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LIGHTING STANDARDS

The most recent version of this document can be found at:

http://www.colliergov.net/your-government/divisions-a-e/county-manager-s-office/standards

ISSUED BY: COUNTY-WIDE LIGHTING TEAM

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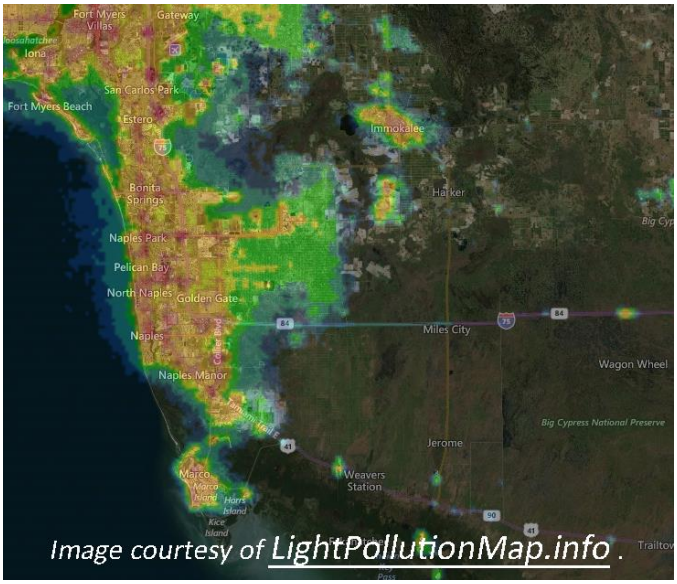
EXECUTIVE SUMMARY

Lighting is an important aspect to Collier County's residents and visitors for safety, security, livability, and enjoyment. Well-coordinated and designed lighting systems are an effective way to enhance the feeling of security and comfort throughout the County. Presently, outdoor lighting standards are included in parts of the existing land development code, zoning ordinance or code of laws for automobile fueling facilities, convenience stores, golf courses, parking facilities, security requirements and general shielding standards. Additional standards have been determined on a case-by-case basis during a zoning process or as the result of hazardous interference with automotive and pedestrian traffic on an adjoining street. Subsequently, an integrated approach has been taken to describe and define what should be best management and common practices for the illumination and installation of all lighting is essential to benefit county residents and visitors.



The Collier County Board of County Commissioners (hereby referred to as "BCC" or "County") is responsible for the management of both indoor and outdoor lighting at a variety of locations throughout the County including roadways, facilities, parks, beaches, airports, and utility sites. The BCC desires to establish within its code, guidelines that preserve and enhance the character of the County and ensure that lighting does not become a nuisance within the community. In March 2013, during the rezoning review for Top Hat Auto PUD, the BCC requested staff to address ambient outdoor lighting in what is becoming a growing trend by changing technologies for light transmission onto private property and its impact to the neighboring environment. It is by the establishment of an outdoor lighting policy, guidance in the proper design, installation and in the long-term operations that sustainable lighting practices and standards can be upheld. In March 2016, the BCC highlighted not only the cost and environmental benefits of "Dark Skies" lighting, but also the safety benefits as well.

In April of 2016, the CMO (CMO) created a self-managed team comprised of the major lighting stakeholders throughout the agency divisions and tasked the team with the following goals:

- Assess the current state of lighting throughout the County
- Determine the current best practices for lighting employed by other government agencies and private businesses
- Find ways to incorporate International Dark-Sky Association (IDA) guidelines and recommendations to reduce the amount of artificial light that is projected into neighboring properties, environmentally sensitive areas, as well as the atmosphere
- Develop a set of lighting standards and guidelines that would apply across the agency for all County-owned and/or maintained sites and structures
- Prepare a return on investment (ROI) analysis for transitioning existing County lighting to more energy efficient options while incorporating the new standards and guidelines

The initial study was to determine what needs to happen as common practice, who are the relevant stakeholders and a general knowledge of illumination, excessive light spillage or trespass and dark sky

outdoor lighting technology. After reviewing other jurisdictions' (including out of state) practices and installation experiences, the team consulted with IDA's staff to obtain their recommended guidelines for exterior lighting best practices and guidelines. It then became clear that good outdoor lighting should shield light when it is needed, minimize energy consumption, curtail negative impacts to the environment and people, and maintain uniformity of illumination.

The team reached a consensus for the County to start a process to improve the quality of life for its citizens with a simple and practical approach. This approach will involve the County finding ways to improve the lighting at its own structures and sites. The lighting team firmly believes that the County leading by example will be the most effective approach to getting the buy-in of its businesses, citizens, and visitors to adopt similar practices. The first step of the process is to apply the establishment of guidelines and standards for interior and exterior lighting at County-owned and/or maintained properties.

VISION

To be a state and national leader in community lighting standards and practices, while protecting and preserving the natural environment and view of the night sky.

MISSION

To develop standards and practices to effectively, efficiently, responsibly, safely, and securely illuminate Collier County.

