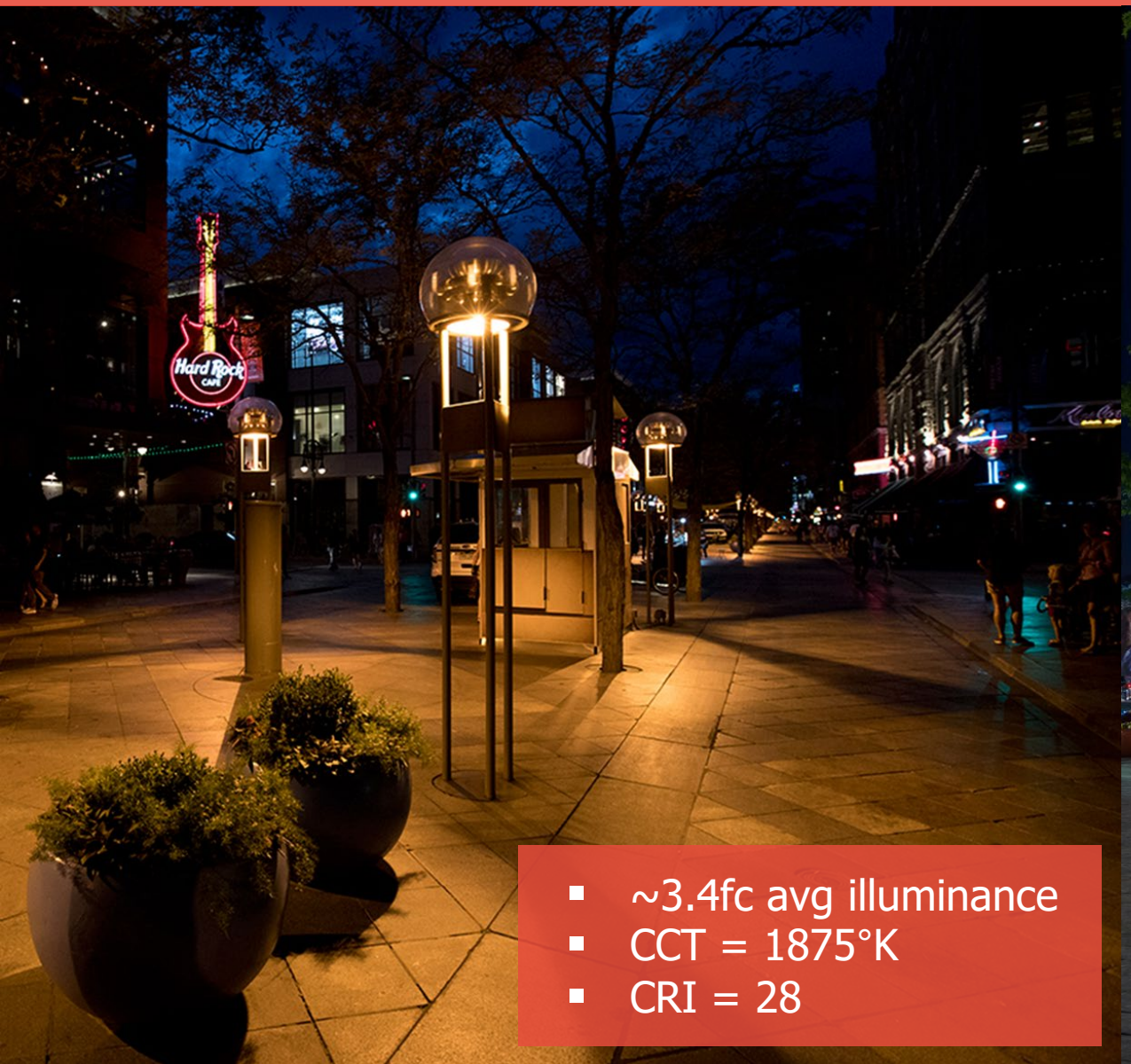
Lighting Metrics: Illuminance vs Luminance



Illuminance = amount of light on a surface, such as the ground or a pedestrian (FC or lumens per sq. ft.)

Luminance = what we actually see at night, or the amount of light returned from a surface to the eye (cd/m^2)

16th Street Mall – Denver, CO



- ~3.4fc avg illuminance
- CCT = 1875°K
- CRI = 28

- ~1.1fc avg illuminance
- CCT = 3100°K
- CRI = 83

YOU

At some point you may come back to read this line or maybe not.

WILL READ THIS FIRST.

And then you will read this line next.

You will go back to read this body copy if you want to know more. It takes the most effort to read because it has a lot of text in a small font in a light weight with tight line spacing. Many people will skip paragraphs like this unless if they aren't engaged right away. This is why it's important to draw attention to your message using visual hierarchy.

You'll probably read this before the paragraph.

Perceiving Lighting

GLARE

ADAPTATION

CONTRAST

SPECTRUM

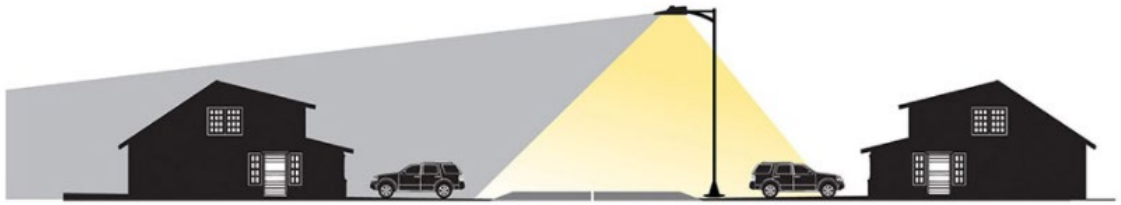
Glare - Visibility

High glare reduces our ability to see and perceive contrast.

The absence of glare prevents unwanted adaptation and significantly improves the visual experience.

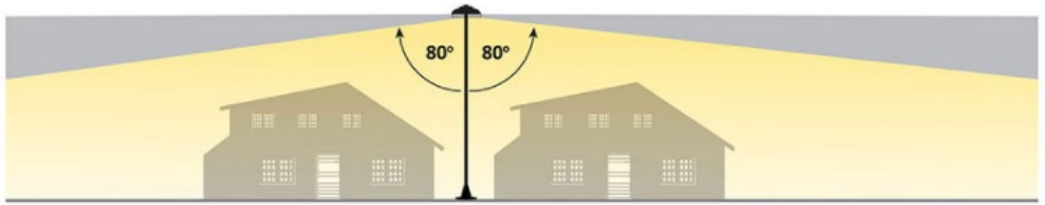
Glare - Light Trespass

HOUSE-SIDE SHIELD



FRONT-SIDE SHIELD

CUL-DE-SAC SHIELD



GLARE CUT-OFF SHIELD

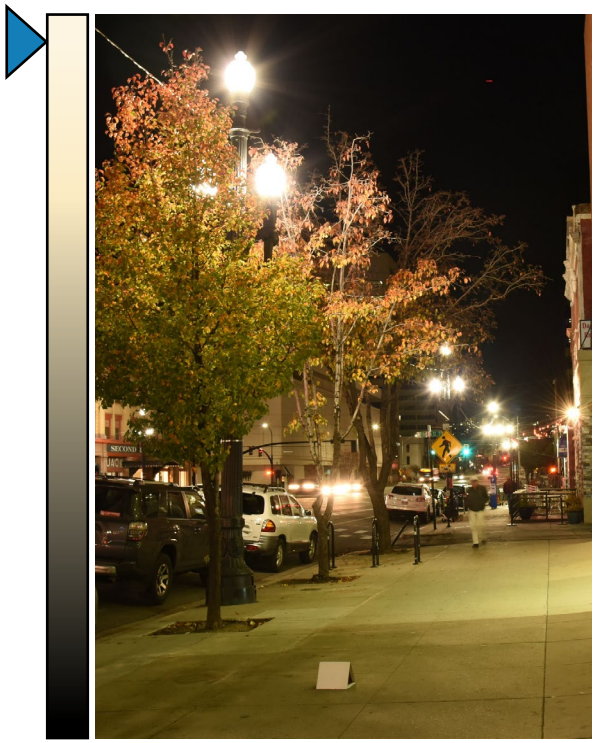
This is unwanted, "stray" light from nearby luminaires.

It's affected by:

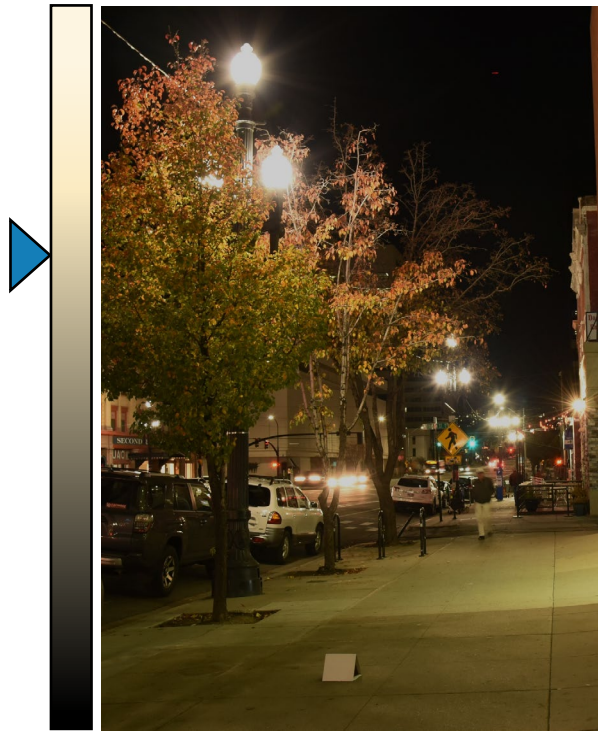
- Light Distribution Selection
- Light Trespass Calculations
- Appropriate Light Level
- Shielding
- High-End Tuning
- Adaptive Dimming

