New Jersey Turnpike Authority
P.O. Box 5042, Woodbridge, NJ 07095

January 9, 2024

Document Change Announcement

2007 Design Manual
Electrical Qualification Criteria Updates
DCA2024DM-01

Subject: Revisions to

Section 8 Lighting and Power Distribution Systems, Subsection 8.1 General
Subsection 8.2 Lighting Systems Design
Subsection 8.3 Lighting Equipment and Materials
Subsection 8.4 Power Distribution and Raceway System Design

Description of Change:
This DCA contains miscellaneous electrical updates and is released in conjunction with DCAs for the Standard Supplementary Specifications and Standard Drawings. The Design Manual changes clarify direction for wire and cable requirements, verbiage referring to Manual Transfer Switches and Generator Docking Stations, enclosure types and materials.

Notice to New Jersey Turnpike Authority Staff and Design Consultants
Effective immediately, all contracts currently in the design phase shall incorporate the revisions herein. For advertised contracts awaiting the opening of bids this revision shall be incorporated via addendum. Contact your New Jersey Turnpike Authority Project Manager for instruction.

The revisions may be accessed on the Authority's webpage: https://www.njta.com/doing-business/professional-services

Recommended By:

Lamis T. Malak, P.E.
Deputy Chief Engineer - Design

Daniel Hesslein, P.E.
Deputy Chief Engineer - Construction

Approved By:

Michael Garofalo, P.E.
Chief Engineer

Distribution: Senior Staff Engineering, Law, Maintenance & Operations Depts., All Prequalified Consultant Firms, File

NOTE: All text herein are REVISIONS, as indicated by the highlighted tracked changes, to the latest version of the Design Manual.

Section 8 - LIGHTING AND POWER DISTRIBUTION SYSTEMS

8.1. GENERAL

8.1.4. Reference Publications

The following publications have been referenced in developing this Section for Lighting and Power Distribution Systems and shall serve as a reference to design information that is not specifically included in this Manual. Unless otherwise noted, all publications in this Manual shall refer to the latest edition.

- *Roadway Lighting Design Guide.* AASHTO Publication GL, American Association of State Highway and Transportation Officials (AASHTO).
- *Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting.* Publication Number RP-8, Illuminating Engineering Society ~~of North America~~ (IES~~NA~~) and American National Standards Institute (ANSI).
- *FHWA Lighting Handbook. Federal Highway Administration (FHWA).*
- *Standard Specifications. New Jersey Turnpike Authority.*
- *Current Standard Drawings. New Jersey Turnpike Authority.*
- *NJTA Qualified Products List (QPL). New Jersey Turnpike Authority*
- *National Electrical Code. Publication Number NFPA 70, National Fire Protection Association (NFPA).*
- ~~*The Lighting Handbook. Illumination Engineering Society (IES)*~~
- *NJDOT Roadway Design Manual. New Jersey Department of Transportation*
- *The National Electrical Safety Code (NESC). Publication C2, Institute of Electrical and Electronics Engineers Standards Association (IEEE SA).*
- *A Policy on Geometric Design of Highways and Streets. American Association of State Highway and Transportation Officials (AASHTO).*

8.2.1.3. Sign Lighting

Sign Lighting shall not be provided for any new signs (span, butterfly, cantilever, ground, or bridge-mounted) on the Authority roadways, unless warranted based on the conditions below.

Where existing sign lighting or sign panels are to be replaced, sign panels shall be replaced with new retroreflective sheeting in accordance with the Standard Specifications. Where proposed conditions do not warrant sign lighting, the existing sign lighting shall be removed, including structural supports.

The Engineer shall list the design criteria to be used for all sign lighting calculations in the Phase "A" submission and submit the calculations in the Phase "B" submission.