This mission will be achieved by obtaining BCC direction and approval to implement consistent lighting systems, practices, and standards for each of the County's owned and/or maintained roadways, facilities and structures, utilities sites and structures, parks, and beaches.

Once the lighting standards have been adopted by the BCC for County-owned and/or maintained sites and structures, the Lighting Team envisions a transparent process for offering stakeholders an opportunity to provide input and obtain public feedback prior to the adoption of the lighting standards through any ordinance or amendments to the Land Development Code. This will assist the various departments, plan reviewers, and code enforcers in the identification of minimum and maximum illumination standards such as performance, prescriptive, or a hybrid of both methods based upon differential land use zoning categories or by an overlay lighting district.

GUIDING PRINCIPLES

Lighting designs should minimize light trespass/pollution and impact on neighboring properties and natural habitats while ensuring safety, security, utility, productivity, commerce, livability, and enjoyment.

Lighting equipment should be responsibly selected and sourced through careful consideration of the short and long-term financial, environmental, and social costs incurred through lighting.

Energy and resources should be conserved to the greatest extent possible.

Designs should be practical as well as financially and technologically feasible, based on industry-acceptable best practices.

Lighting systems should be properly implemented, maintained, and managed.

APPLICABILITY

The standards set forth in this administrative guidebook shall apply to all properties, infrastructure, and facilities owned and/or maintained by Collier County, a political subdivision of the State of Florida, and the Collier County Water-Sewer District. These locations include (but are not limited to) roadways, facilities, structures, campuses, airports, utility locations, parks, and beaches. It is *encouraged* that other governmental agencies that own and/or maintain properties, infrastructure, and/or facilities within the confines of Collier County adopt the standards described in this guidebook. However, this guidebook is not intended, nor does it have the legal authority, to apply to entities outside of the BCC. Similarly, these standards **do not** apply to private residences and businesses.

The standards contained herein are prospective and **will not** require existing lighting systems to be immediately retrofitted or replaced to ensure compliance. Instead, the primary goal is to ensure all new and retrofitted lighting meets the standards from this point forward. Compliance with the standards will be required during new installations as well as major repairs, remodels, and modernizations.

These standards shall be referenced in all future bids, contracts, purchase orders, and any other type of purchases that involve the installation or modification of lighting systems. All CMO Departments and Divisions that maintain construction standards shall reference this guidebook in their construction standards documents.

The standards contained within this guidebook shall be considered *minimum* requirements for projects at County-owned and/or maintained sites and structures, which do not relieve the Design Professional or Contractor from mandatory code compliance and/or coordination on specific project requirements. No portion of this guidebook may be copied and used as the *sole* specification for any project.

Any exceptions to these standards must be approved in writing by the CMO division(s) responsible for the oversight and maintenance of the lighting system(s). All construction design drawings are to be approved by the responsible CMO division(s) prior to commencement of the project.

STANDARDS - GENERAL

This section applies broadly to all artificially lighted areas.

- Lighting shall, at a minimum, meet all applicable local, state, and federal codes and regulations.
  - If the standards contained herein conflict with the codes and regulations mentioned above, the most restrictive requirements shall prevail.
- Lighting shall meet the illumination levels and uniformity ratios in accordance with the current recommended practices of the Illuminating Engineering Society of North America (IESNA) or as otherwise specified herein.
  - Illumination levels shall not exceed the *maximums* set forth by IESNA.
- All lighting equipment must be of commercial quality and listed with a Nationally Recognized Testing Laboratory (NRTL) such is Underwriters Laboratories (U.L.) or Electrical Testing Labs (ETL).
- The color rendering index (CRI), or other similar color accuracy specifications, of lighting products shall be considered when designing and installing lighting systems to ensure that the color accuracy of the provided illumination meets or exceeds the needs of the application.
- Subject to appropriation, all lighting systems shall be regularly maintained such that they continue to provide acceptable illumination levels, glare control, and minimize light trespass.

ACCESSIBLE DESIGN CONSIDERATIONS

- The design of lighting systems shall meet the Americans with Disabilities Act of 1990 (ADA) requirements as outlined below.
- "State and local government facilities must follow the requirements of the U.S. Department of Justice **2010 ADA Standards for Accessible Design**, including both the Title II regulations at 28 CFR 35.151; and the 2004 ADAAG at 36 CFR part 1191, appendices B and D." The requirements include:
  - "Each facility or part of a facility constructed by, on behalf of, or for the use of a public entity shall be designed and constructed in such manner that the facility or part of the facility is readily accessible to and usable by individuals with disabilities."
  - "Each facility or part of a facility altered by, on behalf of, or for the use of a public entity in a manner that affects or could affect the usability of the facility or part of the facility shall, to the maximum extent feasible, be altered in such manner that the altered portion of the facility is readily accessible to and usable by individuals with disabilities."
- More broadly, lighting systems should be designed in a way that affords the highest practicable level of accessibility to all staff, citizens, and visitors to ensure the usability and enjoyment of County facilities for everyone.