Adaptation - Light Level

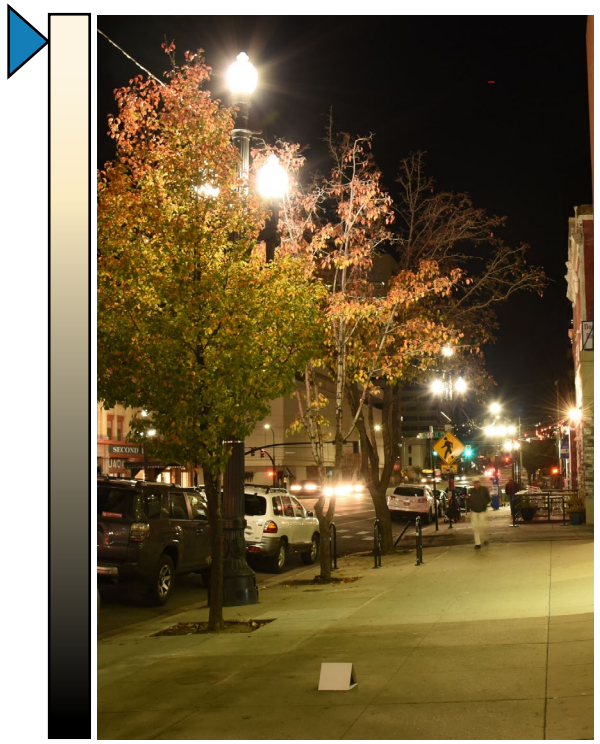
Adaptation – Dimming



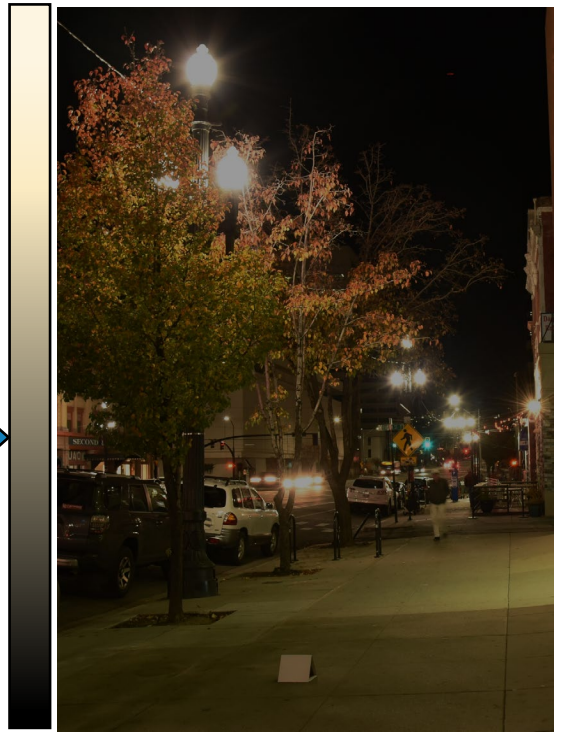
Dusk to 10pm
Light to Criteria



10pm to 12am
Reduce Pedestrian Criteria



Weekends
12am to 2am
Light to Criteria



2am to Dawn
Reduce to Low Ped Criteria

Contrast - Positive vs Negative

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

CONTRAST

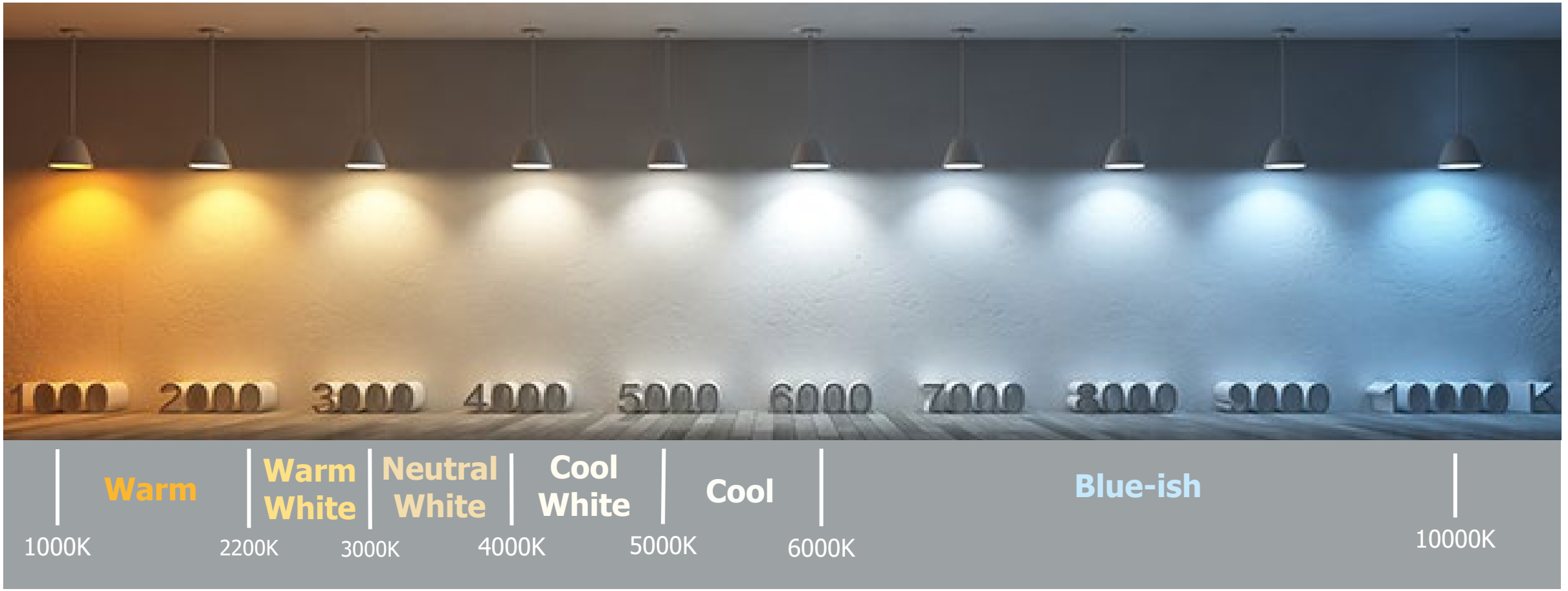
CONTRAST

Contrast - Uniformity

Excessive uniformity of lighting can reduce contrast to the point where objects can seem to vanish.

Appropriate uniformity maintains contrast and allows small objects in the road to be seen.

Spectrum:
Correlated Color Temperature (CCT)

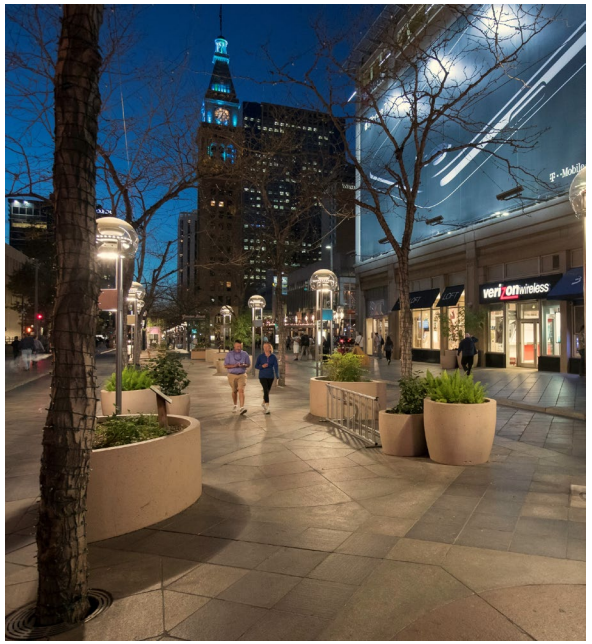


These temperatures are measured in degrees Kelvin (K).

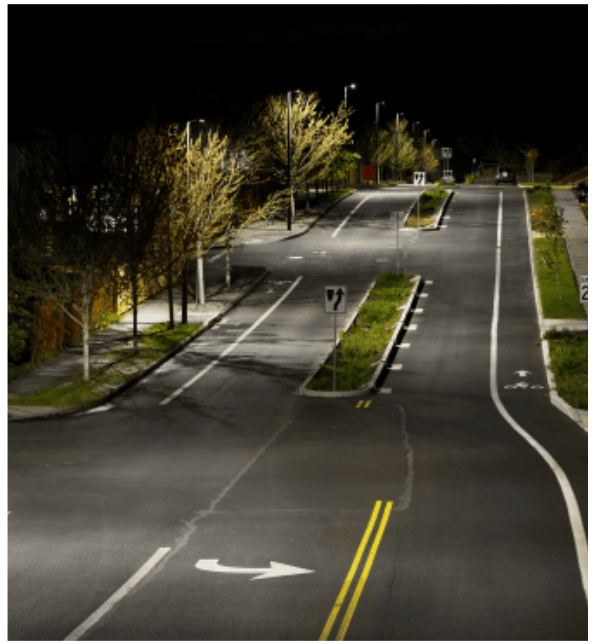
Spectrum:
Correlated Color Temperature (CCT)

CCT = 2200K
Warm Amber

CCT = 2700K
Warm White



CCT = 3000K
Neutral White



CCT = 4000K
Cool White

Spectrum:
Color Rendering Index (CRI)

- C.R.I. is how well an artificial light can reproduce colors for human vision
- Light sources with the same Color Temperature (CCT) can have significant differences in wavelength composition
- Higher C.R.I. improves visual contrast without increasing light temperature or lumens

CRI: 40

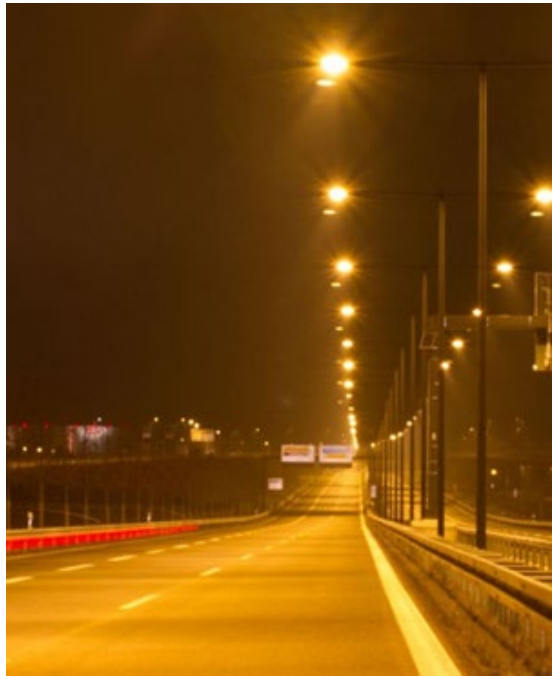
CRI: 60

CRI: 80

Spectrum:
Color Rendering Index (CRI)