The following are the overhead sign lighting warranting conditions:

1. Tangent sight distance is less than 1200 feet due to horizontal or vertical curve or other sight obstruction.
2. Areas with high occurrence of fog as identified by Operations.
3. The sign is for a left exit and is the last sign, nearest the gore area when exiting the mainline, in any series of signs approaching the exit.
4. The sign is an Exit Direction Sign, as defined in the Design Manual Subsection 7.4.3.1, and is the last sign prior to exiting the roadway. See Exhibit 7-57 of Design Manual Section 7.
5. The penultimate, overhead advance warning or guide sign on approach to a mainline barrier toll plaza where the final sign in the sequence is the Exit Direction sign to that plaza. Lighting for this penultimate sign is warranted if located less than one-half mile from the bifurcation.
6. Other guide signs where directed by the Authority.

...

8.2.1.4. Roadway Tunnel Lighting

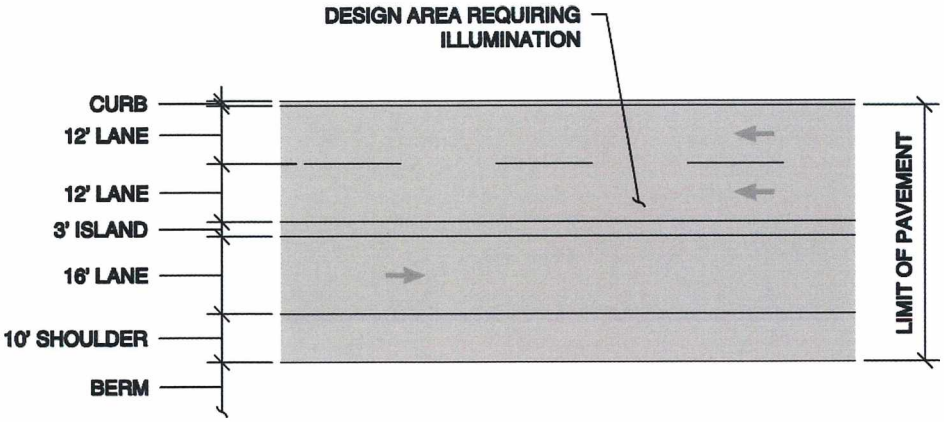
A warrant analysis for Roadway Tunnel Lighting shall be prepared in accordance with the ANSI/IES~~NA~~ Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting Publication RP-8. RP-8 characterizes a tunnel as, "A structure over a roadway that restricts the normal daytime illumination of a roadway section such that the driver's vision is substantially diminished."

Where tunnel lighting is warranted, supplemental daytime lighting shall be required as directed in RP-8. Nighttime light levels in the tunnel shall be in accordance with RP-8 Tunnel Lighting Recommendations.

...