CRIME DETERRENCE & SECURITY CONSIDERATIONS

Lighting may provide both a real and psychological deterrent for continuous or periodic observation by a potential threat. Darkness can instill a sense of insecurity as it is very challenging for humans to determine threats and unsafe conditions without sufficient light. Without the feeling of safety that proper lighting can provide, people may choose to avoid dark spaces and thus hinder their enjoyment of the area. Conversely, areas that are overly illuminated can also negatively affect the perception of safety. Since the human eye can take some time to adjust to different lighting scenarios, overly bright areas can sometimes result in temporary blindness-type symptoms while the eye adjusts to large changes in illumination levels. Overly bright areas may also give the impression that the area is high-risk, which can discourage people from occupying the space.

The left photo below illustrates how dark areas in a scene paired with an overly bright security light (using a suboptimal fixture type) can make it very challenging to see a potential threat. The photo on the right illustrates how the proper use of shielded light can enhance threat detection.

Photos courtesy of the International Dark-Sky Association / FAU

The role of security lighting in deterring crime can often be subject to contentious debate. Historically, it was thought that increased lighting levels allows for better surveillance of potential offenders through

increased visibility and a greater likelihood people occupying spaces. It is also argued that higher lighting levels can lead to increased pride in the community, cohesiveness, and informal social control. On the opposite side of the argument, it is asserted that the judicious application of light in combination with motion-activated security lighting can prove to be a better deterrent. In factoring in the various lighting considerations and industry best practices, the Lighting Team became more closely aligned with the judicious application of lighting perspective and these lighting standards reflect that viewpoint.

At the most basic level, lighting designed for crime deterrence and security purposes should provide the ability for people to be able to:

- See at a sufficient distance to detect, and have adequate time to react to, a threat, and
- See where to go for safety or refuge if needed.

The objective is to illuminate threat without spotlighting the potential victim(s). More specifically, this type of lighting should provide the ability for someone to see the faces and bodies of people nearby without harsh or strongly directional shadows, identify whether they are a friend or potential foe, and whether they are exhibiting malicious body language and/or weapons. High risk areas, areas that could be used to conceal potential threats, or be used to entrap potential victims should generally have higher illumination areas than those designed for general use and activities. Some uniformity of lighting on the ground should also be provided to provide reassurance that there is no danger hiding in the shadows between the person and the area of refuge. Care should be taken to ensure that light sources are properly shielded and positioned to reduce glare, as glare limits the ability for people to see beyond lighted areas. Crime deterrence and security lighting is most effective when the contrast between very bright and very dark areas is reduced and shadows are minimized. The absolute level of light is less critical than the uniformity of the light for security purposes.

When continuous lighting for is required for crime deterrence and security purposes, care should be exercised in the design and implementation of lighting systems to ensure the desired outcomes are achieved. The illustration below shows how the proper selection and installation of a lighting system can reduce glare, skyglow, and light trespass effects while improving security and threat detection.

Illustration courtesy of the Florida Atlantic University

INFORMATION TECHNOLOGY CONSIDERATIONS

- Any system that will be connected to the agency network must be reviewed and approved by the BCC Information Technology (IT) Division.

- This process will include an architectural review along with an information security review of the product.
- Procurement and Lifecycle Management of any system connected to the agency network must adhere to CMO Administrative Procedures (CMA) # 5401.
- When remote automation/control systems are deployed for controlling light systems, the Design Professional / Contractor shall integrate those systems with existing County systems. During the project review process, the responsible CMO division(s) will advise which system (if any) is responsible for remote automation/control.
    - The primary objective of this requirement is to ensure the County will not have the responsibility of supporting and maintaining multiple systems that perform the same functions.
    - Some example requirements for integrated systems are:
        - Systems that provide remote automation/control for *facility* lighting shall be integrated with the Facilities Management building automation system.
        - Systems that provide remote automation/control for *roadway* lighting shall be integrated with the Traffic Management Center's lighting control system.

EXEMPTIONS

- **Emergency Declarations**
    - The standards herein shall be temporarily suspended if Collier County is included in a formal state of emergency declaration by local, state, or federal action.
    - The standards shall apply again once the declared emergency and associated clean-up activities, if applicable, are officially concluded.
- **Emergency Lighting for Non-Structural/Temporary Purposes**
    - Law enforcement, fire service, emergency medical services, and emergency management lighting not affixed to a structure or otherwise installed in a permanent manner are exempt from the requirements contained herein.
- **Holiday Lights**