LED Lighting

HPS Lighting



Typical CRI: 70

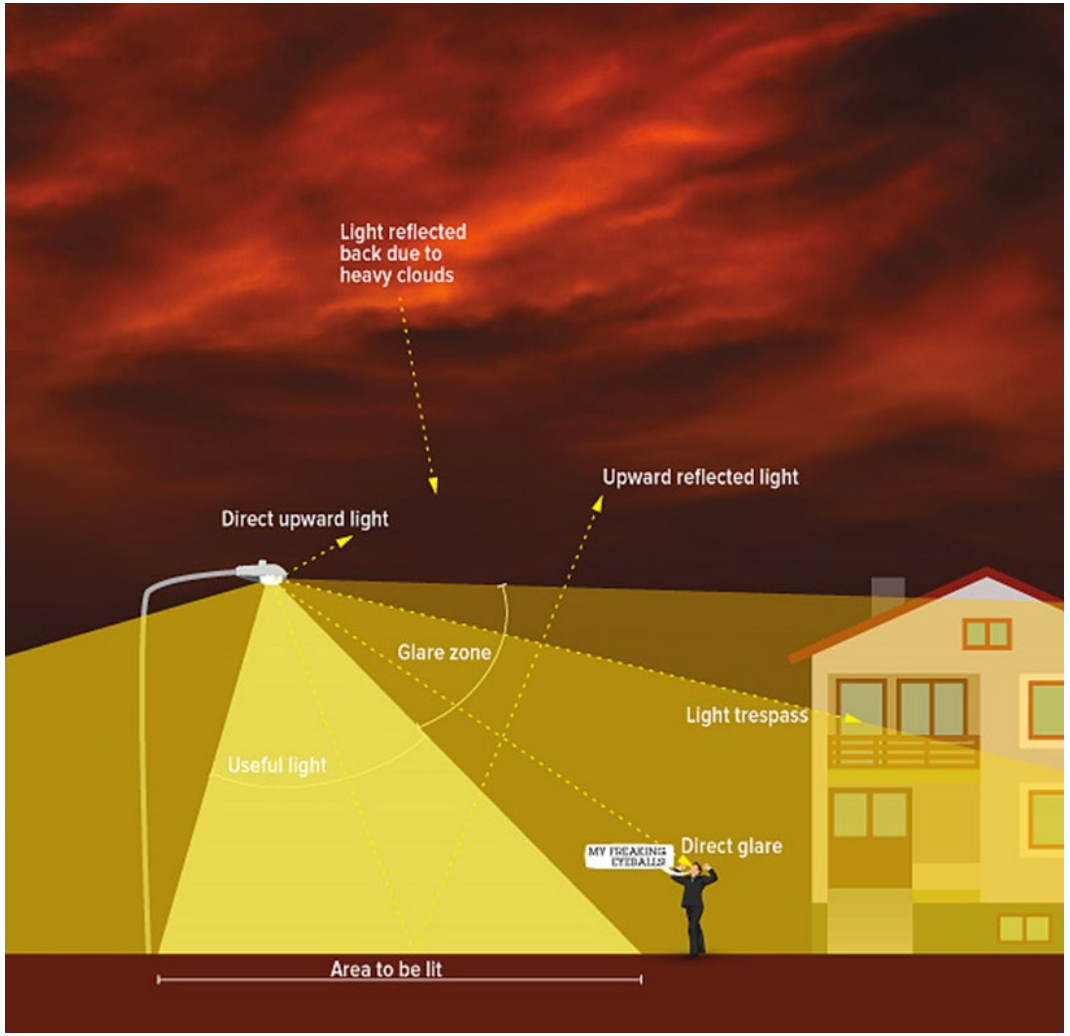
Typical CRI: 35

Light Pollution

Light Pollution & Cities

- Providing lighting at night is a significant amount of municipal energy budgets
- Yet around 30% of that lighting is wasted
- Light pollution is going up 10% annually, not down

Types of Light Pollution



Types:

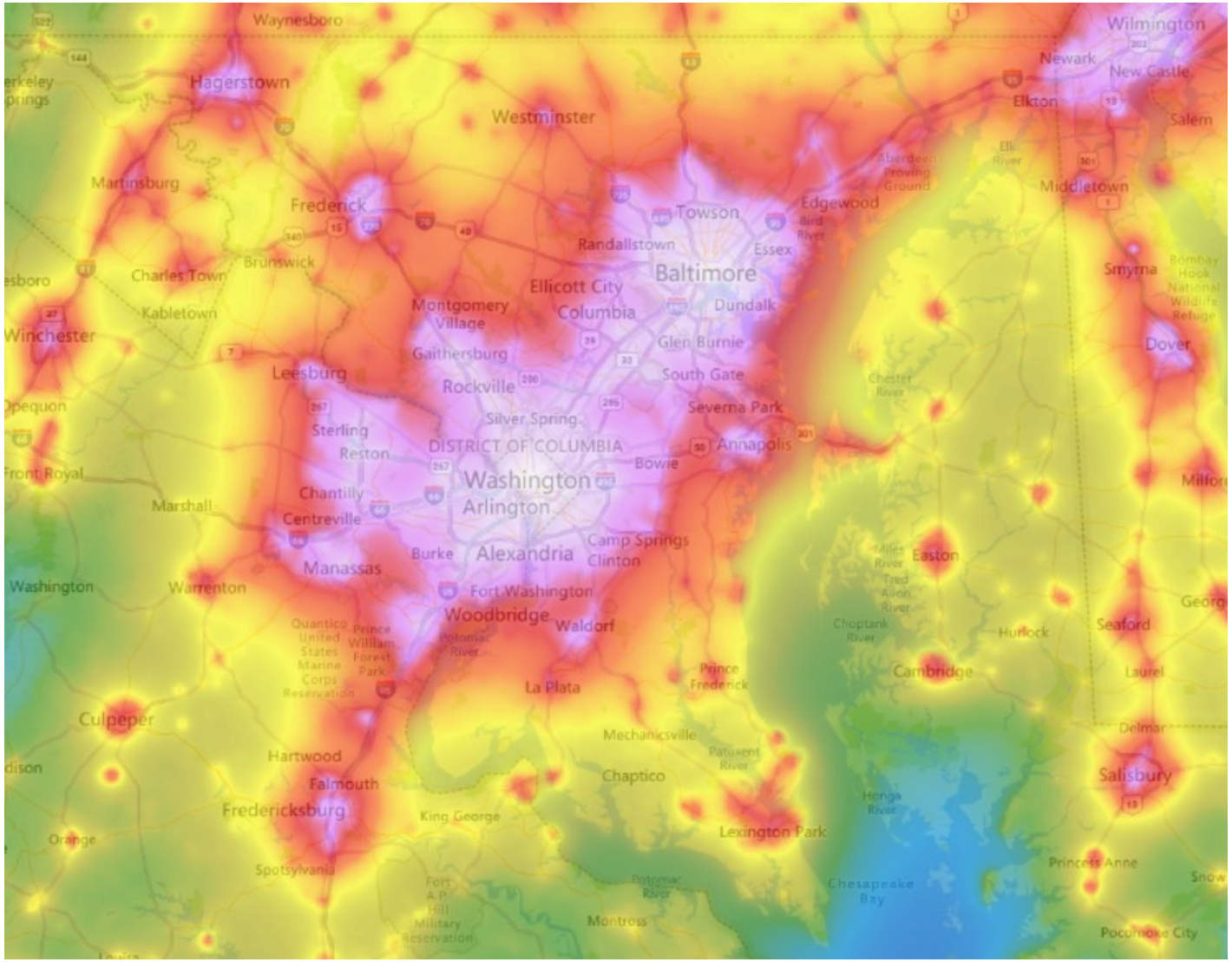
- Glare
- Light Trespass
- Sky Glow

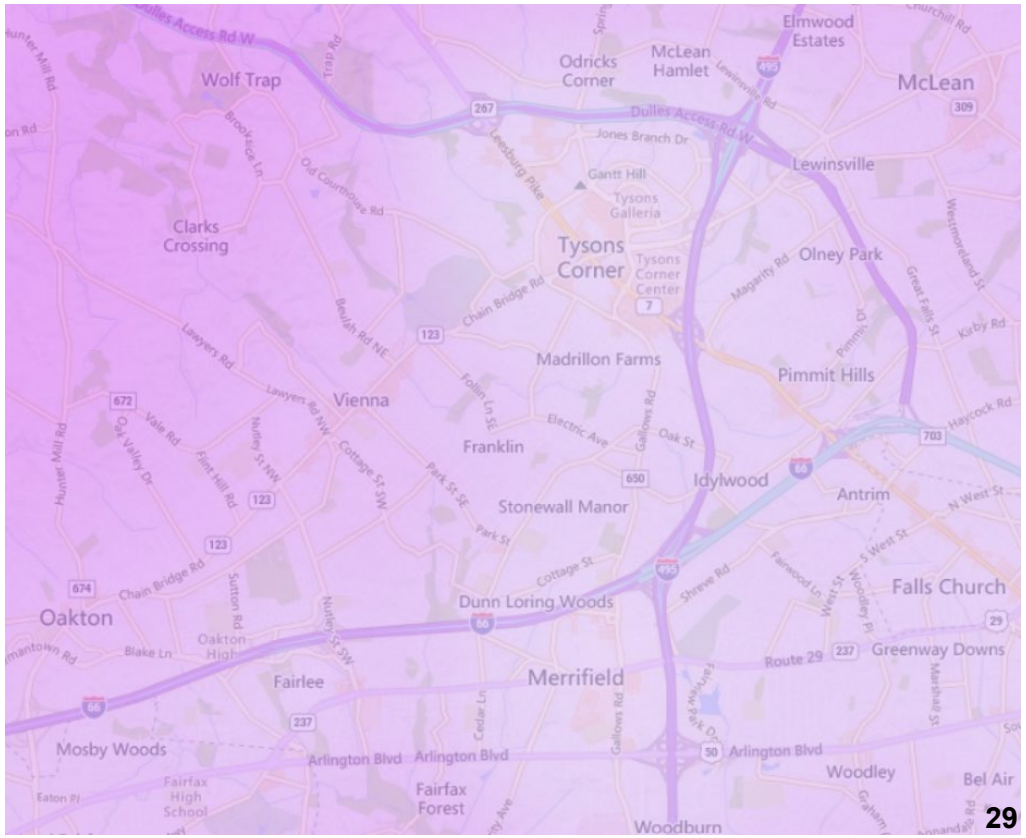
Can be minimized by:

- Directional lighting
- Full cut-off or shielded luminaires
- Curfews

Bortle Scale

Regional Light Pollution





Quality Lighting Systems

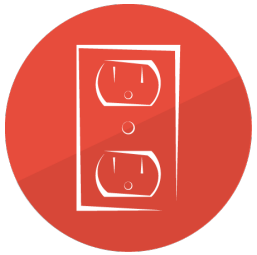
Focusing on human perception helps guide a quality lighting design that better supports people & the environment than focusing only on amounts of lighting.

