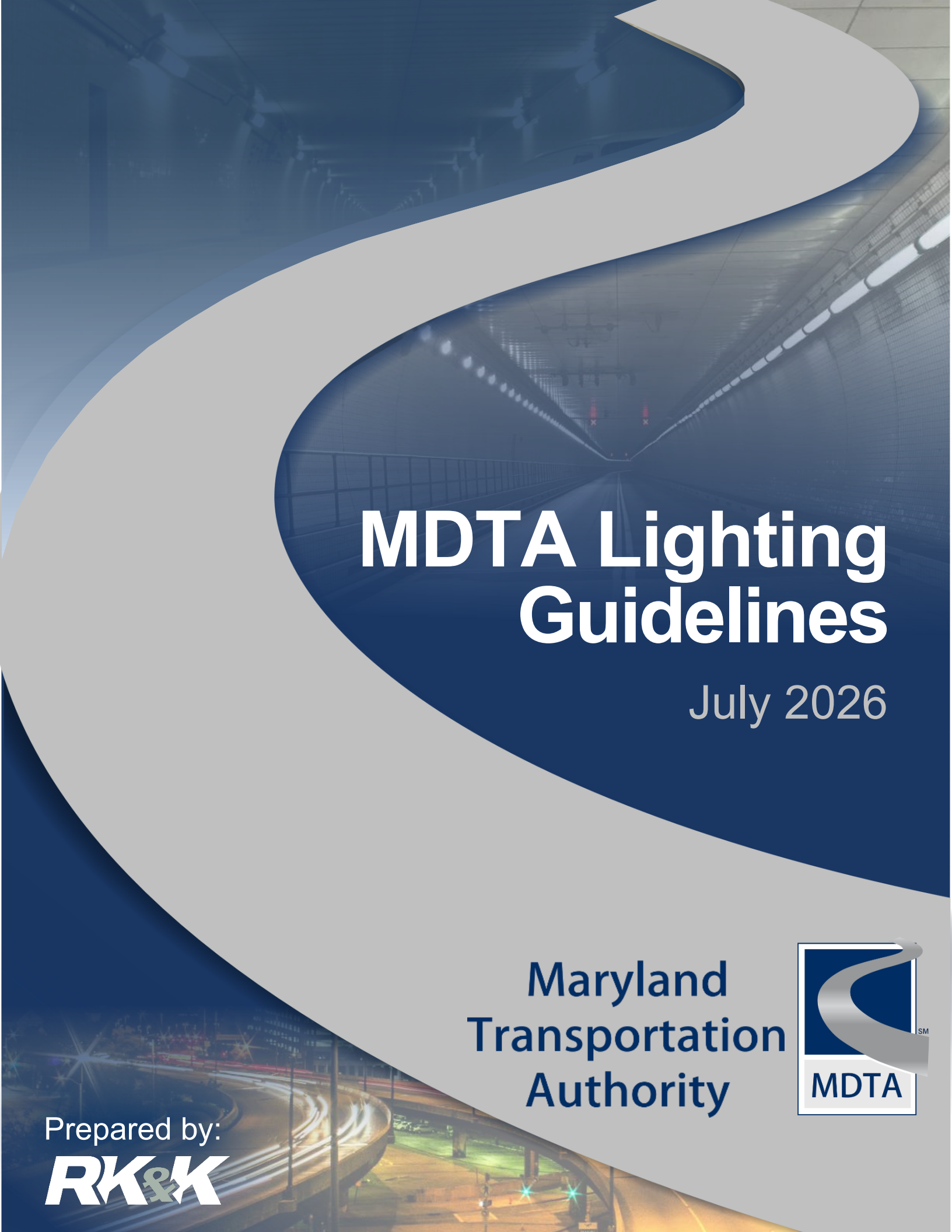

MDTA Lighting Guidelines

July 2026

Maryland Transportation Authority

MDTA

Prepared by:

RK&K

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I. INTRODUCTION

The Maryland Transportation Authority (MDTA) Lighting Guidelines follows the Application Guideline No. 11-X14: Maryland Department of Transportation (MDOT) Maryland State Highway Administration (SHA) Lighting Design Guidelines format but is tailored for facilities owned and operated by MDTA. The purpose of these guidelines is to provide safe and efficient facilities for the benefit of the public. Safety and impacts of lighting systems are key factors considered in this guide.

Roadway lighting is a proven safety countermeasure. When implemented properly, it improves the visibility of pedestrians, cyclists, and hazard identification, and helps mitigate glare from opposing headlights and ambient sources, making it easier for drivers to focus on the roadway. Multiple studies conducted by American Association of State Highway and Transportation Officials (AASHTO) and Federal Highway Administration (FHWA) have confirmed the effectiveness of roadway lighting to reduce the quantity and severity of nighttime or low light level crashes.

Beyond safety, lighting supports other key benefits. It enhances personal security by increasing visibility in and around travel corridors, contributes to better wayfinding for both drivers and pedestrians, and improves the usability of sidewalks and shared-use paths. At the same time, roadway and exterior lighting systems have potential impacts. Light trespass, glare, sky glow, and disruption to nearby wildlife and ecosystems are all important considerations. These impacts can be minimized through appropriate design, which includes proper fixture selection, control of light intensity and direction, and attention to color temperature and spectral content.

The proper fixture selection and placement is critical to meeting these goals without creating adverse effects. Lighting design should provide effective illumination for users while maximizing energy efficiency and minimizing unnecessary expenditure. Additionally, participation of the Local Jurisdictions in the design, construction, operation, and maintenance of lighting systems is an important element when applicable. Based on these considerations, this guideline uses the latest research in the areas of lighting, safety, and impacts to balance the recommendations to achieve these goals.

All new lighting (interchange, intersection, tunnel, underpass, and sign lighting) shall be designed using light emitting diode (LED) fixtures. LED fixtures should also be considered for pedestrian lighting. LED luminaires shall be selected from the MDTA ITS & Electrical Special Provision 950.12 Attachment 950.12-A: Suggested Luminaires for MDTA Projects.

These guidelines are separated into four parts:

- **Part II. *Criteria for Eligibility*** defines the circumstances which qualify a roadway to be considered for the installation of lighting.
- **Part III. *Typical Lighting Applications*** describes the common applications of lighting installations.
- **Part IV. *Special Lighting Applications*** describes the various applications in relation to the roadways in which lighting shall be considered.
- **Part V. *Lighting Design Considerations*** describes general lighting system design, construction, and maintenance.

II. CRITERIA FOR ELIGIBILITY

To determine the eligibility for lighting installations, MDTA requires an engineering study of local conditions considering such factors as crash data, roadway characteristics, speed (posted and prevailing) and ambient light to support lighting installation decisions and to promote road user safety (motorists, pedestrian, cyclists, etc.). When there is a history of crashes, the type and circumstances of the crashes should also be considered by the study. Engineering judgment should be used in instances where an operational or safety concern is not indicated by the crash data. Traffic volumes can also be used as a supplemental measure in evaluating lighting eligibility. Furthermore, the AASHTO Roadway Lighting Design Guide outlines minimum conditions for when to consider lighting. These AASHTO considerations shall be used when determining eligibility for all lighting installations. Another resource for use in lighting studies is the FHWA Roadway Lighting Handbook, which discusses AASHTO and other warranting methods which may help in the decision process. In addition, the Illuminating Engineering Society's (IES) Recommended Practice: Lighting Roadway and Parking Facilities (RP-8) provides detailed technical criteria and design practices that support consistent and effective roadway lighting applications.

The conditions for eligibility for specific facility types are described in **Part III** and **Part IV**. Meeting these conditions does not obligate MDTA to provide lighting nor is it a requirement for installation of lighting in special circumstances.

III. TYPICAL LIGHTING APPLICATIONS

Roadway lighting may be provided in areas determined to be eligible in **Part II**. When determining the extents of the lighting, the designer shall consider the warranting conditions as well as the location, lighting treatment in the surrounding area, and concurrence from MDTA.

A. Interchange Lighting

Partial Interchange Lighting shall be installed on all approaches at new and reconstructed grade-separated interchanges on MDTA facilities across the state. At existing grade-separated interchanges without interchange lighting; lighting shall be installed based on an established need including nighttime crash history, site-specific conditions and engineering judgement. Secondary ramp merges and diverges shall be treated in the same manner as mainline exits. **Figure III-A.1** in the Appendix should be used as a **reference** for lighting placements. The installation of additional lights is at the discretion of the MDTA. For all lighting placements, the entering and/or exiting lane(s) and one (1) adjacent mainline travel lane shall be analyzed when determining proper spacing as shown in **Figure III-A.2** and **Figure III-A.3** of the Appendix.