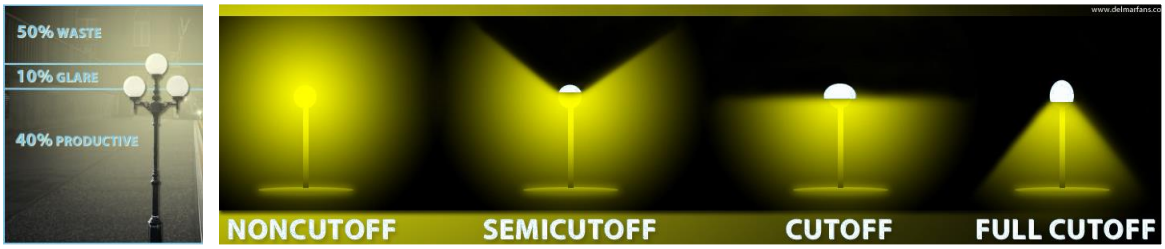
  Holiday lights are exempt from the standards provided they meet all of the following conditions:
    - Are installed properly and in compliance with all applicable codes and regulations.
    - Do not pose a threat to the safety and security of:
        - Occupants and Visitors [Interior Lights]
        - Motorists and Passersby [Exterior Lights]
    - Are temporary in nature:
        - Turned on two weeks or less before the celebrated holiday/season.
        - Turned off two weeks or less after the celebrated holiday/season.
- **Live and Recorded Performances**
    - Film, stage, and video broadcasting equipment for use in live or recorded performances.

STANDARDS - OUTDOOR

*This section applies broadly to all outdoor lighting areas covered by the **Applicability** section above.*

- Exterior lighting should not exceed the minimum levels specified in the IESNA recommended practices for night-time safety, utility, security, productivity, enjoyment, and commerce.
- IDA approved lighting fixtures, or those that meet the same shielding (full cutoff) and downward orientation requirements, should be used whenever possible.

- For the lighting of predominantly horizontal surfaces, luminaires shall be aimed straight down, have no uplight and shall meet latest IESNA full-cutoff/fully shielded criteria.
- Below are examples of different shielding/cutoff levels:



Images courtesy of Del Mar Fan & Lighting

- The photos below demonstrate the disadvantages of *unshielded* light fixtures:

Photos courtesy of Joshua Hammond and Richard Henderlong (Collier County Lighting Team)

- Below is an example of the differences between unshielded (left) and shielded (right) fixtures:

Image courtesy of eSchoolToday

- Exterior lighting shall not be designed, installed, or maintained in a way that constitutes a hazard or nuisance to neighboring properties or the traveling public.
  - Search lights, strobe lights, lasers and other high intensity light sources are prohibited.
    - This prohibition does not apply to lights used for traffic signaling purposes or by law enforcement, security, and other public safety staff operating in an official capacity.

- Lights that could be confused for traffic control devices are also prohibited.
- Lighting should be accessible enough to maintain while not being easy to tamper with.
- Landscaping shall not be planted or installed in a way that will obscure the required light levels of the site throughout the expected lifetime of the lighting system(s).
  - The design and location of lighting systems shall be arranged in a manner that considers the ultimate growth of landscaping and tree canopies to minimize or prevent conflicts between landscaping and lighting systems.
  - Below are examples of *improper* landscaping placement [too close to light poles]:


Photos courtesy of Joshua Hammond (Collier County Lighting Team)

ARCHITECTURAL AND LANDSCAPE LIGHTING

Landscape and architectural lighting encompasses lights used to illuminate landscape areas, signs (without integrated light source), statues, and other objects mounted on pedestals, poles, or platforms.

- Architectural and landscape lighting should be designed, installed, and controlled to ensure that the lights only illuminate the intended object(s).
  - To the extent practical and where possible, lighting fixtures shall be directed downward rather than upward. Directional shielding shall be implemented to minimize or prevent glare, light trespass, and skyglow.
    - When uplighting is required, lighting systems should be low in intensity and incorporate full shielding.

CONSTRUCTION LIGHTING

- All construction site lighting fixtures must be full cut-off or directionally shielded fixtures that are aimed and controlled so the directed light is substantially confined to the object intended to be illuminated and not directly visible outside of the property.
- Interior construction lights shall be extinguished after the work has been completed for the day unless needed to ensure safety, security, or legal compliance.
- A building is no longer considered under construction once exterior walls and windows are installed and permanent lighting replaces temporary lighting as the primary source of light for the building.

FLAGS

- The United States of America, POW/MIA, State of Florida, and Collier County flags may be illuminated during hours of darkness.
  - 4 U.S.C. § (U.S. Flag Code) requires the American Flag to be “properly illuminated”, but does not provide specific illumination requirements or standards. The Congressional

Research Service's **United States Flag: Federal Law Relating to Display and Associated Questions** suggests that lighting should preserve the dignity of the flag by preventing it from being enveloped in darkness, but that 4 U.S.C. § *does not* require that flags be illuminated directly.

- Artificial lighting for flags should use downlights, rather than uplights, whenever possible.
  - If downlight illumination is not practicable, uplights shall meet the following requirements:
    - Employ full shielding to minimize skyglow, light trespass, and glare to ensure that the light(s) only illuminate the intended flag(s)
    - Correlated Color Temperature (CCT) value less than or equal to 2700 Degrees Kelvin, regardless of lighting zone.
    - Use the least amount of illumination necessary to preserve the dignity of the flag(s).
  - Proper Flag Illumination Example:

Image courtesy of Clean-energies.org

LIGHT POLES

- Free-standing light poles shall be protected and located in areas that prevent them from being easily damaged by vehicles and other equipment.
- Maximum light pole height requirements are contained in the Collier County **Land Development Code** and may vary depending on site-specific conditions.
- Light poles shall not be placed within the anticipated fifteen (15) year canopy or within twelve (12) feet of any tree.