Light Trespass

Streamline Maintenance

Light Pollution

Health & Wellbeing



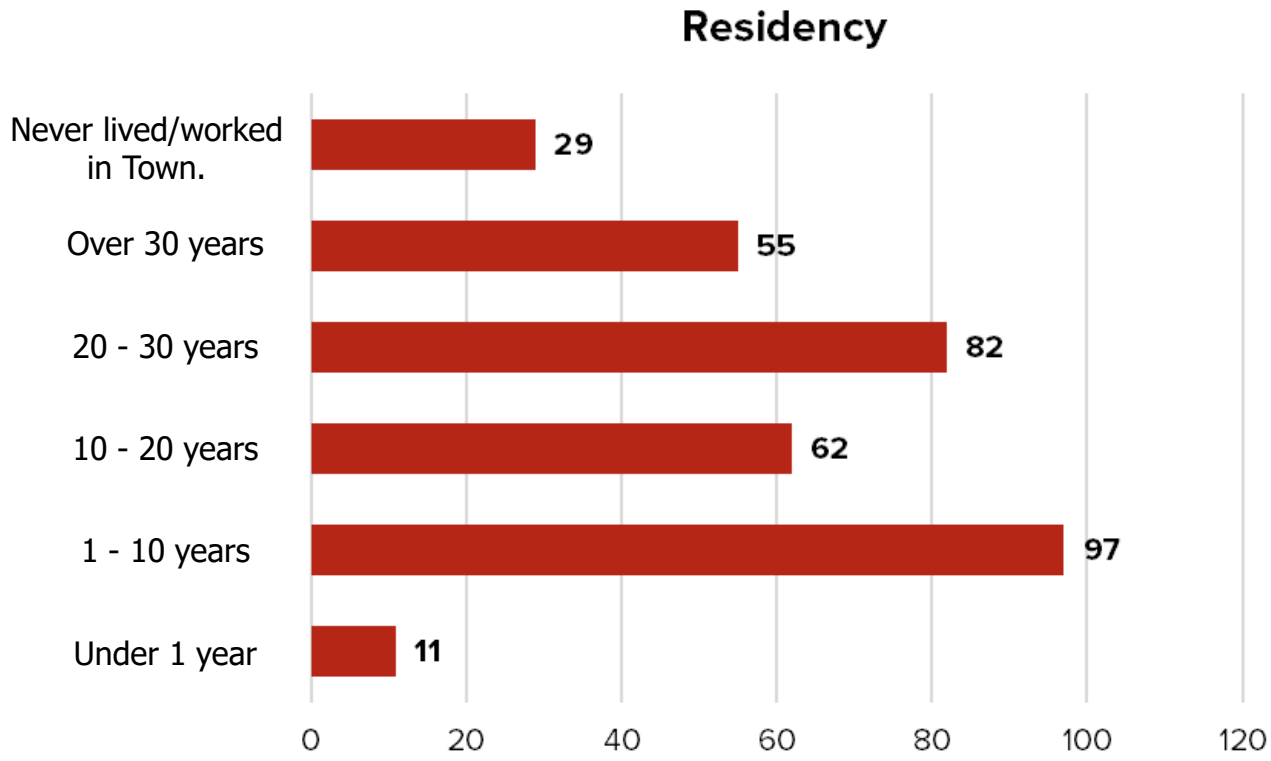
Energy Conservation

Wildlife Protection

Community Survey Results

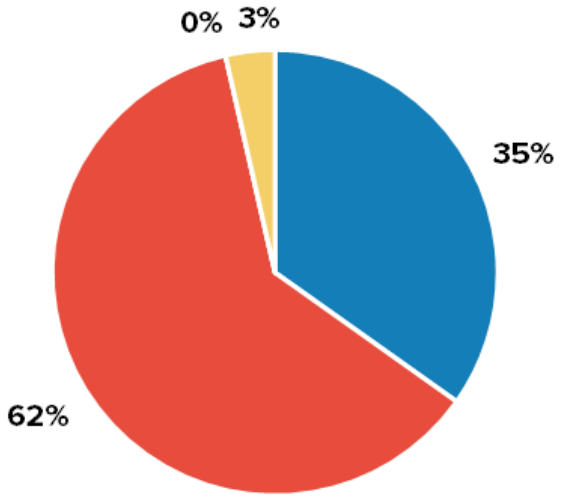
Lighting Preferences & Nighttime Behaviors Survey

- Open from Mid-October 2024 through Mid-March 2025
- 25 Questions on demographics, lighting, and nighttime behavior patterns
- 336 Responses Analyzed
- 799 Unique Free Responses Analyzed