When proposed lighting designed to meet these guidelines and recommended values results in less than 600 feet between any two light poles, additional lighting shall be installed to fill in this gap and to provide uniform levels in that section. Additional interchange lighting shall be considered on facilities with one or more of the following characteristics:

1. Ramps, interchange alignments, or grades which are complex or unusual. This includes ramps with substandard deceleration or acceleration lanes, full loops, compound curves, lane reductions and/or multi-lane ramps.
2. Locations with significant pedestrian or bicycle activities during times of darkness.
3. Important decision point(s) or existing roadside hazard areas that would not be covered with partial interchange lighting, e.g. crossovers.
4. An operational analysis indicates the need for lighting. Volume and crash data should be used to support the analysis.

Refer to **Table III-A.4** of the Appendix for recommended illuminance lighting values for interchanges.

High mast lighting may be considered along MDTA roadways if lighting levels cannot be achieved with low level lighting and is justified by an engineering study. High mast systems offer advantages such as wide-area coverage with fewer poles, improved uniformity of light distribution, and centralized maintenance access. However, they also introduce challenges, which include higher capital costs, increased potential for light trespass and glare, and more complex maintenance operations due to the height and location of the poles. The presence of rural or historic districts, National Historic Landmarks, or other relevant historic and environmental properties in the vicinity should be considered as well.

B. Intersection Lighting

Intersection lighting should be provided in accordance with the SHA Lighting Design Guidelines for intersecting roadways including:

1. All signalized intersections shall have partial intersection lighting.
2. All roundabouts shall have lighting (refer to the SHA Lighting Design Guidelines for the MDOT SHA Roundabout Guidelines for placement and illuminance requirements.)
3. All non-signalized intersections for which a need is determined based on the SHA Evaluation Form for Intersection Lighting. Refer to **Table III-B.2** of the Appendix for the SHA Evaluation Form for Intersection and Mid-Block Pedestrian Crossing Lighting.

Lighting should be located on the downstream side of an intersection and coverage may include channelized (free) right turn lanes. See **Figure III-A.1** of the Appendix for example lighting configurations. Where possible, the placement of the luminaire on a signal pole is preferred at signalized intersections. When crosswalks are present, luminaires should be positioned in advance of the crosswalks to provide positive contrast of pedestrians. The conduit system for intersection lighting shall be dedicated for lighting only and shall not be shared with the signal cable unless the luminaire is mounted on the signal pole or otherwise directed by the MDTA. Further, service pedestals may be shared for lighting and signals at the discretion of the MDTA. Refer to **Table III-B.3** of the Appendix for recommended lighting values for intersections other than roundabouts. Refer to **Table III-B.4** of the Appendix for recommended lighting values for intersections of continuously lit roadways.

C. Continuous Roadway Lighting

Continuous roadway lighting shall only be installed when justified by an engineering study and approved by the MDTA. If approved, it shall be designed according to the luminance requirements in **Table III-C.1** of the Appendix for straight roadways. Illuminance values in accordance with **Table III-A.4** may be used when sufficient curvature exists on the roadway such that utilizing the luminance method for lighting design is not feasible.

The installation of continuous roadway lighting may be justified when pedestrian/ bicycle/vulnerable road user lighting is warranted along a state highway to improve safety. Most walkways and bike lanes are located adjacent to roadways. The light spillover from pedestrian lighting onto the roadway shall be evaluated and designed to ensure roadway and pedestrian lighting meet acceptable levels. Refer to **Part III Section C** and **Part IV Section E** of the SHA Lighting Design Guidelines for additional information.

Refer to **Table III-C.2** of the Appendix for the warrant evaluation form for Continuous Freeway Lighting along roadways owned and operated by MDTA.

D. Sign Lighting

Traffic signs are placed along the roadway in strategic locations and are used to convey specific, consistent messages to motorists. The standards used in the design of traffic signs are described in the Maryland Manual on Uniform Traffic Control Devices (MDMUTCD). The intent of these standards is to ensure that all traffic signs are designed and maintained to provide information that can quickly and accurately convey the necessary information and to provide national sign design consistency. The MDMUTCD states, “signs shall be retroreflective or illuminated to show the same shape and similar color by both day and night”.

Nighttime or low light level sign legibility can be achieved in one of two ways:

1. Using American Society for Testing and Materials (ASTM) D4956 Type XI retroreflective sheeting materials for the legend and background.
2. Using either internal or external sign illumination.

Almost all signs are manufactured using retroreflective sheeting materials to enhance nighttime visibility. Only certain signs are illuminated – typically overhead guide signs. The added sign illumination helps compensate for situations where the vehicle headlamps and the retroreflective properties of the sign sheeting materials are inadequate by themselves.

A sign designed to be legible under daylight conditions may be illuminated to fulfill its basic purpose at night. A properly designed sign lighting system aids motorists with the rapid and accurate recognition of the sign’s shape, color, and message. This contributes to improved safety by reducing the possibility of motorists significantly reducing their speed at locations where signs may be otherwise difficult to read.

Overhead signs shall be installed with ASTM D4956 Type XI sheeting and shall not be illuminated with sign lighting except under the following conditions:

1. Toll Rate signs shall be illuminated with sign lighting.
2. All overhead signs with unencumbered sight distance of less than 1,000 feet. Unencumbered sight distance exists where all portions of every overhead sign panel on that structure are visible to motorists in all approaching lanes. Examples of signs which may not have unencumbered sight distance include:
    i. Signs beyond sag vertical curves and outside the influence area of vehicle headlamps.
    ii. Signs in horizontal curves that are outside the influence area of vehicle headlamps.
3. Signs on or adjacent to bridge structures and other areas prone to heavy fog cover or snowfall where atmospheric conditions reduce the effectiveness of the retroreflective sheeting.
4. Additional lighting may be considered and requested as part of an engineering study and/or based on engineering judgement to address site specific conditions.
5. Any other sign that MDTA deems necessary.

Sight distance, as noted above, should be considered when selecting locations for new structures.

When sign lighting is provided:

1. Lighting shall consist of LED Luminaires.
2. Individual supports for each luminaire is the preferred mounting method; sign lighting maintenance systems may only be used with the approval of the MDTA. The spacing of LED luminaires for sign lighting should be based on **Figure III-D.2.** MDTA ITS & Electrical Special Provision 806 includes requirements for the Contractor to perform sign lighting photometric analysis during the submittal review process to confirm the lighting target values described in MDTA ITS & Electrical Special Provision 806 are achieved.
3. All overhead sign panels mounted on a structure facing the same direction of travel shall be illuminated. Lighting only select panels is not permitted even if signs have different ownership.

All new signs require ASTM D4956 Type XI sheeting so the need for sign lighting will be determined per the above criteria. If any overhead sign does not require sign lighting, it shall use ASTM D4956 Type XI sheeting, which shall be specified on the sign detail sheets. Refer to **Section III-D.1**: Design Guidance for Sign Lighting in the Appendix for additional information regarding the installation, replacement, removal, and design of sign lighting.

E. Mid-Block Pedestrian Crossing Lighting

Partial lighting shall be installed at all locations that meet the following criteria:

1. All signalized mid-block pedestrian crossings will have partial lighting. Pedestrian Hybrid Beacons qualify for partial lighting under this warrant.

2. All mid-block pedestrian crossings with flashing beacons or Rectangular Rapid-Flashing Beacons will have partial lighting.

3. All non-signalized mid-block pedestrian crossings for which a need is determined based on the SHA Evaluation Form for Intersection Lighting and Mid-Block Pedestrian Crossing Lighting. Refer to **Table III-B.2** of the Appendix for the SHA Evaluation Form for Intersection and Mid-Block Pedestrian Crossing Lighting.

Refer to **Table III-E.1** of the Appendix for recommended vertical illuminance values for mid-block pedestrian crossings. The vertical illuminance values in **Table III-E.1** of the Appendix shall be met for isolated mid-block pedestrian crossings (partial lighting) or the mid-block pedestrian crossings along continuously lit roadways. If the approach roadway is continuously lit, the luminance values in **Table III-C.1** shall be used for the approach roadway.

At mid-block pedestrian crosswalk locations, consideration should be given to placing lights in advance of the crossings on both approaches to illuminate the front of the pedestrian and avoid creating silhouettes. Where possible, the placement of the luminaire on a signal pole is preferred at signalized mid-block pedestrian crossings. The conduit system for lighting shall be dedicated for lighting only and shall not be shared with the signal cable unless the luminaire is mounted on the signal pole or otherwise directed by the MDTA. Further, service pedestals may be shared for lighting and signals at the discretion of the MDTA.

IV. SPECIAL LIGHTING APPLICATIONS

A. Bridge Lighting

Bridge lighting shall be evaluated using the roadway lighting criteria provided above, particularly the approach transition areas, with the following exceptions:

1. Existing bridge lighting not impacted by a roadway project may remain in place.
2. Pedestrian lighting on bridges shall be installed in accordance with the SHA Pedestrian Lighting Policy (Application Guideline 11-X9).
3. Decorative lighting should not be installed on bridges without sidewalks. When a sidewalk is present, the installation of lighting should be in accordance with the SHA Pedestrian Lighting Policy (Application Guideline 11-X9).
4. Areas where surveillance (CCTV cameras), security, identification of disabled vehicles, or environmental conditions – such as industrial waste or fog – may be evaluated for lighting.
5. If aesthetic lighting is desired by MDTA on a bridge structure, the lighting levels on the bridge should be compatible with the appropriate facility application. Refer to **Part IV Section F** of these Guidelines for more information on aesthetic lighting design.
6. All other lighting applications shall be determined at the discretion of the MDTA.