TEMPORARY LIGHTING

- For the purposes of this guidebook, temporary lighting is comprised of light sources not covered elsewhere in this guidebook that will be in use for less than seven (7) calendar days per year.
- All temporary lighting shall be aimed and controlled so that light is confined to the site or object(s) intended to be lit and minimally contribute to glare and skyglow.
- Below is an example of *improper* temporary lighting that should be avoided:

Photo courtesy of Diana Umpierre (IDA)

"DARK SKY" LIGHTING ZONES AND OUTDOOR LIGHTING RESTRICTIONS

The Illuminating Engineering Society of North America (IESNA) and the International Dark-Sky Association (IDA) developed a Model Lighting Ordinance (MLO) in June 2011 to provide communities with a framework for enacting outdoor lighting standards and associated legislation. The Collier County Lighting Team thoroughly reviewed the MLO and engaged in subsequent discussions with IDA staff. The Collier County Lighting Team also reviewed codes, ordinances, and standards of other governmental organizations as well as industry best practices. Through extensive research and deliberation, the Collier County Lighting Team came to the unanimous decision that many of the core ideas in the MLO should be adopted in Collier County's outdoor lighting standards.

One of the foundational concepts behind the MLO is the use of lighting zones (LZ) based on the *desired* ambient light levels of a community. This approach affords flexibility in lighting standards based on the safety, security, and environmental needs of specific areas. The use of lighting zones was first developed by the International Commission on Illumination (CIE) in 1997 and was adopted by the Illumination Engineering Society as a recommended outdoor practice in 1999. Since that time, many government agencies have adopted the use of lighting zones in their outdoor lighting standards and land development codes. Notable examples include Palm Beach County, Florida with their **Model Lighting Ordinance** and the United States Department of Defense with their **Unified Facilities Criteria**.

The MLO lighting zones that will be included in the Collier County lighting standards are as follows:

- **LZ0** No ambient lighting
  - Areas where the natural environment will be seriously and adversely affected by lighting or where occupants have expressed a strong desire that light trespass be strictly limited. Impacts include disturbing the biological cycles of flora and fauna and/or detracting from human enjoyment and appreciation of the natural environment. The vision of human residents and users is adapted to total darkness, and they expect to see little or no lighting.
- **LZ1** Low ambient lighting
  - Areas where lighting might adversely affect flora and fauna or disturb the character of the area. The vision of human residents and users is adapted to low light levels. Lighting may be used for safety, security and/or convenience but it is not necessarily uniform or continuous.
- **LZ2** Moderate ambient lighting
  - Areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting may typically be used for safety, security and/or convenience but it is not necessarily uniform or continuous.
- **LZ3** Moderately high ambient lighting
  - Areas of human activity where the vision of human residents and users is adapted to moderately high light levels. Lighting is generally desired for safety, security and/or convenience and it is often uniform and/or continuous.

Based on the safety, security, and environmental needs at the locations as well as the guidance provided by the MLO, County-owned and/or maintained sites and structures have been categorized into the lighting zones listed below. If and when the Land Development Code (LDC) is updated to include lighting zones, the most stringent lighting restrictions will prevail.

TABLE 1 – LIGHTING ZONE CLASSIFICATIONS

Lighting Zones	Site and Structure Classifications
LZ0 No Ambient Lighting	Beaches Boat Launch Sites Cemeteries Nature Trails & Pathways Parks - Neighborhood Preserves Remote Utility Stations Wellfields
LZ1 Low Ambient Lighting	Campuses – Rural Fueling Stations - Rural General Office Buildings Landfills Museums Recycling Centers Outdoor Swimming Pools Parking Lots & Garages - Urban Parks - Community Roadways – Local, Rural Collectors Water Parks - Rural
LZ2 Moderate Ambient Lighting	Airports – Rural Corrections Facilities - Rural Fueling Stations - Urban Master Pump Stations Parking Lots & Garages - Urban Parks – Regional Roadways – Rural Arterial, Urban Collectors Temporary Events – Rural Water & Wastewater Plants – Rural Water Parks - Urban
LZ3 Moderately High Ambient Lighting	Airports - Urban Campuses - Urban Corrections Facilities - Urban Roadways – Urban Arterial Temporary Events – Urban Water & Wastewater Plants – Urban

The following outdoor lighting restrictions will apply to sites and structures based on their assigned lighting zone:

TABLE 2 – LIGHTING ZONE-BASED RESTRICTIONS

Lighting Zones	Color Temperature CCT Allowed Range [1]	Light Reduction R = Required / V = Voluntary	Maximum Light Output Percentage
LZ0	1900K – 3000K	R - **1 Hour** after close of business	**25%**
LZ1	1900K – 3000K	R- **1 ½ Hours** after close of business	**25%**
LZ2	1900K – 3500K[2]	R - **2 Hours** after close of business	**50%**
LZ3	1900K – 4800K[3]	V - **2 Hours** after close of business	**50%**

[1] The health and environmental impacts of nighttime lighting that incorporate the blue portion of the color spectrum are currently subject to ongoing research and debate. As of the time of the first publication of these standards, the American Medical Association and IDA currently recommend warmer color temperatures (3000K or less) for outdoor installations to reduce the amount of blue-light emissions at nighttime.