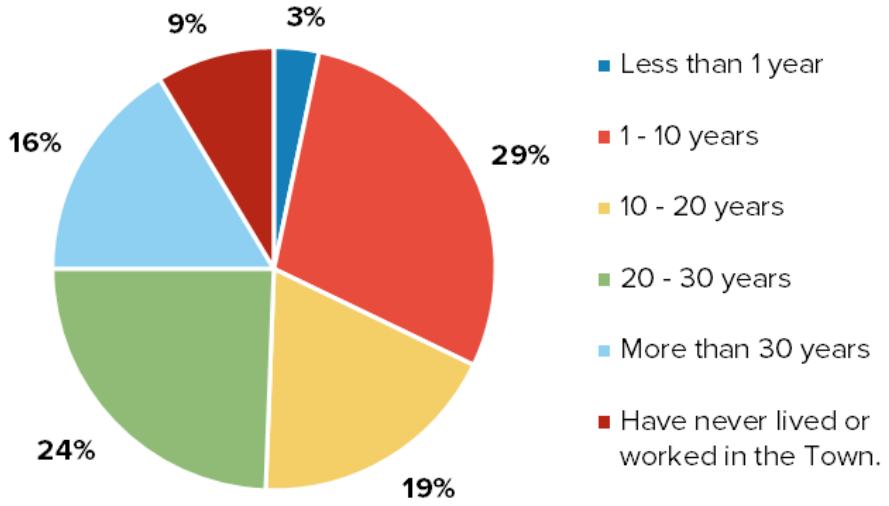


Demographics

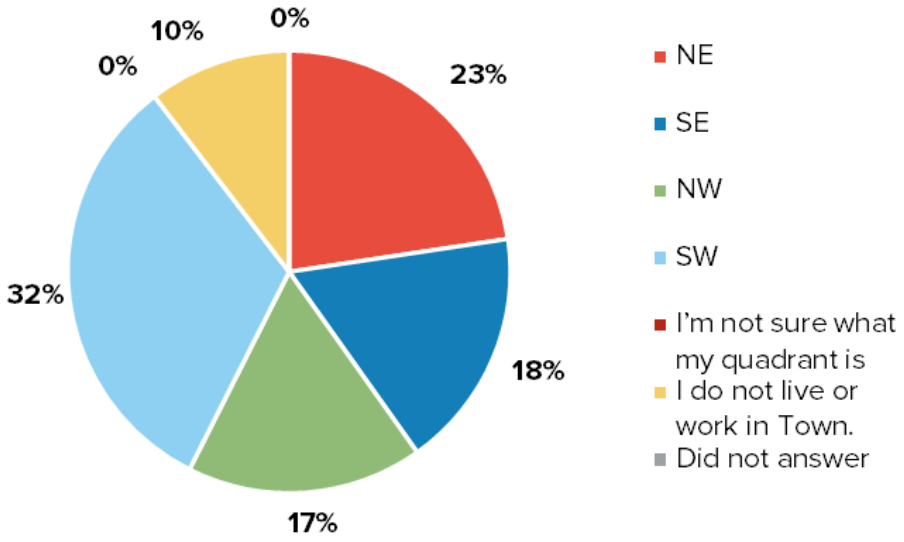
Gender Distribution



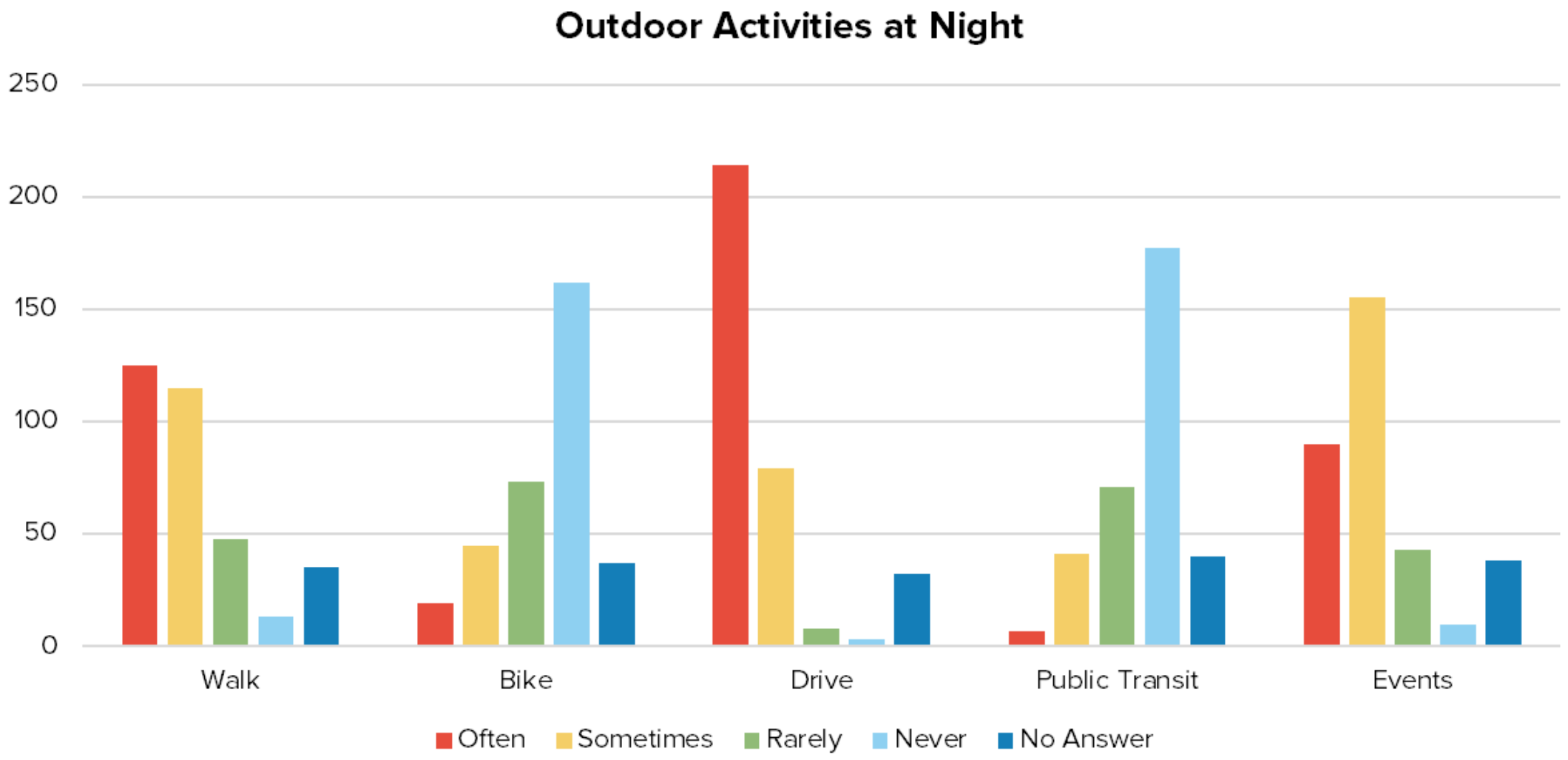
Length of Residency



Quadrant Distribution

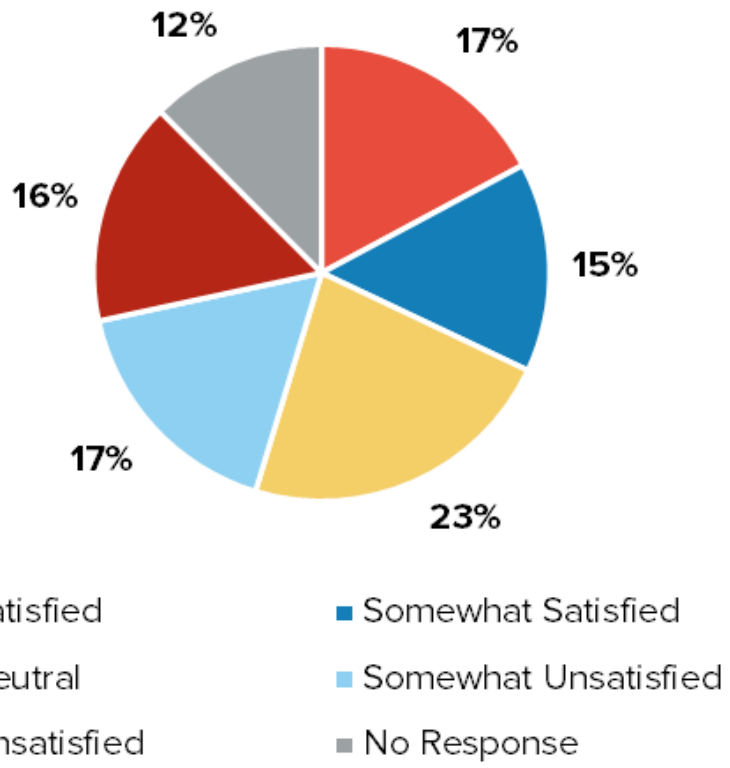


Nighttime Activity in the Town

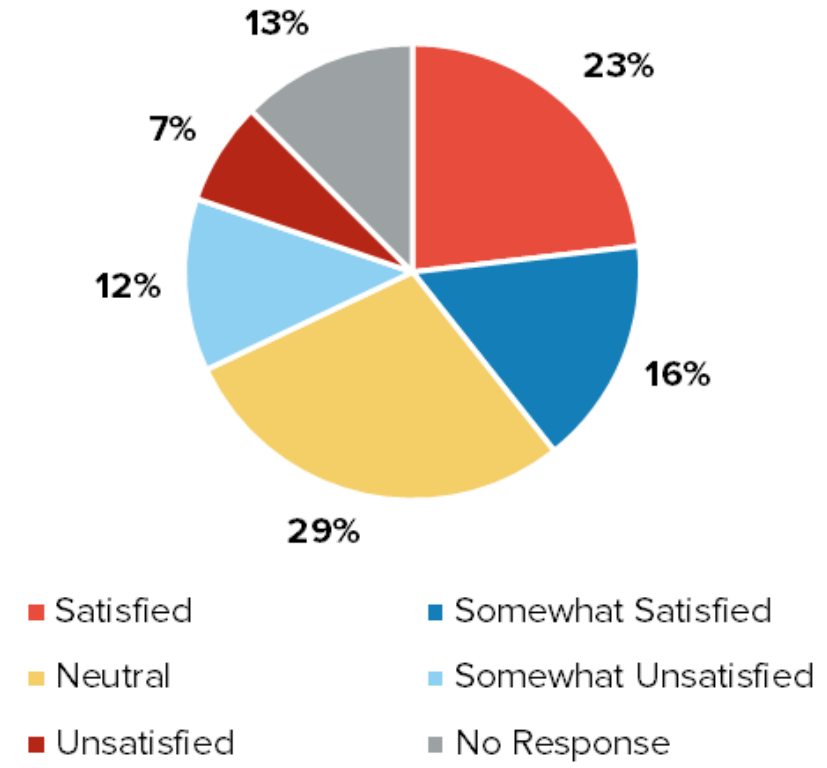


Aesthetic Satisfaction

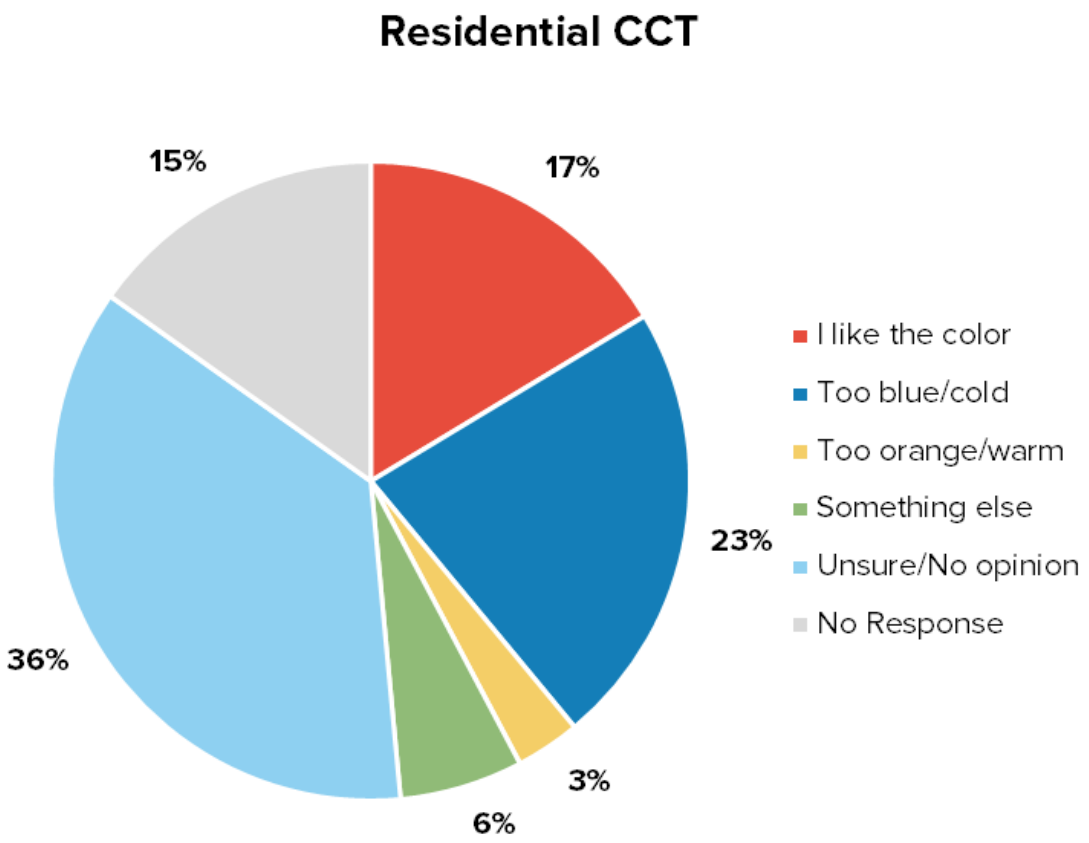
Outdoor Lighting Aesthetic Satisfaction

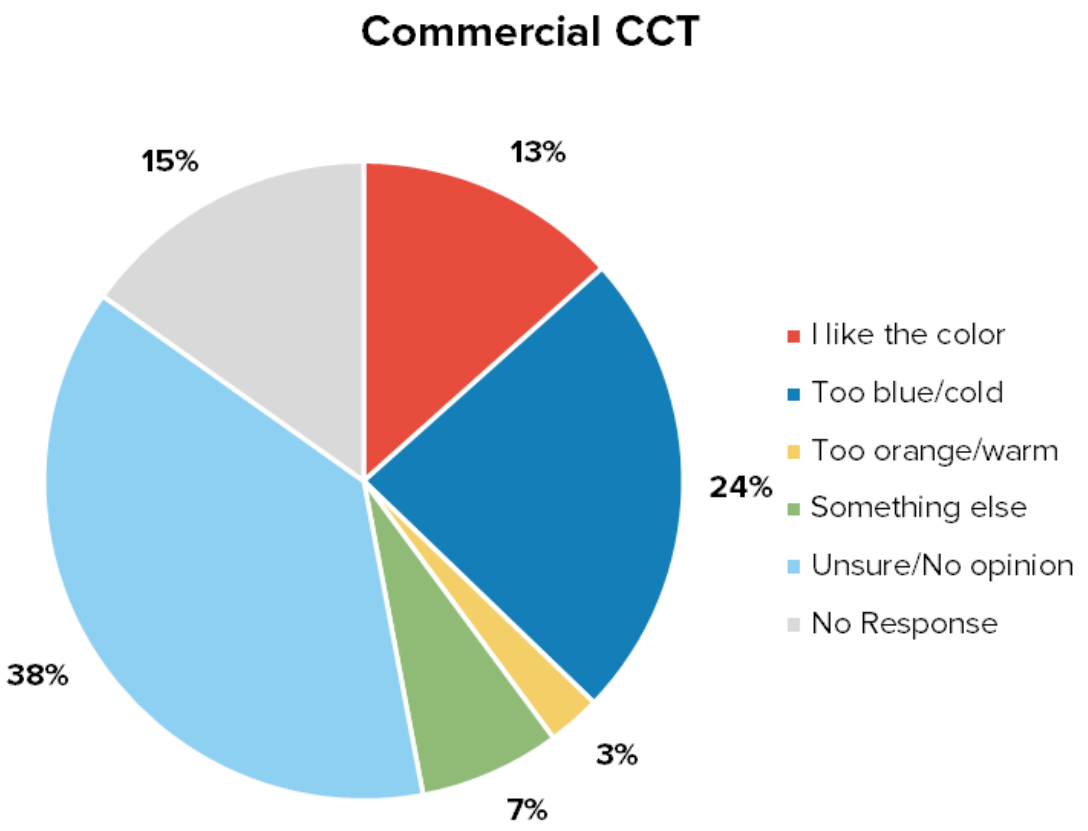


Lighted Signage Aesthetic Satisfaction

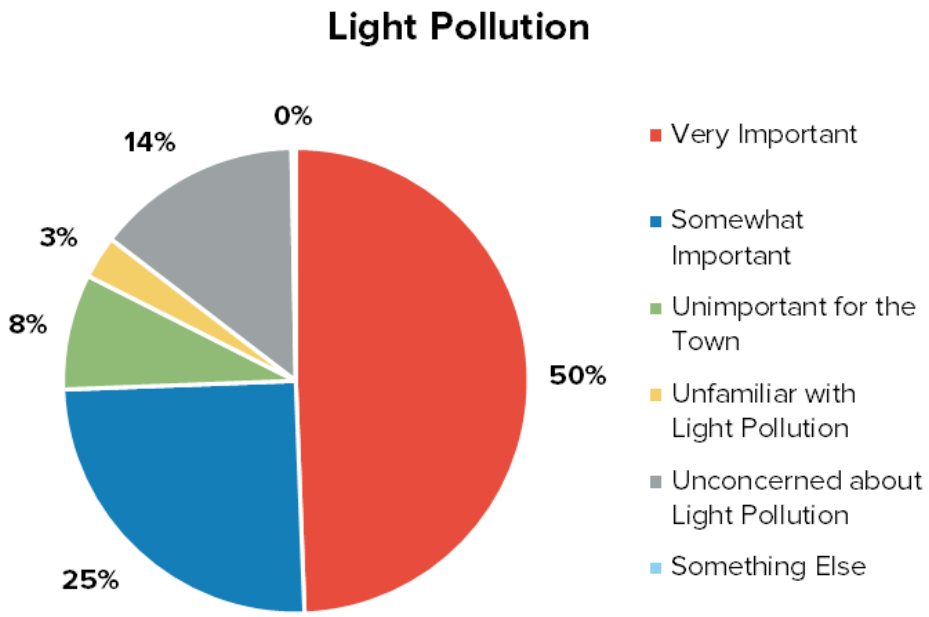


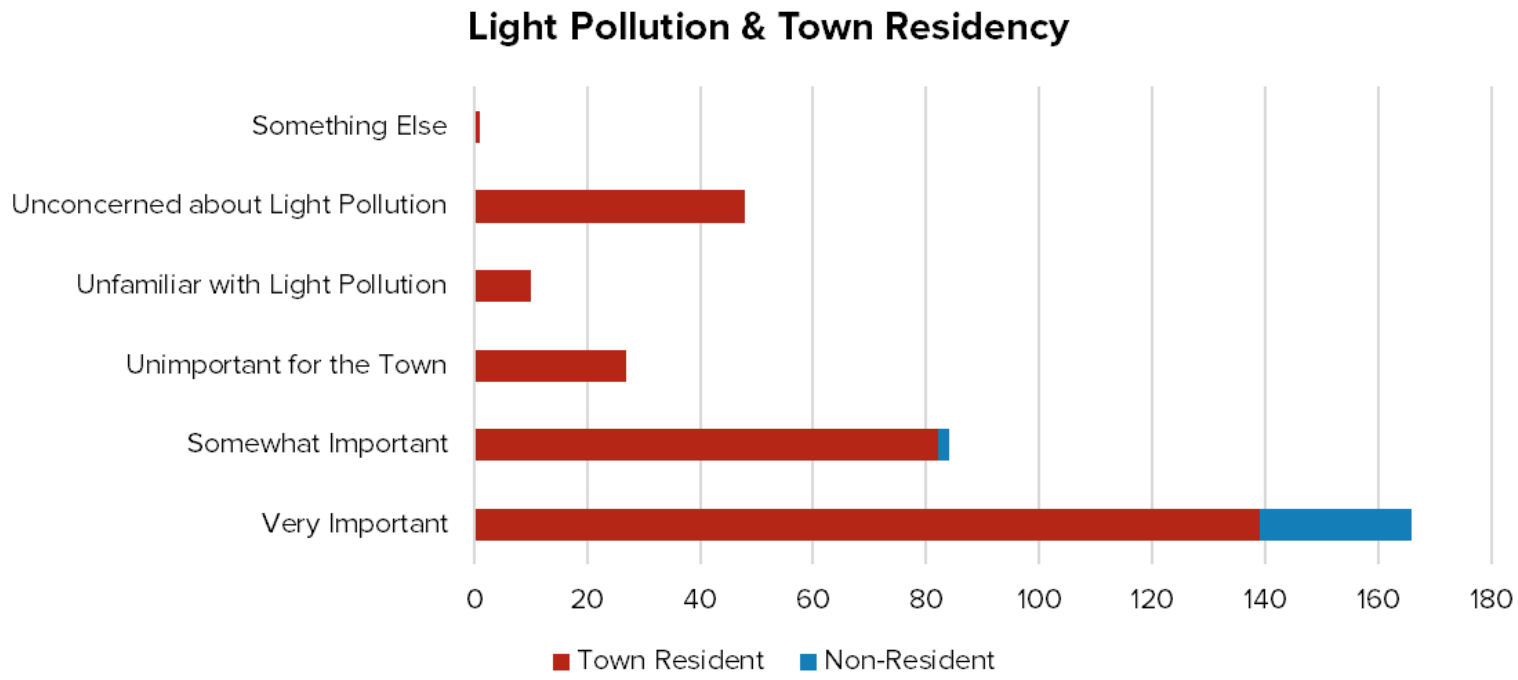
Color Temperature



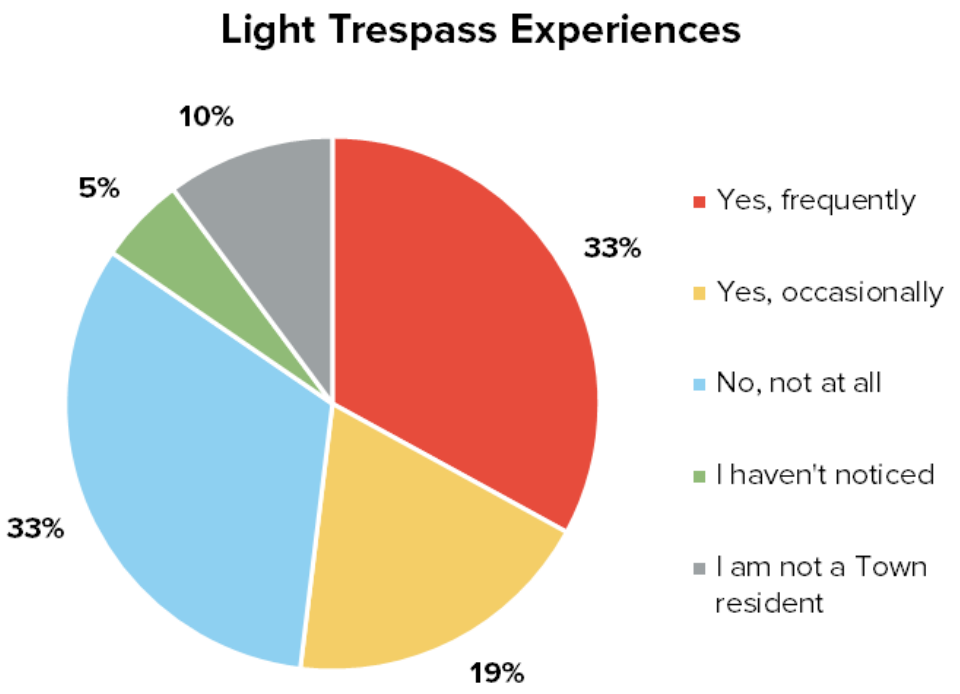


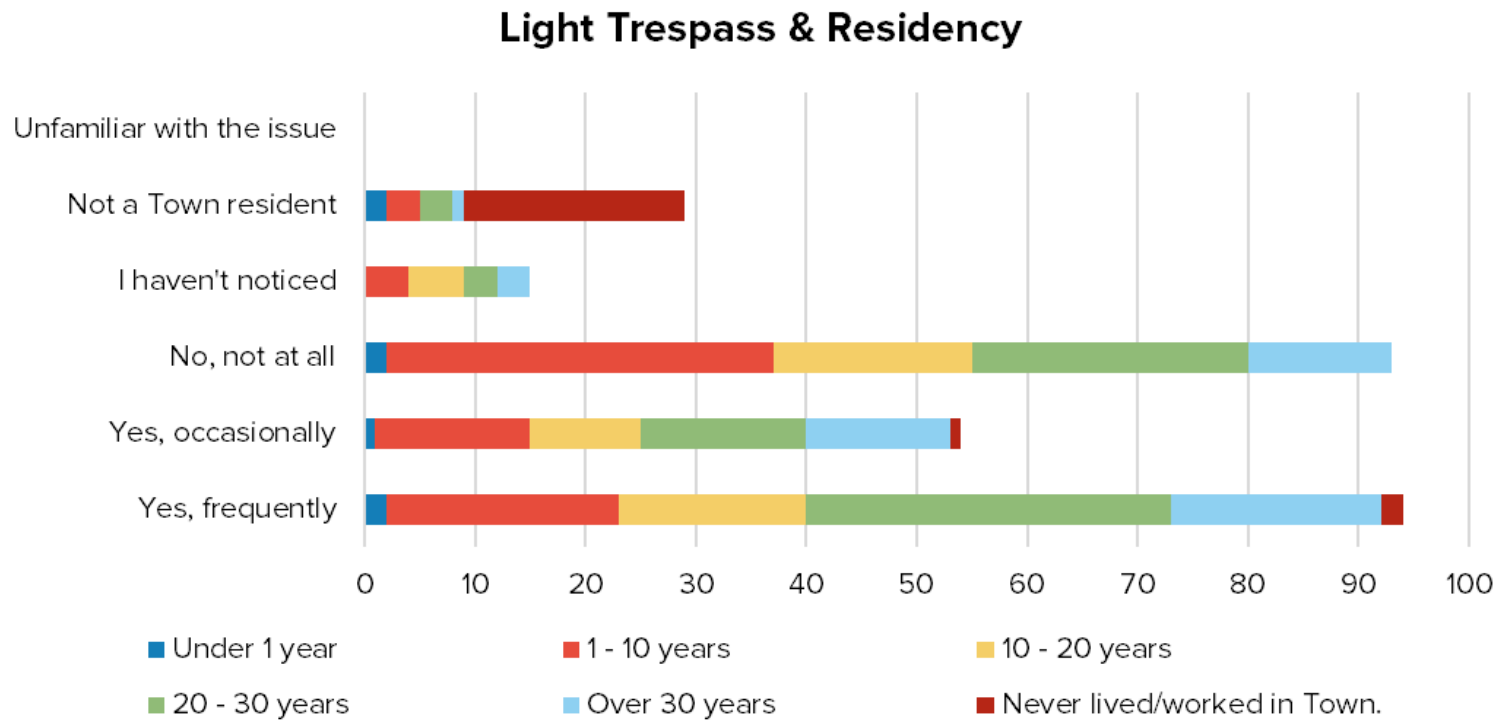
Light Pollution



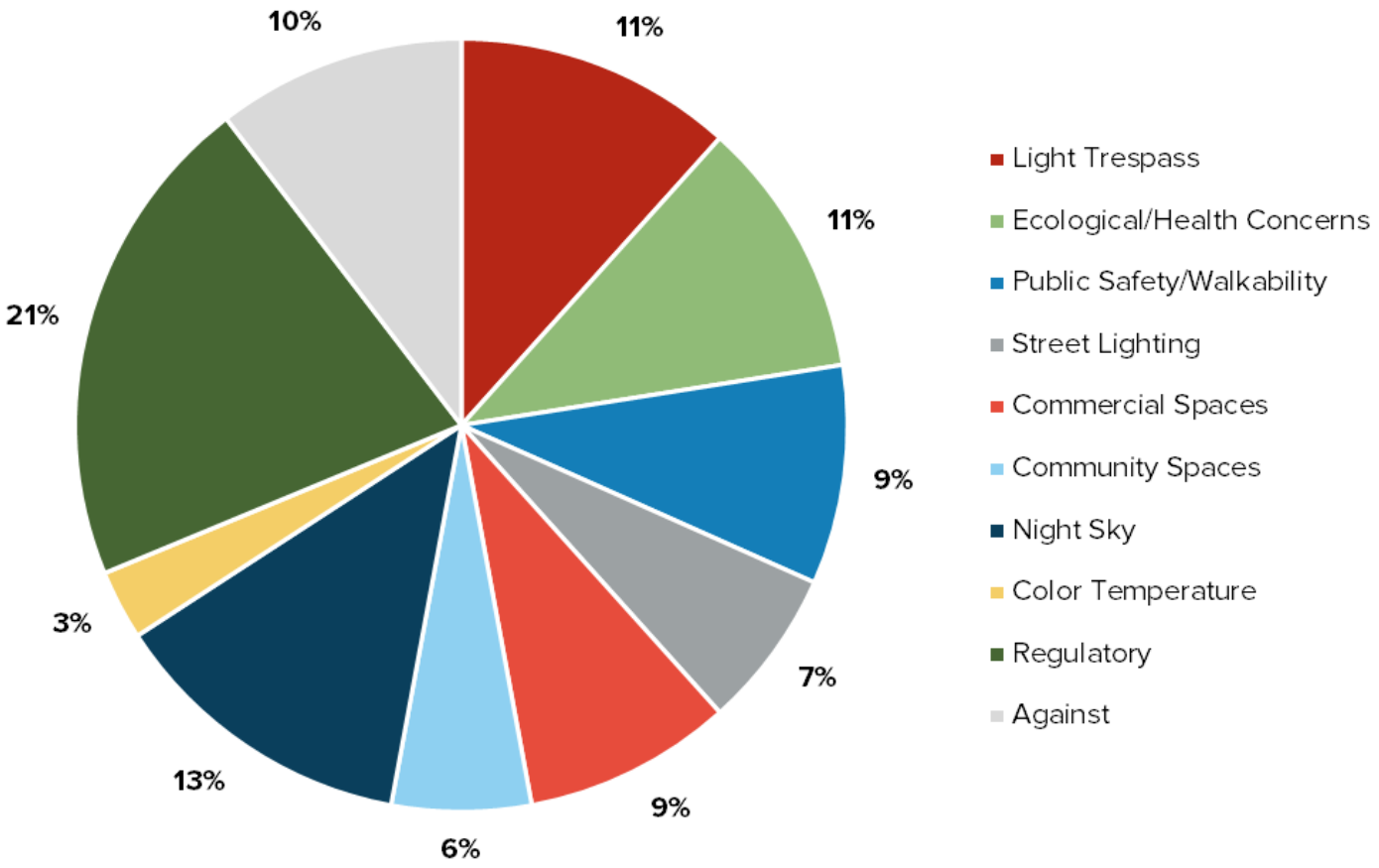