B. Rest Area or Park-and-Ride Lots

Sufficient illumination for public safety purposes shall be provided at rest areas, travel plazas, and park-and-ride lots. Refer to **Table IV-B.1**: Recommended Maintained Illuminance Levels for Roadway Rest Areas and **Table IV-B.2**: Recommended Maintained Illuminance Levels for Parking Areas in the Appendix. Access ramps to and from these facilities shall be treated as interchange ramps as defined in **Part III Section A** of this document.

C. Underpass Lighting

The need for underpass lighting shall be based on an engineering study. Nighttime underpass lighting shall be designed to meet the same requirements as for the approach roadways and if a sidewalk is present, in accordance with **Table IV-E.2** in the Appendix. If the pedestrian area is separated from the roadway by a wall or otherwise isolated, then the values shall be in accordance with **Table IV-C.1** in the Appendix. Based on the study, the need for daytime lights shall include consideration of ambient light levels.

D. Tunnel Lighting

Tunnel lighting shall be designed in accordance with Chapter 14: Tunnel Lighting of IES RP-8. When upgrading lighting in existing tunnels, crash data is often available which can help determine whether existing light levels are sufficient for safety or changing the levels should be considered. In those existing tunnels, an engineering study may be performed to analyze a minimum of 5 years of crash data for the tunnel threshold/transition zones and approach roads (if

valid data is available) to determine whether current conditions meet the necessary requirements for visibility and safety at the tunnel entrance.

Emergency tunnel lighting shall be designed in accordance with National Fire Protection Association (NFPA) 502 to provide reliable illumination for safe egress during an emergency. NFPA 502 includes minimum roadway and walkway illumination levels.

Control systems for tunnel lighting shall also be adequately studied to determine the best system for minimizing energy consumption, maximizing equipment life, and adjusting light levels for different zones. Annex B: Outdoor Lighting Controls – Additional Information from IES RP-8 provides information for goals and best practices for planning a lighting project which can be used for evaluating the design of a tunnel lighting system. For LED tunnel lighting systems, these may include adaptive controls to provide the appropriate light levels for the threshold, transition, and interior zones in the tunnel based on ambient light levels on the approach to the tunnel. Annex L: Designing Tunnel Lighting Control Systems from IES RP-8 discusses the various modes of operations for tunnel lighting controls and provides design examples. The equipment selected shall be tested for use in a tunnel environment and have a projected operating life equal to the tunnel lighting system. The luminaires selected for tunnel lighting applications shall pass the Water Spray test per American National Standards Institute (ANSI) C136.27 Section 17.2 to avoid any water intrusion to the fixture housing.

E. Pedestrian Lighting

The design and installation of pedestrian lighting is directed by SHA's Pedestrian Lighting Policy (Application Guideline 11-X9). For Recommended Values for High, Medium and Low Pedestrian Conflict Areas see **Table IV-E.2**, **Table IV-E.3** and **Table IV-E.4** of the Appendix. Where pedestrian lighting is installed along a roadway, the veiling luminance along the roadway, per **Table III-A.4** and **Table III-C.1** of the Appendix, shall not be exceeded.

The SHA Evaluation Form for Pedestrian Lighting may be used to support the decision to install pedestrian lighting. Refer to **Table IV-E.1** of the Appendix for the SHA Evaluation Form for Pedestrian Lighting.

The installation of continuous roadway lighting may be justified when pedestrian/ bicycle/vulnerable road user lighting is warranted along a roadway owned and operated by MDTA to improve safety. The light spillover from pedestrian lighting onto the roadway shall be evaluated and designed to ensure the roadway and pedestrian lighting meets acceptable levels. Refer to **Part III Section C** for additional information.

F. Aesthetic Lighting

Aesthetic Lighting may be installed, if desired by MDTA, to enhance the visual characteristics of a roadway, bridge, or other public facility. The designer should carefully consider local ordinances, light trespass, glare to motorists, and architectural styles in addition to ensuring light level requirements outlined in these guidelines are met. At a minimum, aesthetic lighting should consider IES Designing Quality Lighting for People in Outdoor Environments (LP-2), IES Environmental Considerations for Outdoor Lighting (LP-11), and IES Lighting Exterior Applications (RP-43)

G. Temporary Lighting

During construction, temporary lighting should be provided for decision points. During design of the project, it should be determined if existing and/or proposed light poles will sufficiently illuminate conflict points; otherwise, temporary light poles (typically wood poles with overhead feeds) should be provided. Wood poles shall be protected from vehicular traffic.

Lighting for work zones shall meet the requirements of Occupational Safety and Health Administration (OSHA) for worker safety and Chapter 19: Temporary and Work Zone Lighting of IES RP-8.

H. Campus Lighting

Lighting for parking areas shall meet the requirements stated in **Part IV Section B**. Lighting requirements for office buildings, salt barns, maintenance shops, etc., shall meet the recommendations included in the IES Lighting Handbook.

I. Crossover Lighting

Lighting at locations used as crossover areas for diverting traffic from one side of the road to another shall meet all the lighting requirements for roadway interchange lighting as specified in **Part III Section A**. A calculation area should be added for the crossover extending across all active vehicle areas and should provide uniform levels in that section of roadway meeting the requirements of **Table III-A.4**.

V. LIGHTING DESIGN CONSIDERATIONS

Once eligibility has been established, the designer must determine the lighting application to be used, which is detailed in **Part III** and **Part IV** of these guidelines. Along with the application, the designer must be aware of the standards and specifications used to construct a lighting system as well as general design practices, operations, and procedures. This part aims to provide resources that the designer can use to refine a lighting system.

A. Standards and Specifications

The MDOT SHA Book of Standards for Highways, Incidental Structures and Traffic Control Applications, Category 8 provides typical drawings for common lighting elements, which include poles, bracket arms, cabinets, transformer bases, conduit installation methods, foundations, electrical components, etc. When a lighting system requires design elements not included in the SHA Book of Standards, the designs of those elements shall be included in the plans. Designers shall coordinate with MDTA Structures regarding lighting structure design including requirements for design to AASHTO Load and Resistance Factor Design (LRFD) Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

The MDOT SHA Standard Specifications for Construction and Materials are typically used as the basis for specifications for all MDTA projects. Lighting system elements shall follow the requirements set for in the SHA Standard Specifications for Construction and Materials and the MDTA ITS and Electrical Special Provisions (SPs), which include MDTA-specific revisions to the Standard Specifications. In addition to the MDTA SPs, project-specific Special Provisions may also be required to tailor to lighting system design.

The designer should refer to the MDTA ITS & Electrical Special Provision 950.12 Attachment 950.12-A: Suggested Luminaires for MDTA Projects for the appropriate pre-approved luminaire and to find relevant information that should be provided in the contract documents (typical mounting height, etc.).

B. Maintenance and Operations

Ongoing maintenance is a critical component of lighting systems. A properly designed lighting system should not only meet initial lighting criteria but also remain reliable over its full life cycle. Therefore, lighting design should factor in maintenance considerations with the design.

Maintenance requirements should be considered at the design stage and not deferred until after installation. Lighting systems are subject to performance degradations over time and require timely maintenance to sustain safety and effectiveness. Light design should include considerations for the following:

- Access for maintenance, which can include pole placement, handhole sizing, and high mast lowering devices.
- Product standardization, which can ensure consistent replacement parts and more intimate knowledge by maintenance personnel.

- Asset management system integration, which can provide electronic monitoring, outage detection, and maintenance scheduling.

When maintenance considerations are integrated at the design stages, it ensures that lighting systems remain efficient and cost-effective by preserving the intended lighting design for roadway users and minimizing deferred maintenance. Refer to FHWA Tunnel Operations, Maintenance, Inspection, and Evaluation (TOMIE) Manual for additional information related to tunnel lighting maintenance and operations.

C. Knock Downs and Removals

For existing lighting systems that incur a knocked down pole, maintenance forces should verify with the Electrical Discipline Manager or authority having jurisdiction if the pole shall be replaced. If replacement of the pole is necessary, the existing fixture shall be upgraded with an LED fixture. If replacement is not necessary, all equipment and the circuits controlling the subject pole shall be verified. Provisions shall be made for the maintenance and continued operation of the equipment if other lighting structures utilize the same circuits. Similarly, if light poles are deemed for planned removal, appropriate measures should be taken to ensure continuous operation of other lighting within the same system.

D. Adaptive Controls

Adaptive lighting allows for varying light levels based on external factors such as ambient light levels or vehicular/pedestrian volumes. Adaptive lighting is implemented through lighting controls to dim or turn off luminaires at pre-defined times or based on the readings of luminescence meters. The benefits of adaptive lighting include a reduced impact on the surrounding environment and energy savings.