[2] While LZ2 and LZ3 have higher *allowable* color temperature ranges, it is still strongly recommended to use warmer color temperatures (3000K or lower) whenever practicable. Cooler color temperatures (greater than 3000K) shall be reserved for instances where there are special requirements or regulations that necessitate higher values.

[3] Due to the large range of allowable color temperatures in LZ3, care should be taken to prevent harsh transitions between cool and warm color temperatures in neighboring areas. As a general rule of thumb, the difference in CCT values should not be greater than 1000K when transitioning between areas of differing color temperatures.

EXEMPTIONS

- Arterial roadway light fixtures are not required to be included in the IDA's Fixture Seal of Approval (FSA) program, however roadway fixtures should incorporate the same design requirements (e.g. shielding) whenever practicable and minimally contribute to skyglow.
- The following locations are exempt from the time-based light restrictions outlined in **TABLE 2** above, however it is strongly encouraged that these locations voluntarily participate when doing so would not pose any substantial risk to safety, security, and legal requirements:
  - Airports
  - Areas undergoing nighttime construction, preparation, or clean-up activities
  - Locations that are staffed and operate on an around-the-clock basis
  - Roadways
- Airports are also exempt from the color temperature restrictions.
- The maximum light output percentage restrictions only apply to lights that are on continuously throughout dark hours.
  - Motion-activated lights *do not* have a maximum light output percentage requirement.
  - Depending on the application, it may be more beneficial to shut off lights completely and only turn on specific lights when motion is detected for safety and security purposes.
- Maintenance activities (e.g. repairs, setup, and tear-down) may supersede the lighting restrictions to ensure the safety and security of maintenance staff.

STANDARDS - INDOOR

*This section applies broadly to all interior lighting areas covered by the **Applicability** section above unless superseded by specialty requirements listed below.*

- Indoor lighting systems should provide the levels of illumination necessary to comfortably and efficiently complete tasks and navigate through spaces.
- Care should be taken when designing, installing, and operating indoor lighting so that it does not introduce significant glare, light trespass, and skyglow through windows or building openings at nighttime.
- Lighting should primarily be directed onto walls and ceilings to allow for better eye adaptation and occupant comfort.
- Glare, especially on electronic screens should be restricted as much as possible.
- Articulating task lights should be considered in office environments to assist occupants with balancing light levels at their workspaces.
- All spaces should incorporate controls, sensors, or other means of automation to turn off lights when the spaces are not in use.
    - The interior spaces of vacant buildings shall not be continuously illuminated during hours of darkness unless there are specific considerations that require continuous illumination.
    - Care should be exercised in the design, installation, and maintenance of sensors to prevent lights from being turned off while occupants are present.
- Spaces larger than 100 square feet should incorporate multi-level lighting controls or continuous dimming with manual on/off capabilities whenever practicable.
- The treads in stairwells should be illuminated in a way that ensures that they are easily distinguishable from the above step.

DAYLIGHTING

- Daylighting, the inclusion of natural lighting into interior spaces, should be incorporated whenever practicable in the design of interior spaces to provide natural light and reduce energy requirements of artificial lighting during the daytime.
- When considering daylighting, the potential lighting system energy savings should be evaluated against increases in cooling and heating loads.
- Special consideration should be made to ensure glare, brightness, and contrast levels are comfortable to occupants regardless of the time of day.
- To ensure daylighting is effective at reducing energy consumption, the lighting controls should be responsive to the natural lighting levels (i.e. dim when there is sufficient natural light and get brighter as night approaches).
    - The controls should also prevent rapid cycling based on changes in sky conditions and gradually fade between light levels while dimming.
- “Manual-On” occupancy sensors should be utilized in daylighted areas to save on electrical energy consumption.
    - Proper calibration and commissioning of the sensors shall be performed during daytime as well as nighttime to ensure the lighting system is performing satisfactorily.
- Proper window and skylight orientation, design, and glazing should be incorporated to control solar heat gain and loss while preventing glare and excessive brightness/contrast from negatively impacting the occupants.

CURRENCY OF STANDARDS

The standards described in this guidebook are intended to be dynamic and evolve over time based on the needs, financial resources, technological capabilities, and other important factors as deemed appropriate by the County Manager or BCC. **This guidebook is valid until one (1) year after the latest revision date** indicated on the top of Page 1. After one (1) year has passed from the latest revision, it is the responsibility of the Design Professional/Contractor to obtain the latest version. While the County reserves the right to revise and enforce the standards in this guidebook at any time, it will be the responsibility of the County to inform the Design Professional/Contractor if they are required to adhere to the latest revision prior to the one (1) year expiration date.