8.2.2.1. Continuous Lighting on Roadways

Exhibit 8-1 ~~Exhibit 8-1~~ Required Design Area for Typical Ramp



8.2.2.2. Deceleration Lanes

Exhibit 8-2 ~~Exhibit 8-2~~ Required Design Area for Deceleration Lane

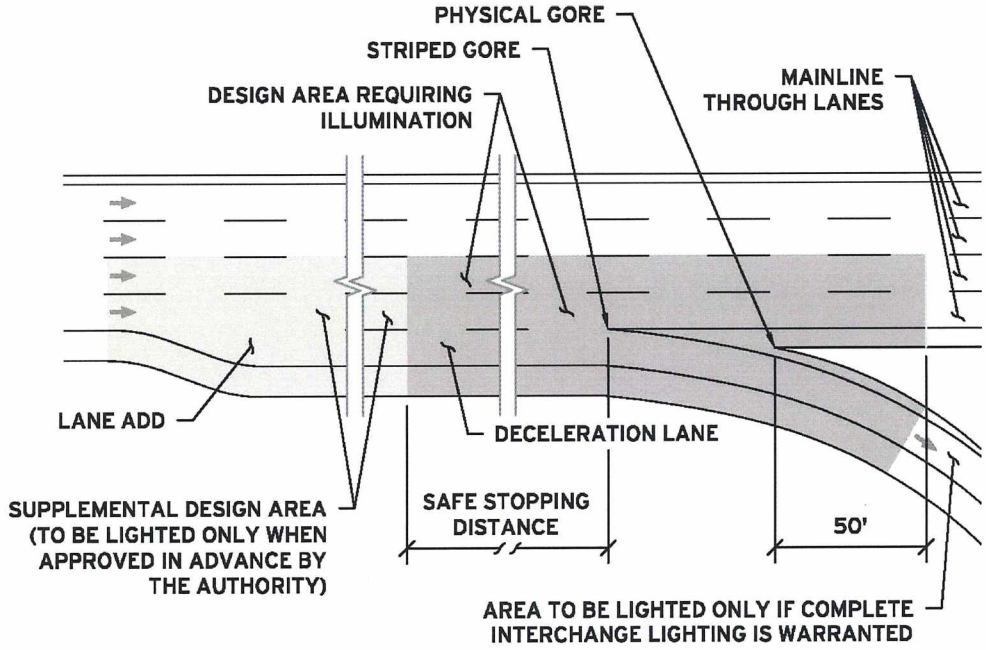
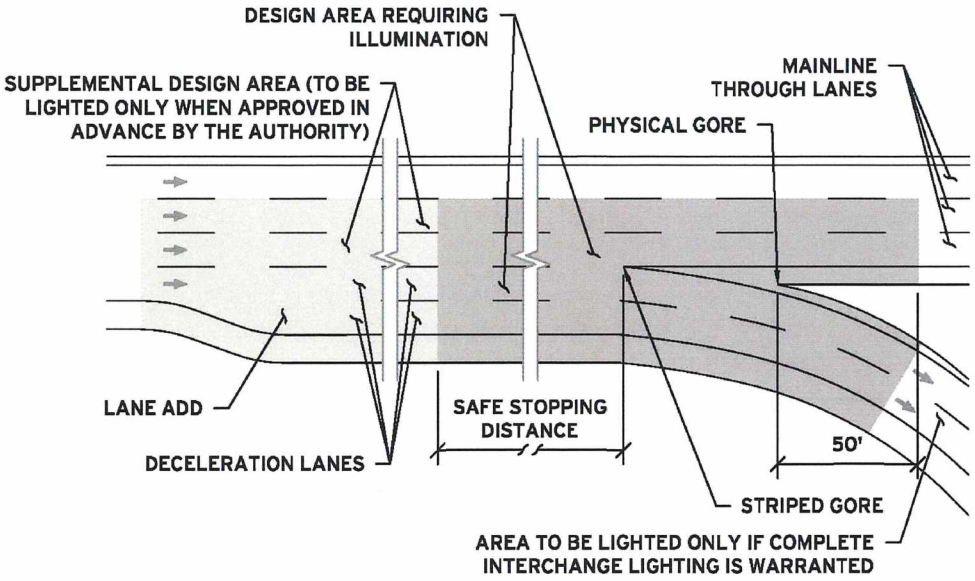