Adaptive lighting controls are not permitted along roadways, interchanges, and intersections owned and operated by MDTA because MDTA's light level criteria represent minimum requirements. The only exception to this requirement is tunnel lighting, which has different luminance requirements for the threshold, transition, and interior zones based on daytime and nighttime conditions. Adaptive lighting control systems shall be considered for tunnel lighting on MDTA-owned roadways. In addition, adaptive lighting controls may be considered for MDTA facility campus lighting.

E. Minimizing Lighting System Impacts

When installing lighting on any MDTA facility, the impacts of the lighting system should be considered – specifically in regards to the areas of sky glow, light trespass, light spill, glare, and any potential health impact. Refer to the latest edition of the FHWA Lighting Design Handbook for additional information on light pollution and mitigation resources.

In general, the following key actions should be performed as part of the design:

1. Perform a review or walk-through of the site during the pre-design stage. This should include an analysis of adjacent property and nearby developments as well as an investigation into the community desires for lighting systems.

2. Select a luminaire whose candela distribution pattern matches the need. Establish the position of the luminaire precisely. If calculations then show the light distribution will be objectionable, make modifications to wattage or mounting height, or select another luminaire.
3. Consider internal and external shields if necessary to limit the candela in certain directions. Also, consider that internal and external shields will alter the photometric distribution of the fixture and account for such alterations in the lighting system design.
4. Consider pole location, mounting height, spacing, finished terrain, and landscaping as design variables that can be used to mitigate light trespass. Take advantage of natural and man-made obstacles such as tree lines and retaining walls.
5. Remember that glare or visual clutter can be produced by almost any luminaire when observed against a dark background. Consider a taller mounting height or cutoff optical system to reduce potential glare impacts to motorists. Choose luminaires and placements with care.

Minimizing Skyglow

IES developed a simplified method of classifying luminaires beyond the traditional roadway classifications of full cutoff, cutoff, semi-cutoff and non-cutoff. This system was published in the IES Technical Manual, Luminaire Classification System for Outdoor Luminaires (TM-15-20) and can be found in IES RP-8. This system considers the amount of light emitted by a luminaire and places a light zone value for Backlight, Uplight and Glare (BUG). This system was developed alongside the joint International Dark-Sky Association (IDA)-IES Model Lighting Ordinance (MLO). The MLO defined lighting requirements and restrictions and created lighting zones according to environmental impact. The following lighting zones have been established:

1. LZ0: No ambient lighting – Areas where the natural environment will be seriously and adversely affected by lighting.
2. LZ1: Low ambient lighting – Areas where lighting might adversely affect flora and fauna or disturb the character of the area.
3. 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 is not necessarily uniform or continuous. After curfew, lighting may be extinguished or reduced as activity levels decline.
4. 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 is often uniform and/or continuous. After curfew, lighting may be reduced as activity levels decline.
5. LZ4: High ambient lighting – Areas of human activity where the vision of human residents and users is adapted to high light levels. Lighting is generally considered necessary for safety, security and/or convenience and is mostly uniform and/or

continuous. After curfew, lighting may be reduced in some areas as activity levels decline.

The BUG system allows a simplified method of generally classifying a luminaire with regard to the amount of light emitted from the front, from the back, and upwards. Lower BUG rating values for backlight (B values) and uplight (U values) will generally produce less impact behind and above the fixture.

For control of skyglow, MDTA projects shall only use luminaires with an uplight rating of U-0 with the exception of tunnel lighting, temporary lighting, sign lighting, and aesthetic light.

Minimizing Light Trespass

There are methods of quantifying light trespass which are used as part of IES RP-8 and included in IES Environmental Considerations for Outdoor Lighting (LP-11). This method has also been included in the joint IDA-IES MLO.

The method includes evaluating light trespass of an exterior lighting system in terms maximum vertical illuminance at any point along a plane at a property line. The limits of vertical illuminance are based on the LZ zone where the lighting system is located. The maximum values are included in the table below.

Lighting Zone LZ 0	Lighting Zone LZ 1	Lighting Zone LZ 2	Lighting Zone LZ 3	Lighting Zone LZ 4
0.05 fc (0.5 lux)	0.1 fc (1.0 lux)	0.3 fc (3.0 lux)	0.8 fc (8.0 lux)	1.5 fc (15.0 lux)

Lighting installations for MDTA shall meet the light trespass values shown above. These limits are the vertical illuminance value along a property line (or at a residence as agreed by MDTA) at a height of 5’ and facing away from the property.

In addition to the light trespass limits shown above, there are also cases where fixture brightness can be cited as an issue from adjacent properties. This more commonly occurs with high mast luminaires and at times can be from properties at quite a distance from the installation where no measurable light can be attributed to the roadway lighting system. Generally, this issue is a perceived brightness issue where the light source – being contrasted against the dark sky – is found objectionable. In most cases, this issue can only be addressed with shielding the luminaire optics from direct view of the adjacent property. It cannot always be achieved while maintaining the required lighting levels, so it should be addressed on an individual basis.

Minimizing Health Impacts

There has been a significant amount of discussion concerning potential health impacts of light at night and some of these discussions have included the use of LED streetlights. There is also much disagreement among national groups including the American Medical Association, IES, FHWA, the US Department of Energy, and many researchers on various aspects of the topic. Based on these discussions and the current available research the following key points emerge:

1. Light at night has potential health risks based on several factors including dosage (amount of light), duration (exposure time), and spectral content (color content).
2. Streetlighting, particularly when using the light trespass limits prescribed above, does not appear to provide sufficient dosage to be a health impact.
3. Spectral content of light sources, which is measured as correlated color temperature (CCT), has impacts on health and visibility. For example, if the dosage is high enough, sources with a higher blue spectral content have greater impacts (on circadian disruption) than sources with less blue content. From a visibility perspective, when comparing sources with a CCT of 4000K (more blue) and sources with a CCT of 3000K (less blue), detection distances appear significantly greater with the 4000K sources in some early studies.

Current studies, however, show that properly designed roadway lighting will not have an impact on health and that 4000K CCT sources appear to offer longer detection distances than other currently offered CCT LEDs. Considering these key points, CCT for MDTA exterior lighting projects shall be 4000K. If lighting impacts to environment are a concern, 3000K sources may be considered but shall require approval from MDTA.

F. Light Loss Factor

Over time, the performance of luminaires diminishes due to a variety of environmental and mechanical factors. IES RP-8 provides two primary factors that contribute to the depreciation of a LED luminaire's lighting output: Lamp Dirt Depreciation (LDD) and Lamp Lumen Depreciation (LLD).

LDD is a ratio used to measure the impact of dirt that accumulates on that lamp over time. LDD will vary based on the characteristics of the location including traffic volumes, weather, and roadway offset. The deposited dirt can deteriorate the luminaire lens, reduce the lumen output of the luminaire, and change the distribution of the light over the roadway. Routinely cleaning the luminaire housing can improve a luminaire's service life and maintain the design lighting values after a system installation. MDTA typically uses a LDD factor of 0.9 based on the guidance from IES RES-1-16. Lighting designers should evaluate the use of a lower LDD if lighting is proposed in an area with unusual dust or smoke (such as a tunnel).

LLD is a ratio used to measure the gradual reduction of lumen output from the lamp itself as it ages. This factor is dependent on the specific luminaire model and will vary between manufacturers and models. Manufacturers publish data for each luminaire model, which should be used by the designer to predict its lumen output. MDTA ITS & Electrical Special Provision 950.12 expects a service life of 50,000 hours, which can be cross-referenced with the lumen maintenance value specified by the manufacturer to obtain the LLD.

When calculating the design values of lighting levels, the lighting designer should choose a reduction factor of the initial luminaire output to model the depreciation over its service life. The reduction factor is called Light Loss Factor (LLF), which is defined as:

LLF = LDD x LLD

MDTA ITS & Electrical Special Provision 950.12 Attachment 950.12-A: Suggested Luminaires for MDTA Projects, contains LLF values for MDTA luminaire models. If a luminaire is being used that does not originate from Attachment 950.12-A, an appropriate LLF should be selected using the above methodology and agreed on by MDTA.

G. Energy Savings Rebates

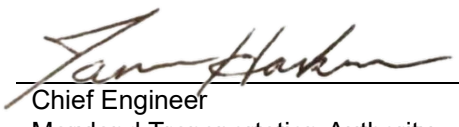
Through the EmPOWER Maryland Energy Efficiency Act of 2008, certain utility companies in Maryland provide incentives for upgrading existing or installing new energy efficient lighting. If a project is applicable for these incentives, the utility companies typically require fixtures that are listed in the Design Lights Consortium (DLC) Qualified Product Listing (QPL). MDTA ITS & Electrical Special Provision 950.12 Attachment 950.12-A: Suggested Luminaires for MDTA Projects provides information about a fixture's compliance with the DLC QPL. For luminaires not included in the Suggested Luminaires for MDTA projects list, additional information can be found on the DLC website.