COUNTY SELF-MANAGED LIGHTING TEAM MEMBERS

Print First and Last Name	Title	Signature	Date
Nick Casalanguida	Deputy County Manager		
Derrick Garby	Lighting Team Member	Derrick Garby	01/27/2017
Joshua Hammond	Lighting Team Member	Josh Hammond	01/05/2017
Richard Henderlong	Lighting Team Member	Rich Henderlong	01/23/2017
John Miller	Lighting Team Member	John W. Miller	01/13/2017
Neil Randall	Lighting Team Member	Neil Randall	01/09/2017
Angel Rodriguez	Lighting Team Member	Angel Rodriguez	01/23/2017
Geoffrey Willig	Lighting Team Member		

APPENDIX A – SPECIALTY LIGHTING REQUIREMENTS & CONSIDERATIONS

- **Lighting Standards Special Considerations Guidebook**
  - http://www.colliergov.net/your-government/divisions-a-e/county-manager-s-office/standards

APPENDIX B – RELATED COUNTY CONSTRUCTIONS STANDARDS

- **Facilities**
  - http://www.colliergov.net/your-government/divisions-f-r/facilities-management/vertical-construction-standards
- **Information Technology**
  - http://www.colliergov.net/your-government/divisions-f-r/facilities-management/vertical-construction-standards
- **Right-of-Way**
  - http://www.colliergov.net/home/showdocument?id=46480
- **Roadway**
  - http://www.colliergov.net/your-government/divisions-s-z/traffic-operations/traffic-technical-special-provisions
- **Utilities**
  - http://www.colliergov.net/your-government/divisions-f-r/public-utilities-planning-and-project-management/utilities-standards-manual

APPENDIX C – GLOSSARY OF TERMS

- **Lighting Standards Glossary** – Collier County BCC Lighting Team
  - http://www.colliergov.net/your-government/divisions-a-e/county-manager-s-office/standards

APPENDIX D – REFERENCES

- **AMA Adopts Community Guidance to Reduce the Harmful Human and Environmental Effects of High Intensity Street Lighting** – American Medical Association
  - http://www.ama-assn.org/ama/pub/news/news/2016/2016-06-14-community-guidance-street-lighting.page
- **Are Smart Street Lights the Future of Security Tech?** – Emergency Management Magazine
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- **Zoning Ordinance Chapter 78 Article VI Division 5 Section 78-668: Lighting Standards** – Buncombe County, North Carolina
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APPENDIX E – RECOMMENDED REFERENCES FOR LIGHTING DESIGN

CODES AND OTHER REGULATION

- **Americans with Disabilities Act Standards for Accessible Design** – U.S. Department of Justice
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- **Endangered Species Act of 1973** – United States Congress
  - http://www.epw.senate.gov/esa73.pdf
- **Florida Building Code** – International Code Council
  - ISBN: 978-1-60983-557-6
- **Florida Building Code: Energy Conservation** – International Code Council
  - ISBN: 978-1-60983-565-1
- **Florida Marine Turtle Protection Act** – Florida Statutes
  - http://www.leg.state.fl.us/statutes/index.cfm?mode=View%20Statutes&SubMenu=1&App_mode=Display_Statute&Search_String=Marine+Turtle+Protection+Act&URL=0300-0399/0379/Sections/0379.2431.html
- **Land Development Code** – Collier County BCC
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- **Ordinance 04-11** – City of Marco Island
- **Ordinance 05-10814** – City of Naples
- **NFPA 70: National Electrical Code (NEC)** – National Fire Protection Association
  - ISBN: 978-1455906727
- **NFPA 72: National Fire Alarm and Signaling Code** – National Fire Protection Association
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- **NFPA 101: Life Safety Code** – National Fire Protection Association
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DESIGN CRITERIA

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- **AC 150/5360-13: Planning and Design Guidelines for Airport Terminal Facilities** – Federal Aviation Administration
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- **Fixture Seal of Approval** – International Dark-Sky Association
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- **Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways** [a.k.a. Florida Greenbook] – Florida Department of Transportation
  - http://www.dot.state.fl.us/rddesign/FloridaGreenbook/FGB.shtm

STANDARDS

- **Aquatic Recreation Facilities** – ANSI/APSP
  - Standard: ANSI/APSP–9 2005
- **Design of High-Performance Green Buildings** - ANSI/ASHRAE/IES
  - Standard: ASH-ST189.1-14
- **Energy Efficiency in Existing Buildings** - ANSI/ASHRAE/IES
  - Standard: ASH-ST100-15
- **Energy Standard for Buildings Except Low-Rise Residential Building (ASNI Approved)** – ANSI/ASHRAE/IES
  - Standard: ASH-ST90.1-13
- **Environmental Design of Control Centres** - International Organization for Standardization
  - Standard: ISO 11064-6:2005
- **Facilities Standards for the Public Buildings Service P100** – U.S. General Services Administration
  - http://www.gsa.gov/portal/content/104821
- **FDOT Design Standards** – Florida Department of Transportation
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- **FDOT Standard Specifications for Road and Bridge Construction** – Florida Department of Transportation
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- **Florida Model Jail Standards Manual** – Florida Sheriffs Association
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- **Lighting of Work Places** – International Organization for Standardization
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- **Public Swimming Pools** – ANSI/APSP/International Code Council
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GUIDEBOOKS & GUIDELINES