Exhibit 8-3 ~~Exhibit 8-3~~ Required Design Area for Multiple Deceleration Lanes



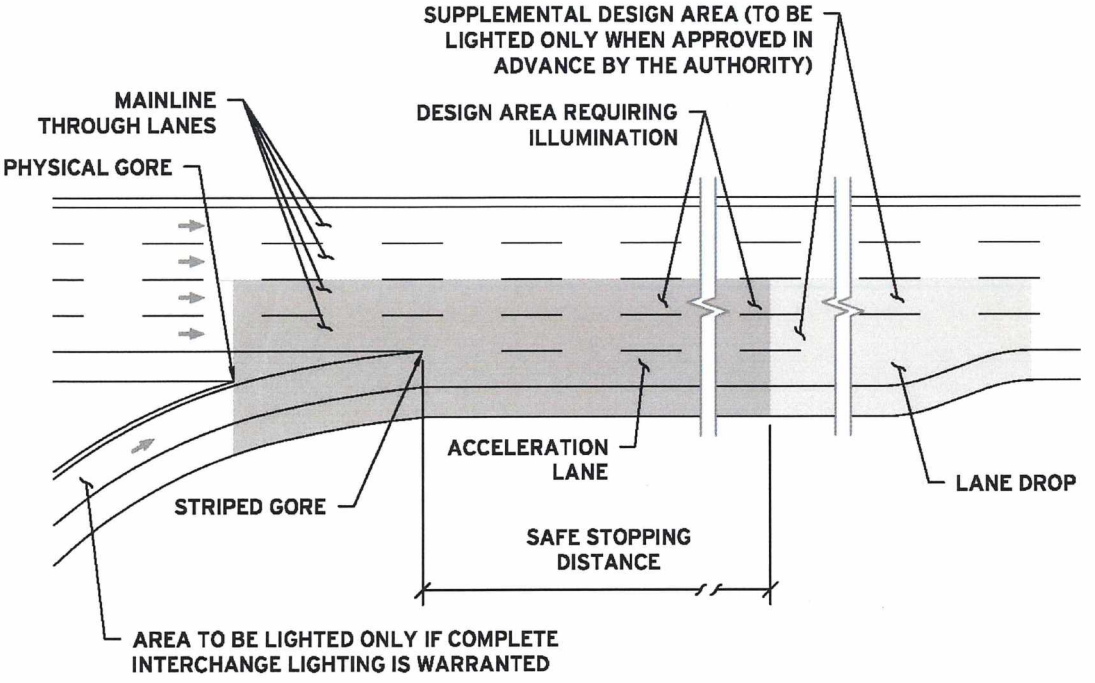
The minimum safe stopping distance that requires lighting, as measured from the physical gore, is listed ~~below~~ in Exhibit 8-6.

Exhibit 8-4~~Exhibit 8-4~~ Table of Minimum Safe Stopping Distances That Requires Lighting

Design Speed Limit	Safe Stopping Distance
35 MPH	250 Feet
40 MPH	325 Feet
45 MPH	400 Feet
50 MPH	475 Feet
55 MPH	550 Feet
60 MPH	640 Feet
65 MPH	735 Feet
70 MPH	835 Feet