H. Geographic Information Systems (GIS) & As-Built Data

Designers should utilize MDTA's existing Enterprise Geographic Information System (GIS) to support lighting design projects. MDTA's GIS includes data on low level light poles, high mast light poles, electrical lines and electrical junctions. All MDTA lighting projects should include the Contract Provision for Electronic Construction Data Submission Requirements For Geographic Information System (GIS) to ensure that GIS as-built data is provided by the Contractor to MDTA to support updates to the MDTA Enterprise GIS system. As-built plans should be provided by the Contractor via the construction submittal process and reviewed by the Engineer of Record for all lighting projects to ensure MDTA has a good record of the work completed along the facilities.

Revision Date	Revision Description:
05/21/2019	Original
07/01/2026	Revisions in Multiple Sections

Approved

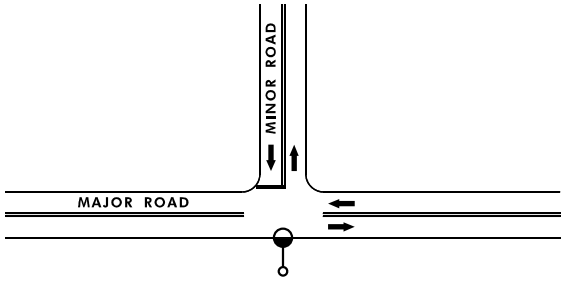


09/04/2026

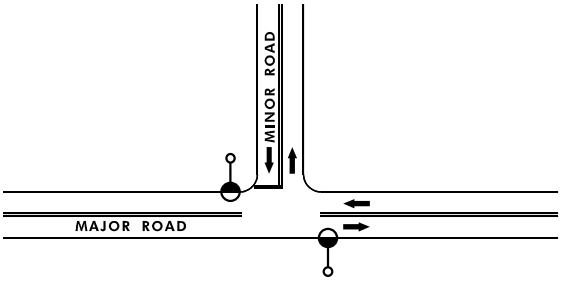
Chief Engineer
Maryland Transportation Authority

Date

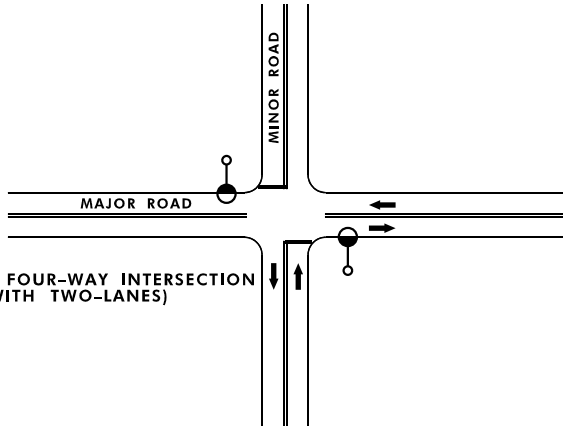
LIST OF APPENDICES



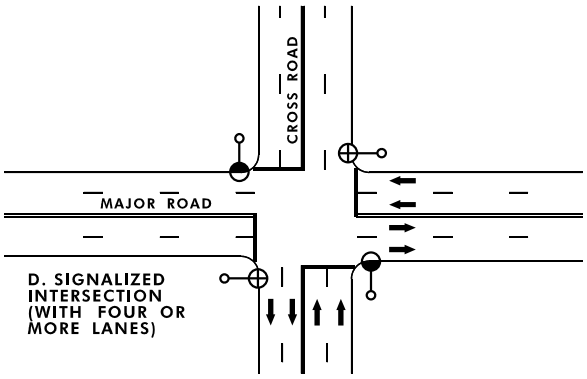
A. T–INTERSECTION



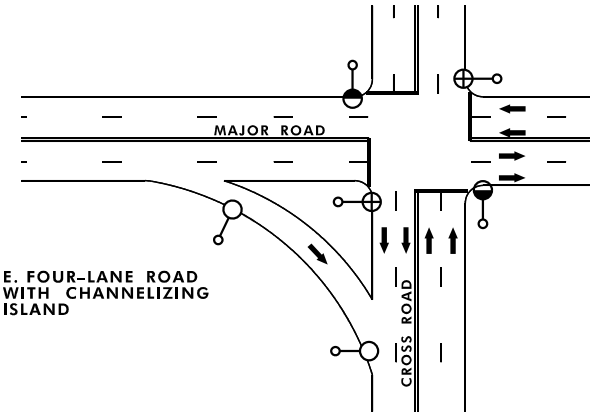
B. T–INTERSECTION (ALTERNATE)



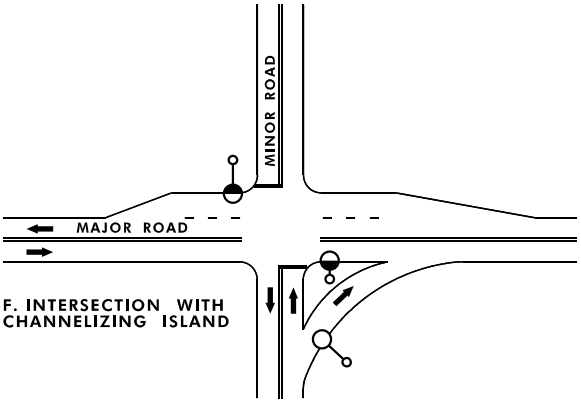
C. FOUR–WAY INTERSECTION (WITH TWO–LANES)



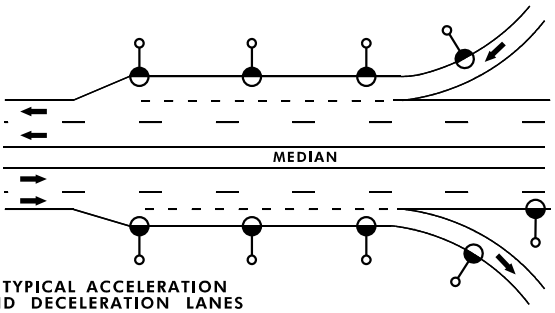
D. SIGNALIZED INTERSECTION (WITH FOUR OR MORE LANES)



E. FOUR–LANE ROAD WITH CHANNELIZING ISLAND



F. INTERSECTION WITH CHANNELIZING ISLAND



G. TYPICAL ACCELERATION AND DECELERATION LANES AT ON AND OFF RAMPS

LEGEND

- UNIT REQUIRED
- UNIT RECOMMENDED
- UNIT OPTIONAL

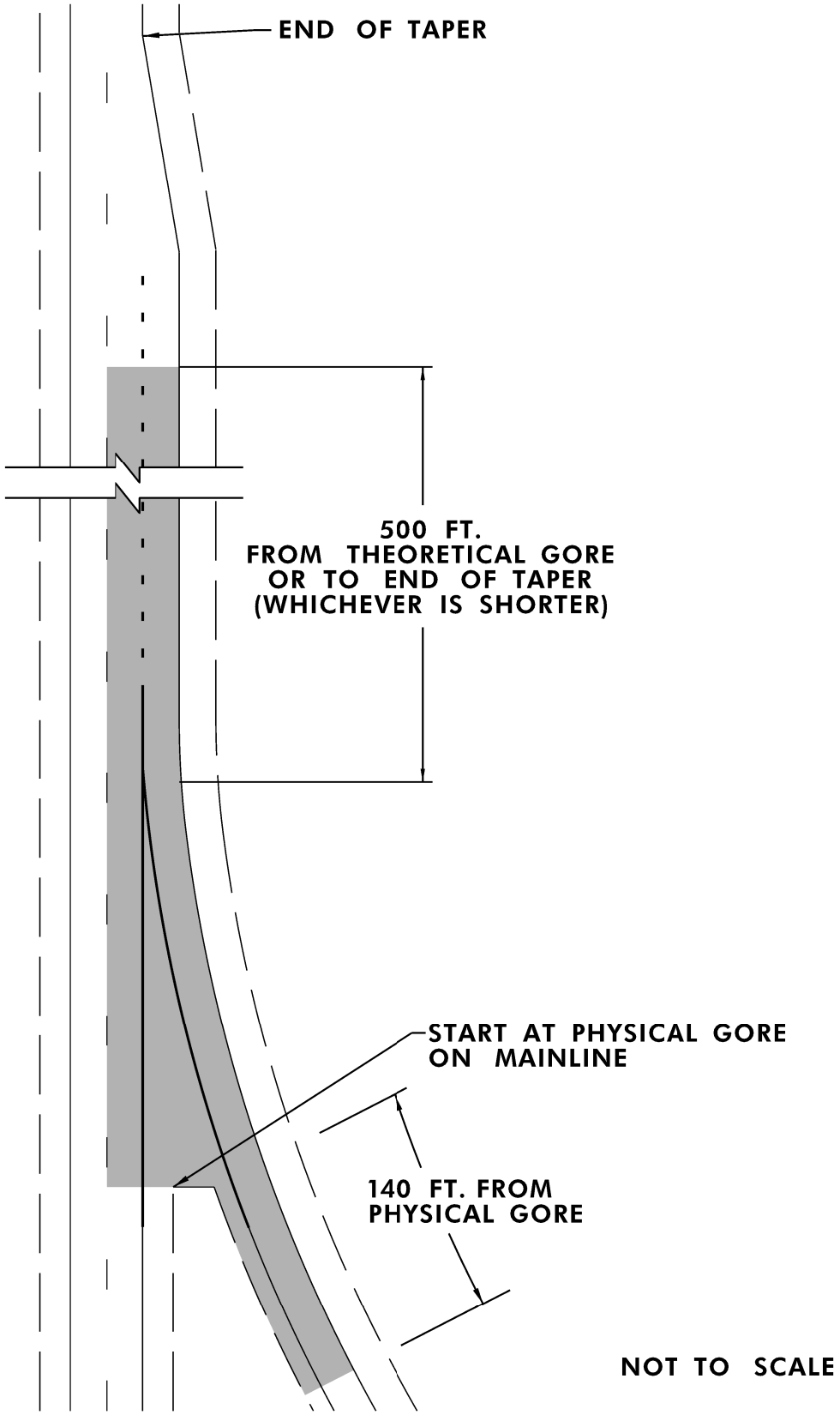
NOTE: DRAWINGS ARE NOT TO SCALE AND THE LIGHT LOCATIONS SHOWN ARE NOT TO BE CONSIDERED COMPLETE IN NUMBER OR BETTER THAN APPROXIMATE IN POSITION