Light Trespass





Free Response: What do you hope a new outdoor lighting ordinance will accomplish for the Town of Vienna?



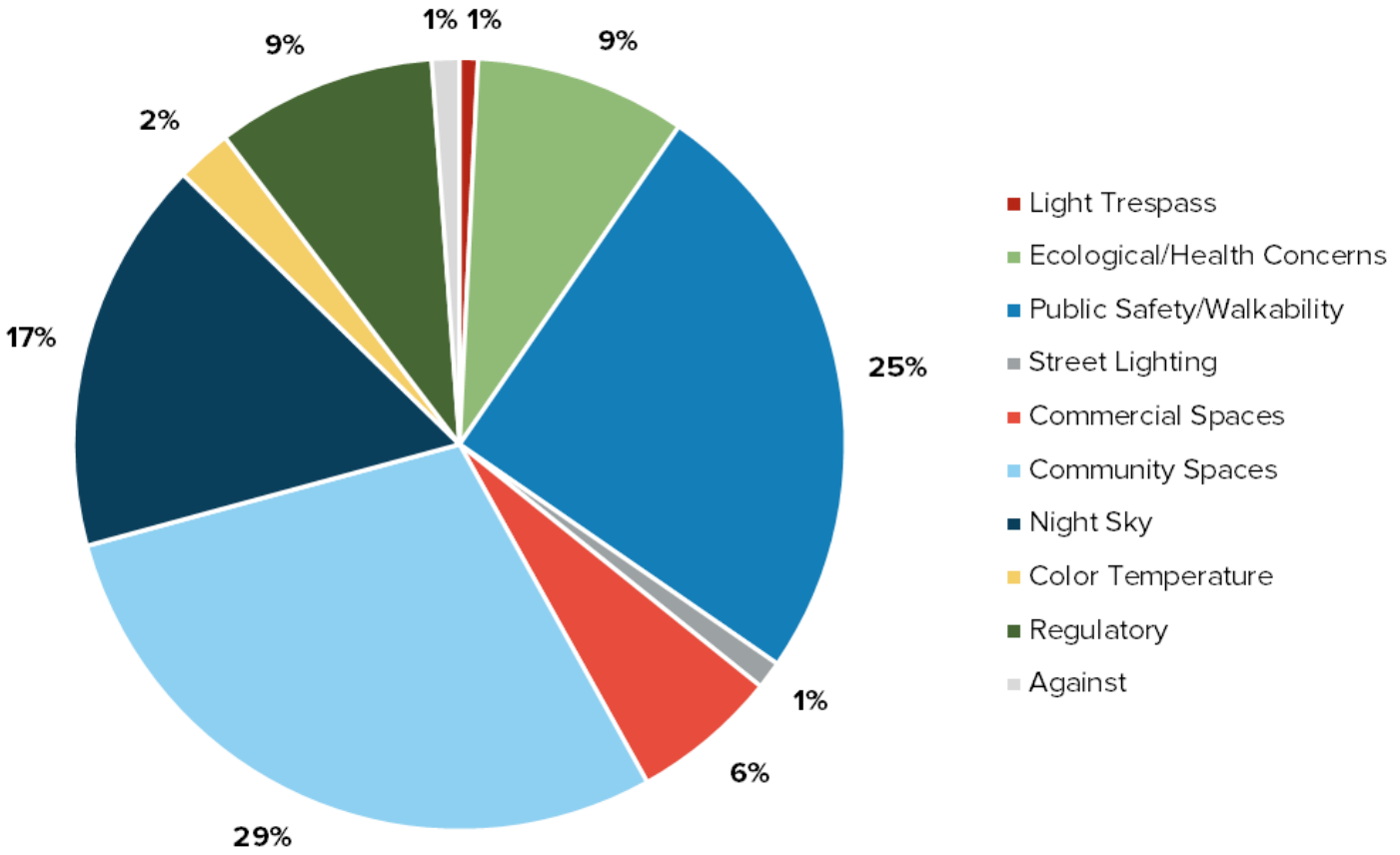
"A new lighting ordinance would ensure that light-energy is not wasted by lighting the sky, and interfering with wildlife needs"

"Less nighttime light pollution in town and regulations for private property. My neighbor has spot lights they often keep on all night and it's very disturbing to sleep when the light shines on my house. "

"As town residents become older eye sight is an important consideration. Provide better focused lighting."

"I've never thought about the Town's lighting ordinance once before this survey."