General Lighting

- **Choosing Light Sources for General Lighting** - Illuminating Engineering Society
  - ISBN: 978-0-87995-254-9
- **Human Factors in Lighting** - Peter Robert Boyce
  - ISBN: 9781439874882
- **Light + Design: A Guide to Designing Quality Lighting for People and Buildings** - Illuminating Engineering Society
  - ISBN: 978-0-87995-231-0
- **Lighting Controls for Energy Management** - Illuminating Engineering Society
  - ISBN: 978-0-87995-279-2
- **Lighting for Exterior Environments** - Illuminating Engineering Society
  - ISBN: 978-0-87995-301-0
- **The Lighting Handbook** - Illuminating Engineering Society of North America
  - ISBN: 978-0-87995-241-9
- **Recommended Practice for the Economic Analysis of Lighting** - Illuminating Engineering Society
  - ISBN: 978-0-87995-290-7
- **Sustainable Lighting: An Introduction to the Environmental Impacts of Lighting** - Illuminating Engineering Society
  - ISBN: 978-87995-258-7

Network Security

- **CIS Critical Security Controls** – Center for Internet Security
  - https://www.cisecurity.org/critical-controls.cfm
- **Cybersecurity Framework**- National Institute of Standards & Technology
  - http://www.nist.gov/cyberframework/
- **Guide to Industrial Control Systems (ICS) Security** - National Institute of Standards & Technology
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Office Building Lighting

- **American National Standard Practice for Office Lighting (ANSI Approved)** - Illuminating Engineering Society
  - ISBN: 978-0-87995-262-4
- **Energy Efficiency Guide for Existing Commercial Buildings: Technical Implementation** - Illuminating Engineering Society
  - ISBN: 9781936504176
- **IES Guidelines for Upgrading Lighting Systems in Commercial and Institutional Spaces** - Illuminating Engineering Society
  - ISBN: 978-0-87995-280-8
- **Recommended Practice for Daylighting Buildings** - Illuminating Engineering Society
  - ISBN: 978-0-87995-281-5

Roadway Lighting

- **Design Guide for Residential Street Lighting** - Illuminating Engineering Society of North America
    - ISBN: 978-0-87995-313-3
- **Guide for Selection, Installation, Operations and Maintenance of Roadway Lighting Control Systems** - Illuminating Engineering Society
    - ISBN: 978-0-87995-314-0
- **Roadway Lighting ANSI/IES** - Illuminating Engineering Society
    - ISBN: 978-0-87995-299-0
- **Roadway Lighting Design Guide** - American Association of State Highway and Transportation Officials
    - ISBN: 978-1-56051-325-4

Security & Crime Prevention Lighting

- **Crime Prevention Through Environmental Design** – Timothy Crowe & Lawrence Fennelly
    - ISBN: 978-0-87995-241-9
- **Facilities Physical Security Measures Guideline** – ASIS International
    - ISBN: 978-1-887056-95-3
- **Guideline on Security Lighting for People, Property, and Public Spaces** - Illuminating Engineering Society
    - ISBN: 978-0-87995-190-0
- **Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings** – Department of Homeland Security
    - https://www.dhs.gov/xlibrary/assets/st/st-bips-06.pdf
- **Unified Facilities Criteria (UFC): Interior and Exterior Lighting Systems and Controls** – United States Department of Defense
    - https://www.wbdg.org/ccb/DOD/UFC/ufc_3_530_01.pdf

Specialty Lighting

- **Guidelines for Developing Non-Motorized Boat Launches in Florida** – Florida Fish and Wildlife Conservation Commission
    - http://myfwc.com/media/1340507/Non-motorizedBoatingAccessGuidelinesVer4.pdf
- **Lighting for Parking Facilities** - Illuminating Engineering Society
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- **Museum Handbook** – U.S. National Park Service
    - https://www.nps.gov/museum/publications/handbook.html
- **Museum Standards and Best Practices** – American Alliance of Museums
    - http://www.aam-us.org/resources/ethics-standards-and-best-practices/standards
- **National Cemetery Administration (NCA) Facilities Design Guide** - U.S. Department of Veterans Affairs
    - http://www.cfm.va.gov/til/nca.asp
- **Outdoor Lighting for Airport Environments** - Illuminating Engineering Society
    - ISBN: 978-0-87995-322-5
- **Recommended Practice for Library Lighting** - Illuminating Engineering Society
    - ISBN: 978-0-87995-278-5
- **Sports and Recreational Area Lighting** - Illuminating Engineering Society
    - ISBN: 978-0-87995-311-9