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

LIGHTING DESIGN GUIDELINES
EXAMPLES OF LIGHTING CONFIGURATIONS

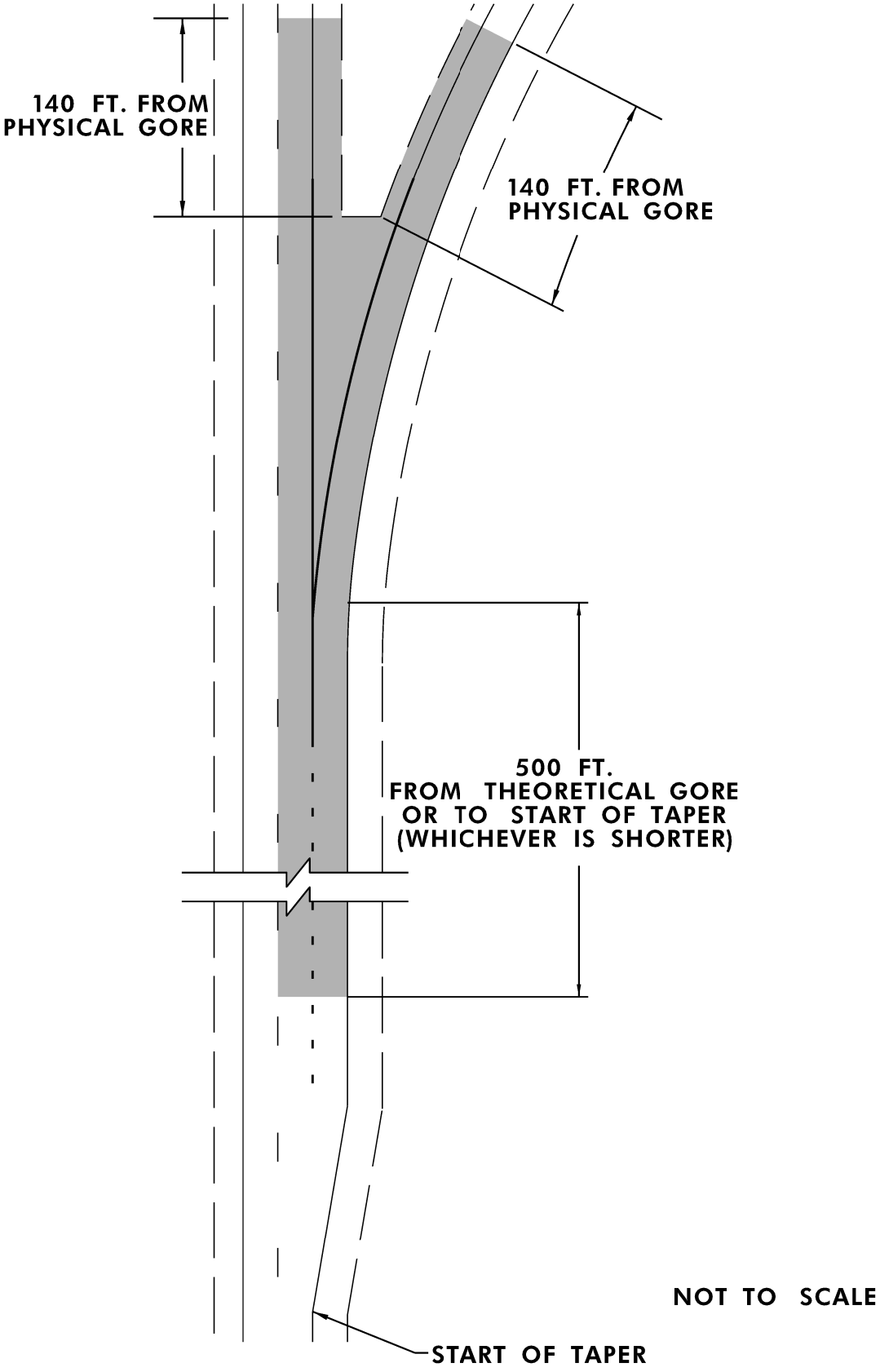
FIGURE NO. III–A.1



MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

LIGHTING DESIGN GUIDELINES
LIGHTING ANALYSIS AREA FOR ENTRANCE RAMPS

FIGURE NO. III–A.2



MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

LIGHTING DESIGN GUIDELINES
LIGHTING ANALYSIS AREA FOR EXIT RAMPS

FIGURE NO. III–A.3

Table III-A.4: Recommended Maintained Illuminance Lighting Values for Interchanges and Continuous Lighting on Roadways with Curves

Road and Pedestrian Activity Classification[1]		Pavement Classification[2] (Minimum Maintained Average Values)			Uniformity Ratio	Veiling Luminance Ratio
Road Classification	**Pedestrian Classification Area**	**R1 (fc)[3]**	**R1&R3 (fc)[3]**	**R4 (fc)[3]**	E_{avg}/E_{min}	$L_{v,max}/L_{avg}$
Freeway Class A		0.6	0.9	0.8	3.0	0.3
Freeway Class B		0.4	0.6	0.5	3.0	0.3
Expressway	High	1.0	1.4	1.3	3.0	0.3
	Medium	0.8	1.2	1.0	3.0	0.3
	Low	0.6	0.9	0.8	3.0	0.3
Major	High	1.2	1.7	1.5	3.0	0.3
	Medium	0.9	1.3	1.1	3.0	0.3
	Low	0.6	0.9	0.8	3.0	0.3
Collector	High	0.8	1.2	1.0	4.0	0.4
	Medium	0.6	0.9	0.8	4.0	0.4
	Low	0.4	0.6	0.5	4.0	0.4
Local	High	0.6	0.9	0.8	6.0	0.4
	Medium	0.5	0.7	0.6	6.0	0.4
	Low	0.3	0.4	0.4	6.0	0.4

[1] Road and Pedestrian Activity Classification as defined in IES RP-8 Recommended Practice: Lighting Roadway and Parking Facilities.

[2] Pavement Classification as defined in IES RP-8 Recommended Practice: Lighting Roadway and Parking Facilities.

[3] The conversion rate between US customary and SI units for illuminance shall be 1 lux = 0.1 fc. SI unit values shall match or exceed values specified in RP-8.

Table III-B.2: Maryland State Highway Administration Evaluation Form for Intersections and Mid-Block Pedestrian Crossing Lighting

Location:

Evaluation

	Criteria		Scor Met = 1 Not Me = 0 (a)	Weight (b)	Total (a x b)
a.	Is intersection signalized?		0	5	0
b.	Does intersection have medians on any approach?		0	4	0
c.	Does intersection have left turn bays and /or other auxiliary lanes?		0	3	0
d.	Is intersection a freeway ramp terminal?		0	4	0
e.	Is there significant pedestrian volume after dark?		0	3	0
f.	Does intersection involve two or more state maintained highways?		0	1	0
g.	Does ADT of state highway exceed 15,000?		0	2	0
h.	Ratio of Night to total crashes (Min 5 crashes)	0.35-0.40	0	1	0
		0.40-0.45	0	3	0
		0.45-0.50	0	5	0
		> 0.50	0	8	0
i.	Is intersection at school entrance or children walking to school?		0	3	0
j.	Is operating speed on any road approach greater than 50 MPH?		0	4	0
k.	Is intersection sight distance restricted?		0	5	0
l.	Are there any brightly lighted areas, i.e., parking lots, commercial area, etc. within 300 feet of the intersection?		0	4	0
m.	Are any of the road approaches continuously lighted?		0	4	0
Total					0

1) Intersection lighting is to be considered by a score of 13 or more.
2) Potential for intersection lighting will be prioritized based on score.
3) Mid-block crossing lighting is to be considered by a score of 7 or more.