Free Response: In the future, I want nighttime in the Town of Vienna to feel like…



"A cozy suburban town with just enough light to see. Not a bright city."

"Balanced! Thirty years ago our Town did not have this level of light pollution."

"Dark enough to see some stars, light enough to feel safe"

"a safe place for an evening stroll."

Role of Lighting Regulations

How Municipal Regulations Can Help

Community Lighting Needs:

- Purpose & Goals
- Residential vs. Non-Residential
- Applicability & Amortization
- Exemptions & Prohibitions

Defines General Lighting Requirements:

- Light Level
- Uplight control
- Trespass thresholds
- Nighttime hours or curfews
- Spectrum / CCT

Procedures:

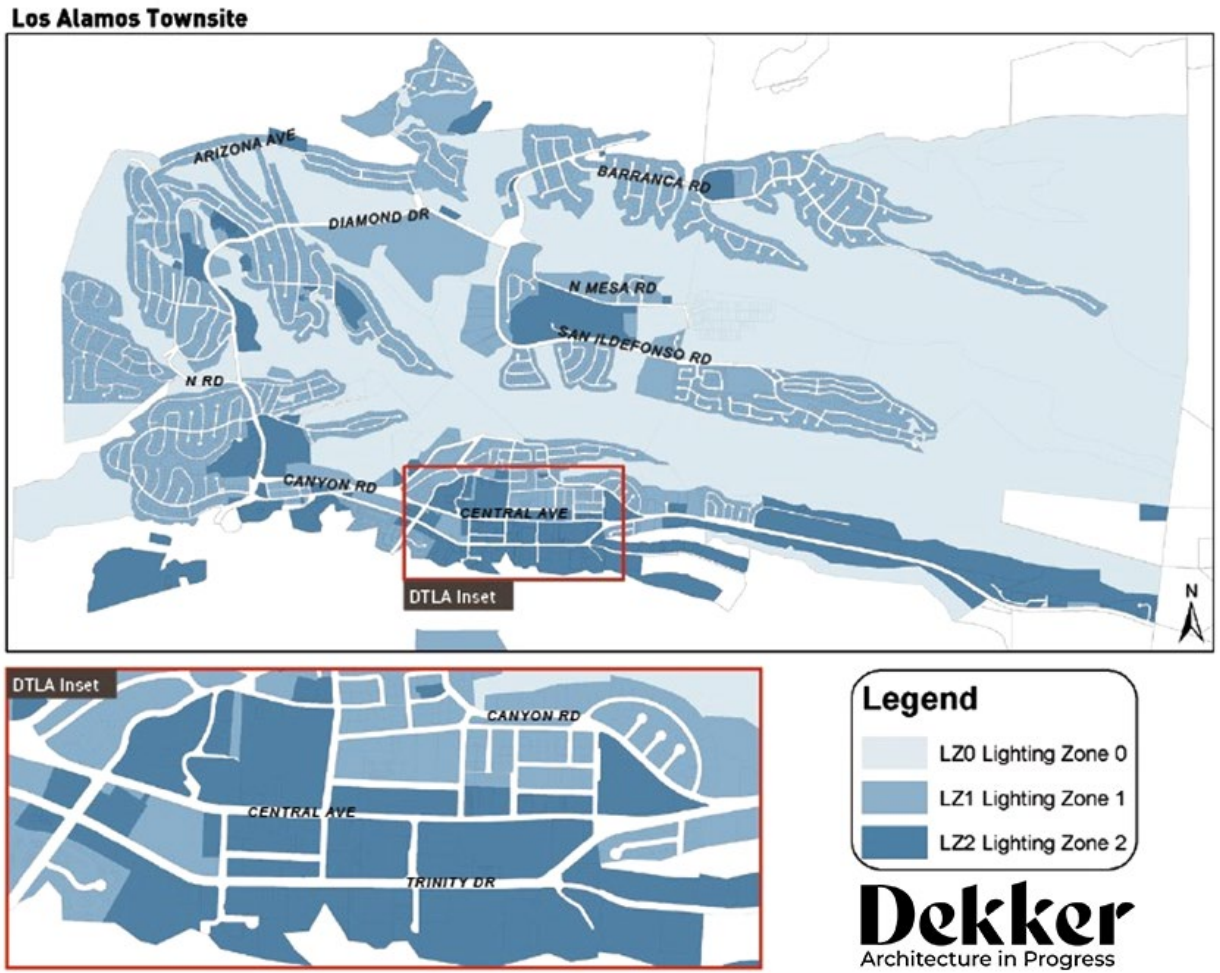
- Application Process
- Enforcement & Penalty