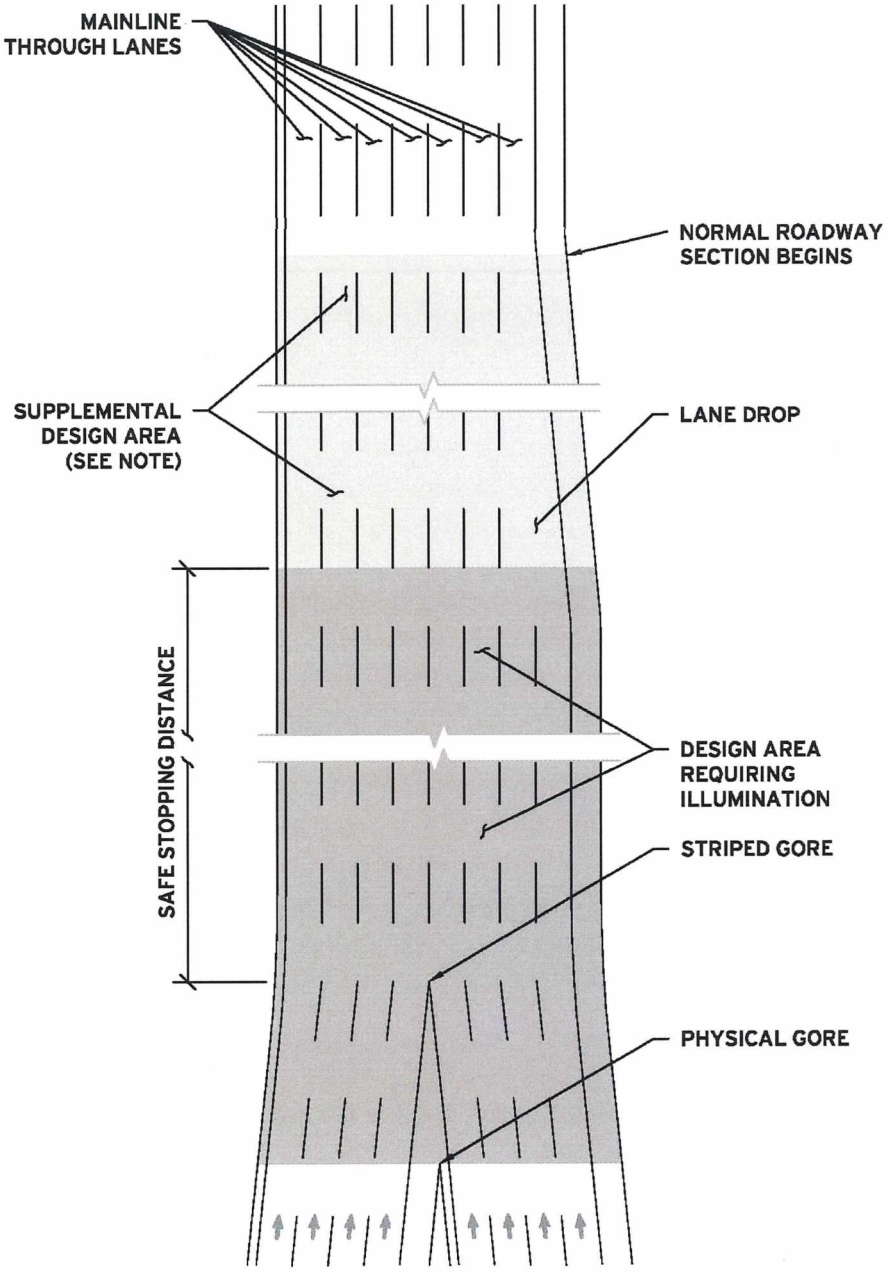
8.2.2.3. Acceleration Lanes

Exhibit 8-5 ~~Exhibit 8-5~~ Required Design Area for Acceleration Lane



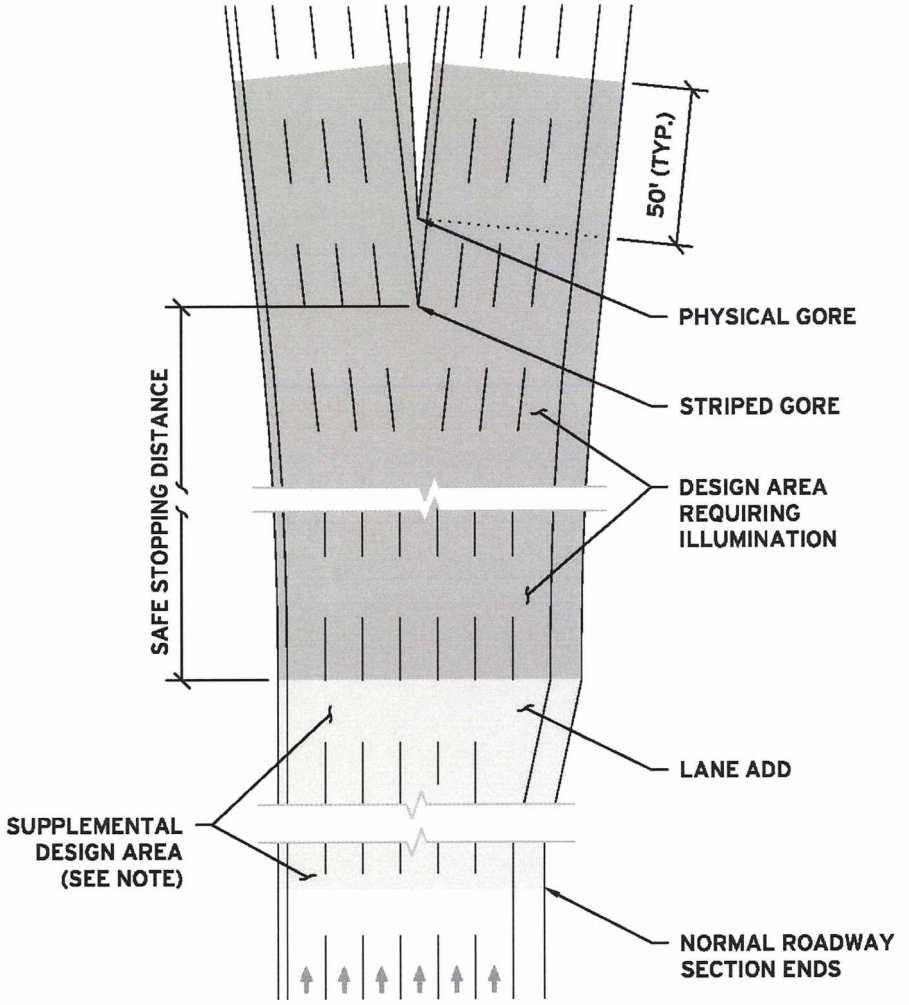
8.2.2.4. Merge, Weaving, and Diverge Areas