Table III-B.3: Recommended Maintained Illuminance Values for Intersections other than Roundabouts

Road Classification	Pavement Classification[1]			Maximum Uniformity Ratio	Maximum Veiling Luminance Ratio
	R1 (fc)[4]	R2 & R3 (fc)[4]	R4 (fc)[4]	E_{avg}/E_{min}	L_{Vmax}/L_{avg}
Intersection Lighting	0.6	0.9	0.8	4.0	0.3

Table III-B.4: Recommended Maintained Illuminance Values for Intersections of Continuously Lit Roadways[3]

Functional Classification	Average Maintained Illuminance (fc)[4]			Maximum Uniformity Ratio E_{avg}/E_{min}
	High[2]	Medium[2]	Low[2]	
Major/Major	3.4	2.6	1.8	3.0
Major/Collector	2.9	2.2	1.5	3.0
Major/Local	2.6	2.0	1.3	3.0
Collector/Collector	2.4	1.8	1.2	4.0
Collector/Local	2.1	1.6	1.0	4.0
Local/Local	1.8	1.4	0.8	6.0

[1] Pavement Classification as defined in IES RP-8 Recommended Practice: Lighting Roadway and Parking Facilities.

[2] Pedestrian Conflict Areas (Pedestrian Activity Classification) as defined in IES RP-8 Recommended Practice: Lighting Roadway and Parking Facilities.

[3] Based on R2/R3 Pavement Classification defined in IES RP-8 Recommended Practice: Lighting Roadway and Parking Facilities.

[4] The conversion rate between US customary and SI units for illuminance shall be 1 lux = 0.1 fc. SI unit values shall match or exceed values specified in RP-8.

Table III-C.1: Recommended Maintained Luminance Values for Continuous Lighting on Straight Roadways and Streets

Road and Pedestrian Conflict Area[1]		Average Luminance L_{avg} (cd/m²)	Uniformity Ratio L_{avg}/L_{min}	Uniformity Ratio L_{max}/L_{min}	Veiling Luminance Ratio L_{vmax}/L_{avg}
Road	**Pedestrian Conflict Area[1]**				
Freeway Class A		0.6	3.5	6.0	0.3
Freeway Class B		0.4	3.5	6.0	0.3
Expressway	High	1.0	3.0	5.0	0.3
	Medium	0.8	3.0	5.0	0.3
	Low	0.6	3.5	6.0	0.3
Major	High	1.2	3.0	5.0	0.3
	Medium	0.9	3.0	5.0	0.3
	Low	0.6	3.5	6.0	0.3
Collector	High	0.8	3.0	5.0	0.4
	Medium	0.6	3.5	6.0	0.4
	Low	0.4	4.0	8.0	0.4
Local	High	0.6	6.0	10.0	0.4
	Medium	0.5	6.0	10.0	0.4
	Low	0.3	6.0	10.0	0.4

[1] Road and Pedestrian Activity Classification as defined in IES RP-8 Recommended Practice: Lighting Roadway and Parking Facilities.

Table III-C.2 - SHA Evaluation Form for Continuous Freeway Lighting

Consideration No.	Consideration Description	Sub-Category	Score Met = 1 Not Met = 0 (a)	Weight (b)	Sub-Total (a) X (b)
1	Three or more successive interchanges are located with an average spacing of 1.5 mi or less and adjacent areas outside the right-of-way are substantially urban in character.			5	0
2	Sections of two miles or more passing through a substantially developed suburban or urban area in which local traffic operates on a complete street grid having some form of street lighting, parts of which are visible from the freeway.			5	0
3	Sections of two miles or more passing through a substantially developed suburban or urban area in which the freeway passes through a series of developments-such as residential, commercial, industrial and civic areas, colleges, parks, terminals, etc. that include lighted roads, streets, parking areas, yards, etc. that are lighted.			3	0
4	Sections of two miles or more passing through a substantially developed suburban or urban area in which separate cross streets, both with and without connecting ramps, occur with an average spacing of 0.5 mi or less, some of which are lighted as part of the local street system.			3	0
5	Sections of two miles or more passing through a substantially developed suburban or urban area in which the freeway cross section elements, such as median and shoulders, are substantially reduced in width below desirable sections used in relatively open country.			4	0
6	The ratio of nighttime to daytime crashes is at least 2.0 times the statewide average for similar roadways, and a study indicates that lighting may be expected to result in a significant reduction in the night crash rate.			10	0
7	Nighttime fatalities within analyzed segment in past 3 years	0		0	0
		1		2	0
		2		4	0
		3 or more		5	0
8	Average Daily Traffic (ADT)	49,999 or less		0	0
		50,000-79,999		1	0
		80,000-149,999		2	0
		150,000-199,999		3	0
		200,000 or more		5	0
9	Context Zone	A) Urban Core		4	0
		B) Urban Center		3	0
		C) Suburban Activity Center / Traditional Town Center		2	0
		D) Suburban		1	0
		E) Rural		0	0
Total					**0**

Continuous freeway lighting may be considered by a score of 24 or more

Section III-D.1: Design Guidance for Sign Lighting

DESIGN GUIDANCE FOR SIGN LIGHITNG

1. **All overhead signs shall be fabricated with ASTM D4956 Type XI retroreflective sign sheeting. Sign sheeting requirements included on Drawing No. SN-1 and Special Provision 950.03 shall reflect the use of ASTM D4956 Type XI for overhead signs.**

2. **All projects which involve lighting or signing should evaluate existing overhead signs for appropriateness of sign lighting. Signs within the project's signing limits, which are eligible to have sign lighting removed, should be replaced and upgraded to include ASTM D4956 Type XI sign sheeting, except in cases where the existing sign sheeting is known to have met ASTM D4956 Type XI, is in adequate condition to remain, and does not require changes to be in compliance with the Maryland Manual on Uniform Traffic Control Devices (MDMUTCD).**

3. **To reduce the need for maintenance repairs to existing sign lighting circuits, associated with overhead signs which are eligible for sign lighting removal, overhead sign sheeting may be upgraded to ASTM D4956 Type XI sheeting through a task order, maintenance request, or other contractual means.**

4. **For those cases where existing signs are being replaced, the following items must be considered:**

    - Existing sign legends should be assessed for appropriateness and compliance with MDMUTCD and current standards. New signs shall be designed in compliance with the MDMUTCD and current standards.

    - Existing sign structures shall be assessed for structural sufficiency for all signs that are to be mounted (existing to remain and proposed) on a given structure.

    - When sign lighting is deemed to be no longer required for an overhead sign, the existing sign/luminaire 'I' supports should be cut to remove length of support in excess of the sign panel height, cleaned, and spray galvanized. An item shall be included in the Contract that specifies cutting and/or relocating Overhead Sign / Luminaire "I" Support paid per Each. Alternatively, existing 'I' supports may be removed and replaced with new 'I' supports.

        - If the proposed sign is larger than the existing sign and new 'I' supports are not proposed, additional double aluminum angle vertical support attachments shall be added to the top of the existing support as shown in SHA Standard MD 813.05. Designers should work with MDTA to determine the appropriate length of the aluminum angles. The measurement and payment for aluminum angles shall be specified as part of the project specifications including Section 813.

- If new ‘I’ supports are proposed without sign lighting, the spacing criteria used for the Sign Luminaire Supports (OOTS TCD Design Manual and SHA Standard MD 803 Series) shall apply.

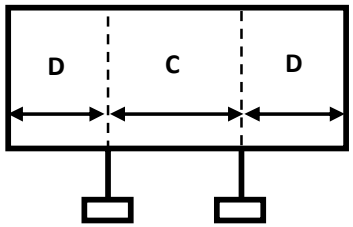
5. Disconnection of existing sign lighting circuit:

- All equipment on the circuits controlling the subject sign structure shall be verified. In cases where there are additional sign structures or other lighting structures on the same circuit, provisions shall be made to keep them operating.

    - The existing circuits to remain in service should be traced back to the point between the last “Y” splice connection and the cabinet; and new Type 1 connector kits or submersible splice kits should be installed in place of the “Y” splices. On some circuits, this “Y” splice could be in the base of the structure itself, a manhole adjacent to the structure, an adjacent light pole or further down the road. Contact the appropriate MDTA maintenance personnel to help identify the logical and safe disconnection point.

    - On sign structures that have a dedicated cabinet and independent service feed, arrangements shall be made with local power company to have the existing electrical utility service feed disconnected. If the existing electrical utility service is un-metered, the structure shall be removed from the MDTA account.