Lighting Zones

- Protects communities and the natural environment from the unintended consequences of excessive or misapplied light at night
- Best used by municipalities, counties, and states as a planning strategy
- Foundational for many illuminance recommendations and their additional auxiliary design and energy standards

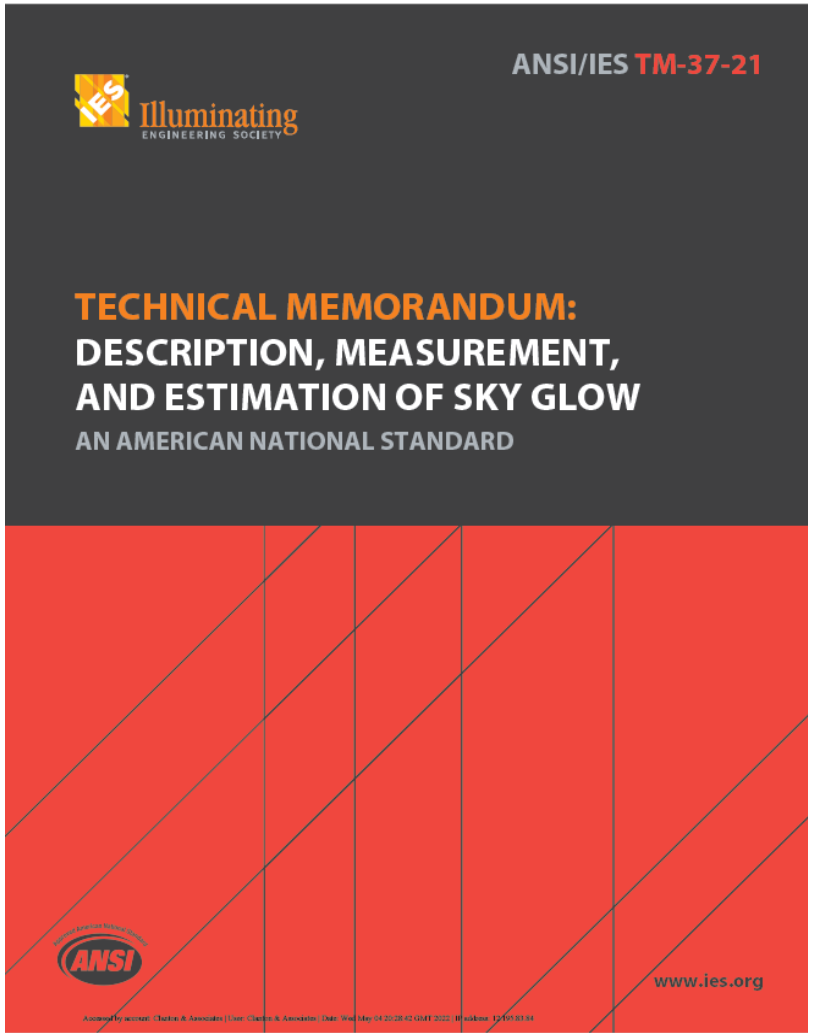
Current Lighting Zones

- NLz – Natural Dark Zone, no lighting allowed
- Lz0 – Parks and Protected Space, Rural Farms
- Lz1 – Residential, Office, Service, Institutional
- Lz2 – Small/Mid City Commercial, Industrial
- Lz3 – Large City Commercial, Hospitality, Heavy Industrial
- Lz4 – Special District Use Only



Dekker
Architecture in Progress

Skyglow & Health Risk (TM-18)

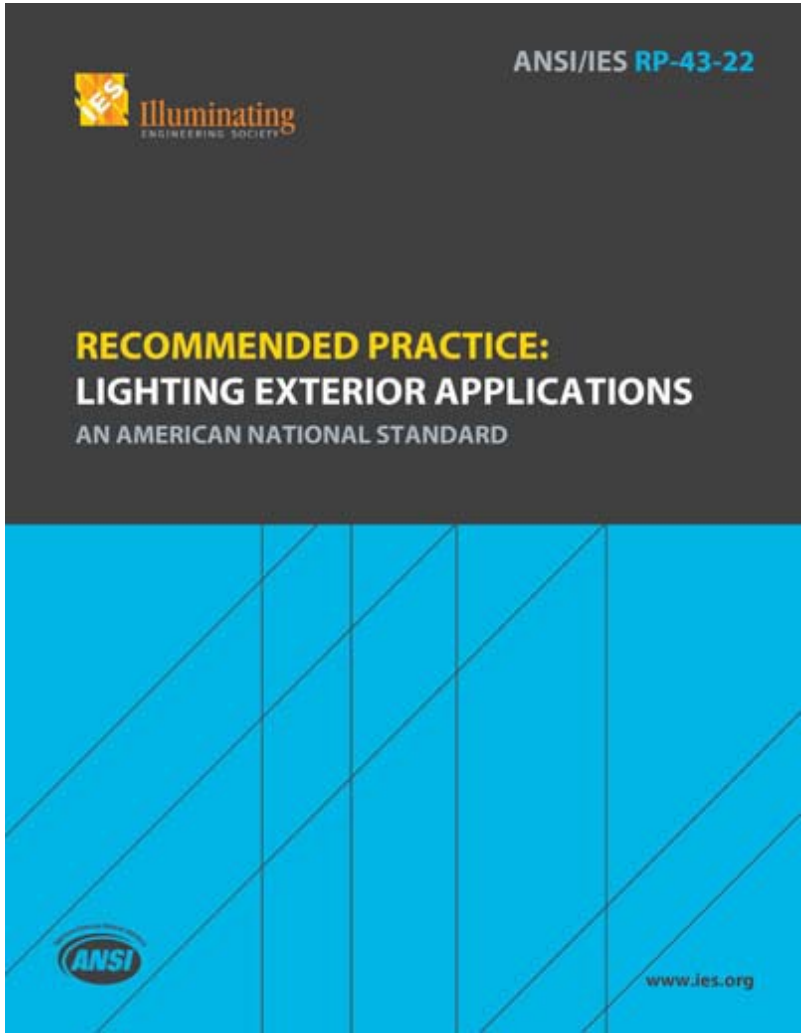


- "*Because blue light is more strongly scattered in the atmosphere, it is more likely to be eventually redirected back toward earth, creating the physical manifestation of sky glow. In addition, advances in biology are showing that many living organisms are sensitive to light at night, and particularly blue light.*
- "*Since the effects of optical radiation can be profound for human health and well-being, it is increasingly important for the lighting community to understand the direct biological influences of light/dark cycles.*"
- "*Exposure between 1 lux and 5 lux (0.1 fc and 0.5 fc) at the cornea of specific monochromatic wavelengths of optical radiation (460nm and 509 nm, respectively) could suppress melatonin in healthy humans.*"

Related:

- Flagstaff, AZ, the first IDA Community in 2001, uses 1800-2200K
- California Bill Proposal- State properties would use 2700K maximum and dim to 50% during curfew
- Maui, HI, Bill #21 (Passed Oct 2022) –Limits the amount of blue spectrum (400-500nm) to 2% and limits uplight to U0

Light Level: ANSI/IES RP-43



ANSI/IES RP-43 Illuminance Recommendations:

- Orientation / Wayfinding
- Reassurance
- Terrain Safety
- Atmosphere / Identity
- Enjoyment

Light Levels: ANSI/IES RP-43

ANSI/IES RP-43: Lighting for Pedestrians in Outdoor Environments	Lighting for Human Vision, Visibility, and Reassurance								Lighting for Responsible Design			
Table A-3	Recommended Average Maintained Illuminance Targets[10]								Optic Control		Controls	Spectrum
	Illuminances are at height of Task Surface (TS) above finished grade (AFG)											
	Horizontal Illuminance				Vertical Illuminance				Glare, Uplight Ratings		Vacancy, Seasonal, & Curfew Reduction	Acceptable Short Wavelength Content[7]
	Target E_h @ Height AFG		Uniformity		Target E_v @ Height AFG		Uniformity					
APPLICATION TASK/AREA[8]	lux @ m	(fc @ ft)	Ratio (Avg:Min)	Ratio Basis	lux @ m	(fc @ ft)	Ratio (Avg:Min)	Ratio Basis	Max Glare Rating (G)	Max Uplight Rating (U)	Light Output During Controls Reduction	Very Low (VL); Low (L); Medium (M); High (H); Very High (VH)
CONTEXT, ORIENTATION, WAYFINDING, REASSURANCE												
Façades												
Façades (low reflectance materials, <0.3) [10]												
Façades (medium reflectance materials, ≥0.3 and ≤0.6) [10]												
Façades (high reflectance materials, >0.6) [10]												
Building Entrances, Drop-Off, Pick-Up												
Building Entrances [2,10]												
LZ4												
Lower limit (avg.)	30 @ 0.00	(3 @ 0.0)	5:1	Avg:Min	10 @ 1.5	(1 @ 5.0)	5:1	Avg:Min	G2	U3	20% to 50%	VL, L, M, H
Upper limit (avg.)	50 @ 0.00	(5 @ 0.0)	5:1	Avg:Min	30 @ 1.5	(3 @ 5.0)	5:1	Avg:Min				
LZ3												
Lower limit (avg.)	20 @ 0.00	(2 @ 0.0)	5:1	Avg:Min	8 @ 1.5	(0.8 @ 5.0)	5:1	Avg:Min	G2	U3	20% to 50%	VL, L, M
Upper limit (avg.)	40 @ 0.00	(4 @ 0.0)	5:1	Avg:Min	20 @ 1.5	(2 @ 5.0)	5:1	Avg:Min				
LZ2												
Lower limit (avg.)	10 @ 0.00	(1 @ 0.0)	5:1	Avg:Min	4 @ 1.5	(0.4 @ 5.0)	5:1	Avg:Min	G2	U2	20% to 50%	VL, L, M
Upper limit (avg.)	20 @ 0.00	(2 @ 0.0)	5:1	Avg:Min	10 @ 1.5	(1 @ 5.0)	5:1	Avg:Min				
LZ1												
Lower limit (avg.)	5 @ 0.00	(0.5 @ 0.0)	5:1	Avg:Min	2 @ 1.5	(0.2 @ 5.0)	5:1	Avg:Min	G1	U1	20% to 50%	VL, L
Upper limit (avg.)	10 @ 0.00	(1 @ 0.0)	5:1	Avg:Min	5 @ 1.5	(0.5 @ 5.0)	5:1	Avg:Min				

Questions?


Thank You!
CLANTON & ASSOCIATES
LIGHTING DESIGN AND ENGINEERING