Figure III-D.2: SHA OOTS Traffic Control Device Design Manual Appendix A-6 Sign Lighting Schedule



SIGN LIGHTING SCHEDULE

PANEL WIDTH (FEET)	SPACING D (FEET)	SPACING C (FEET)	NUMBER LIGHTS NEEDED
8	2	4	2
9	2	5	2
10	3	4	2
11	3	5	2
12	3	6	2
13	2.5	4	3
14	2	5	3
15	2.5	5	3
16	3	5	3
17	3	5.5	3
18	3	6	3
19	2	5	4
20	2.5	5	4
21	3	5	4
22	2	6	4
23	2.5	6	4
24	3	6	4

PANEL WIDTH (FEET)	SPACING D (FEET)	SPACING C (FEET)	NUMBER LIGHTS NEEDED
25	2.5	5	5
26	3	5	5
27	2.5	5.5	5
28	2	6	5
29	2.5	6	5
30	3	6	6
31	3	5	6
32	3.5	5	6
33	1.5	6	6
34	2	6	6
35	2.5	6	6
36	3	6	6
37	2	5.5	7
38	2.5	5.5	7
39	3	5.5	7
40	2	6	7
41	2.5	6	7

PANEL WIDTH (FEET)	SPACING D (FEET)	SPACING C (FEET)	NUMBER LIGHTS NEEDED
42	3	6	7
43	3.5	6	7
44	2.75	5.5	8
45	1.5	6	8
46	2	6	8
47	2.5	6	8
48	3	6	8

Table III-E.1: Recommended Maintained Vertical Illuminance Values for Mid-Block Pedestrian Crossings

Pedestrian Conflict Area[1]	E_{Vmin} (fc)[2,3]
High	3.7
Medium	2.8
Low	1.9

E_{Vmin} = Minimum vertical illumination at 1.5 m (4.9 ft) above crosswalk measured in both directions parallel to vehicle flow.

[1] Pedestrian Conflict Areas (Pedestrian Activity Classification) as defined in IES RP-8 Recommended Practice: Lighting Roadway and Parking Facilities.

[2] The pavement luminance of a mid-block crossing within a corridor with Continuous Freeway Lighting shall meet or exceed the luminance of the road as defined in IES RP-8.

[3] The conversion rate between US customary and SI units for illuminance shall be 1 lux = 0.1 fc. SI unit values shall match or exceed values specified in RP-8.

Table IV-B.1: Recommended Maintained Illuminance Levels for Roadway Rest Areas[1]

Rest Area	Average Horizontal Illuminance (fc)[3]	Uniformity Ratio (AVG:MIN)
Entrance and Exit		
Access Lanes	*Refer to Table III-A.4*	
Gores		
Interior Roadways	0.6	3:1
Activity Areas[2]		
Major	1.0	3:1
Minor	0.5	6:1

[1] The illuminance values recommended represent the condition just prior to cleaning and/or group relamping as calculated and planned in the design procedure.

[2] Activity Areas are not a focus of the MDTA Lighting Guidelines; however, if provided, they shall meet these values.

[3] The conversion rate between US customary and SI units for illuminance shall be 1 lux = 0.1 fc. SI unit values shall match or exceed values specified in RP-8.

Table IV-B.2: Recommended Maintained Illuminance Values for Parking Areas

Parking Area	Minimum Horizontal Illuminance[1] (fc)[5]	Uniformity Ratio[2] (MAX:MIN)	Minimum Vertical Illuminance[3] (fc)[5]
Basic	0.2	20:1	0.1
Enhanced Security[4]	0.5	15:1	0.25

[1] For preliminary design, an average value of 1.0 horizontal footcandle (hfc) for basic illuminance and 2.5 hfc for enhanced illuminance shall be calculated. The minimum and maximum points shall then be calculated, and the uniformity ration shall be checked for compliance with the table's values.

[2] The highest horizontal illuminance point divided by the lowest horizontal illuminance point or area should not be greater than the values shown.

[3] Facial recognition may be made at levels as low as 0.25 fc. The IESNA Security Lighting committee recommends that for facial identification, the minimum vertical illuminance should be 0.5 fc. This should be measured at 1.5 (4.9 ft.) above the surface in various directions.

[4] If personal security or vandalism is a likely and/or severe problem, a significant increase of the Basic level may be appropriate.

[5] The conversion rate between US customary and SI units for illuminance shall be 1 lux = 0.1 fc. SI unit values shall match or exceed values specified in RP-8.

Table IV-C.1: Recommended Maintained Lighting Values for Pedestrian Portion of Underpasses with Walkways/Bikeways

	E_H (fc)[3]	E_{Vmin} (fc)[3]	E_{avg}/E_{min}[1]
Night	4.0	2.0	3.0
Day[2]	10.0	5.0	3.0

E_H = Average horizontal illumination at walkway/bikeway

Evmin = Minimum vertical illumination at 1.5 m (4.9 ft) above walkway/bikeway measured in both directions parallel to the main pedestrian flow

[1] Horizontal only

[2] Use only when engineering study indicates that enhanced security lighting is required

[3] The conversion rate between US customary and SI units for illuminance shall be 1 lux = 0.1 fc. SI unit values shall match or exceed values specified in RP-8.

Table IV-E.1 - SHA Evaluation Form for Pedestrian Lighting

Considerations for Continuous and Non-Continuous (Conflict Area) Pedestrian Lighting

Consideration No.	Consideration Description	Sub-Category	Score Met = 1 Not Met = 0 (a)	Weight (b)	Sub-Total (a) X (b)
1	The system is within ½ mile of a transit center or ¼ mile of a major transit stop or is along a connection between two or more transit centers.			5	0
2	The system falls within a designated Priority Funding Area.			1	0
3	The system is within ½ mile of an educational or similar facility that generates significant pedestrian and/or bicyclist traffic during hours of darkness.			5	0
4	The total number of pedestrians and/or bicyclists within any one-hour period of darkness is greater than 100.			7	0
5	The system is within a commercial area with significant nighttime activities.			4	0
6	Pedestrian and/or bicyclist safety issues have been documented after dark.			4	0
7	Context Zone	A) Urban Core		0	0
		B) Urban Center		0	0
		C) Suburban Activity Center / Traditional Town Center		3	0
		D) Suburban		4	0
		E) Rural		1	0
8	Located in areas with high ambient light levels (parking lots, transit centers, etc.)			3	0
9	Average Daily Traffic (ADT) Exceed 15,000			3	0
10	Facility Type	Non-Divided, 2 or 3 Lanes		0	0
		Non-Divided, 4+ Lanes		1	0
		Divided, 4+ Lanes		2	0
11	Speed Limit *Per ANSI/IES RP-8-18, continuous roadway lighting may not be necessary when the posted speed limit is less than 30 mph. At lower speeds, low beam headlights extend the entire stopping sight distance which provides enough time for drivers to identify and react to obstacles in the roadway.*	Less than 30 MPH		0	0
		30 MPH to 45 MPH		2	0
		Greater Than 45 MPH		3	0
12	Spacing of crossings or intersections is greater than 800 feet. *Along roadways with intersection or crosswalk spacing less than 800 feet, isolated crosswalk lighting might be feasible instead of continuous pedestrian lighting.* (Refer to Table III-B.2)			3	0
13	Nighttime Pedestrian Fatality Has Occurred Within Past 5 Years	None		0	0
		1		6	0
		2		8	0
		3		10	0
		4		12	0
		5 or Greater		14	0
14	Sidewalk Buffer from Roadway Less Than 5 Feet or No Buffer			3	0
15	No barrier between sidewalk or bicycle way and travel lanes			3	0
16	Functional Classification	Interstate/OPA Freeway and Expressway		0	0
		Principal Arterial Other		3	0
		Minor Arterial		2	0
		Collector (Major or Minor)		2	0
		Local		1	0
Total					**0**

Pedestrian lighting may be considered by a score of 18 or more

Table IV-E.2: Recommended Maintained Illuminance Values for High Pedestrian Conflict Areas[1]

	E_H (fc)[2]	E_{vmin} (fc)[2]	E_{avg}/E_{min}*
Mixed Vehicle and Pedestrian**	2.0	1.0	4.0
Pedestrian	1.0	0.5	4.0

Table IV-E.3: Recommended Maintained Illuminance Values for Medium Pedestrian Conflict Areas[1]

	E_H (fc)[2]	E_{vmin} (fc)[2]	E_{avg}/E_{min}*
Pedestrian	0.5	0.2	4.0

Table IV-E.4: Recommended Maintained Illuminance Values for Low Pedestrian Conflict Areas[1]

	E_H (fc)[2]	E_{vmin} (fc)[2]	E_{avg}/E_{min}*
Rural/Semi-Rural Area	0.2	0.06	10.0
Low Density Residential	0.3	0.08	6.0
Medium Density Residential	0.4	0.1	4.0

* Horizontal

** Mixed vehicle and pedestrian refers to those areas where the pedestrians are immediately adjacent to vehicular traffic without barriers or separation. Does not apply to mid-block crossings.

E_H = Average horizontal illuminance at walkway/bikeway

E_{vmin} = Minimum vertical illumination at 1.5 m (4.9 ft) above walkway/bikeway measured in both directions parallel to the main pedestrian flow

[1] Road and Pedestrian Activity Classification as defined in IES RP-8 Recommended Practice: Lighting Roadway and Parking Facilities

[2] The conversion rate between US customary and SI units for illuminance shall be 1 lux = 0.1 fc. SI unit values shall match or exceed values specified in RP-8

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