Exhibit 8-6 ~~Exhibit 8-6~~ Required Design Area for Merge/Weaving Area



NOTE: SUPPLEMENTAL DESIGN AREA TO BE LIGHTED WHERE ROADWAY SECTION IS NOT TYPICAL ONLY WHEN APPROVED IN ADVANCE BY THE AUTHORITY.

Exhibit 8-7 ~~Exhibit 8-7~~ Required Design Area for Diverge Area



NOTE: SUPPLEMENTAL DESIGN AREA TO BE LIGHTED WHERE ROADWAY SECTION IS NOT TYPICAL ONLY WHEN APPROVED IN ADVANCE BY THE AUTHORITY.

8.2.2.5. Ramp Termini

Exhibit 8-8 ~~Exhibit 8-8~~ Required Design Area for Typical Ramp Terminus

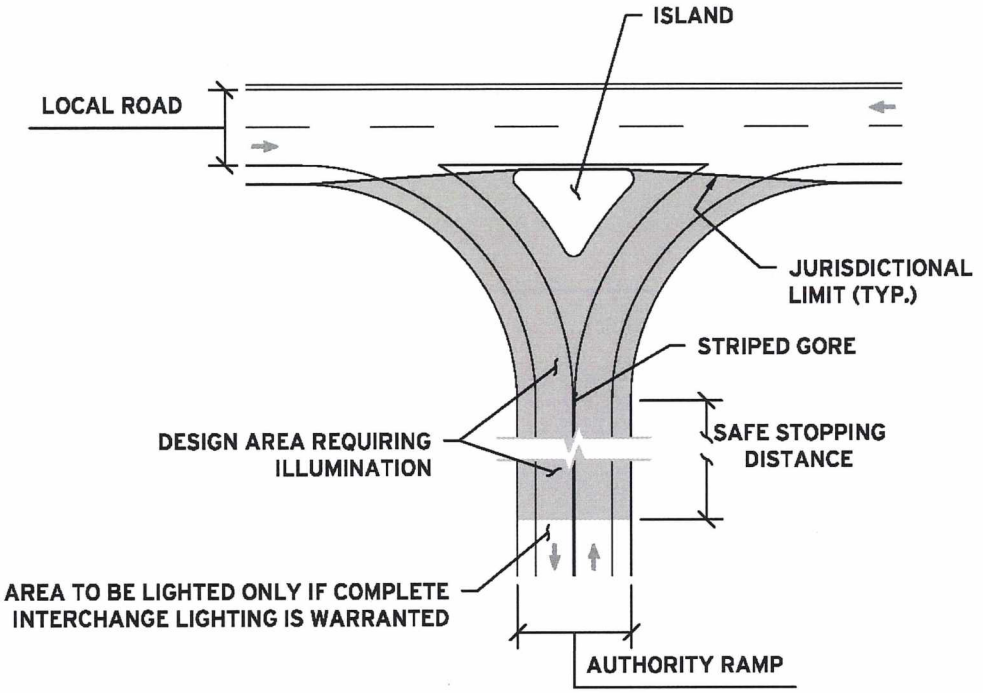
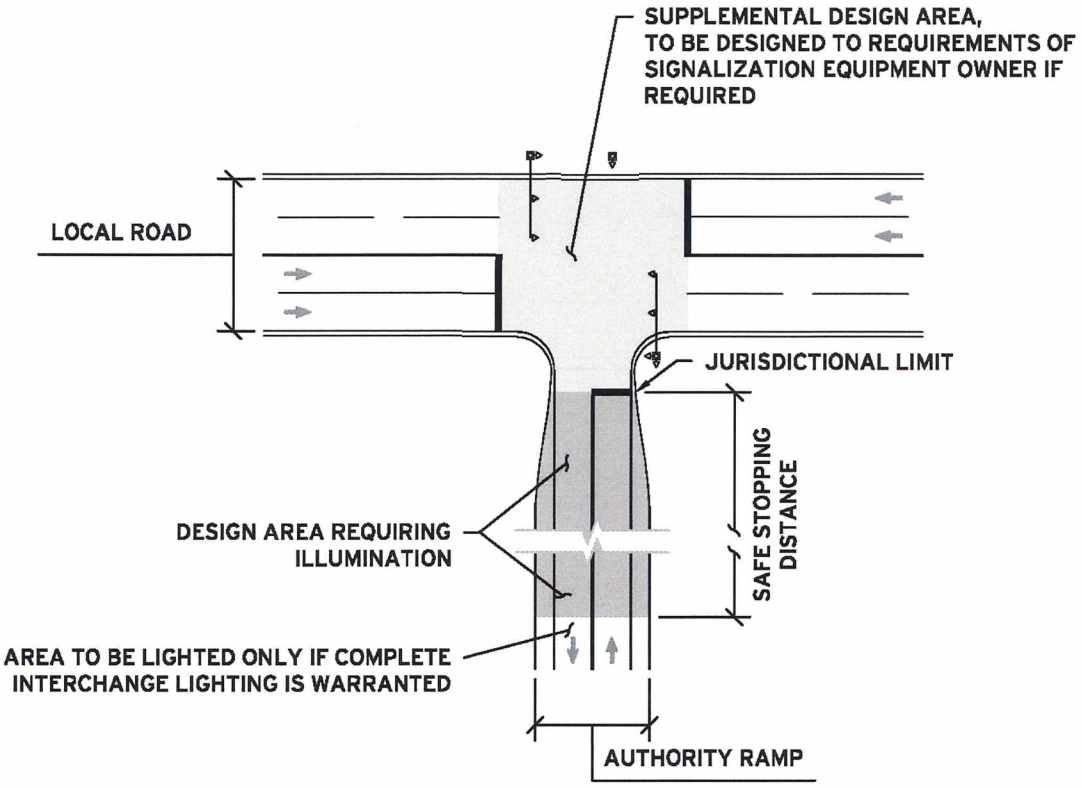


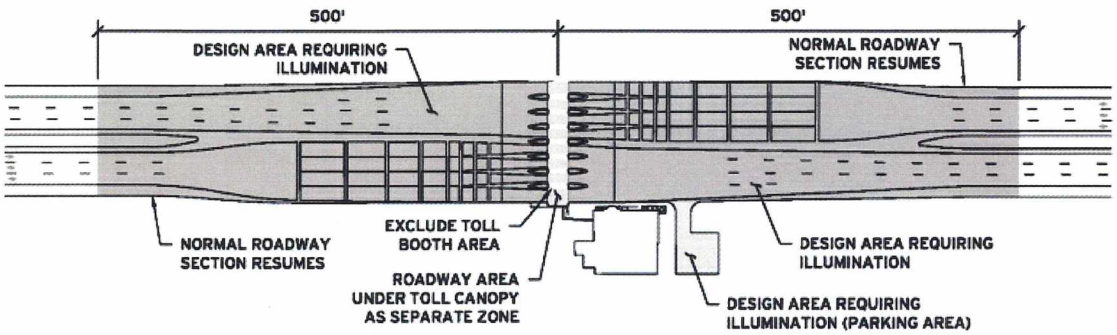
Exhibit 8-9 ~~Exhibit 8-9~~ Required Design Area for Ramp Terminus at Signalized Intersection



8.2.2.6. Toll Plaza Merge Areas

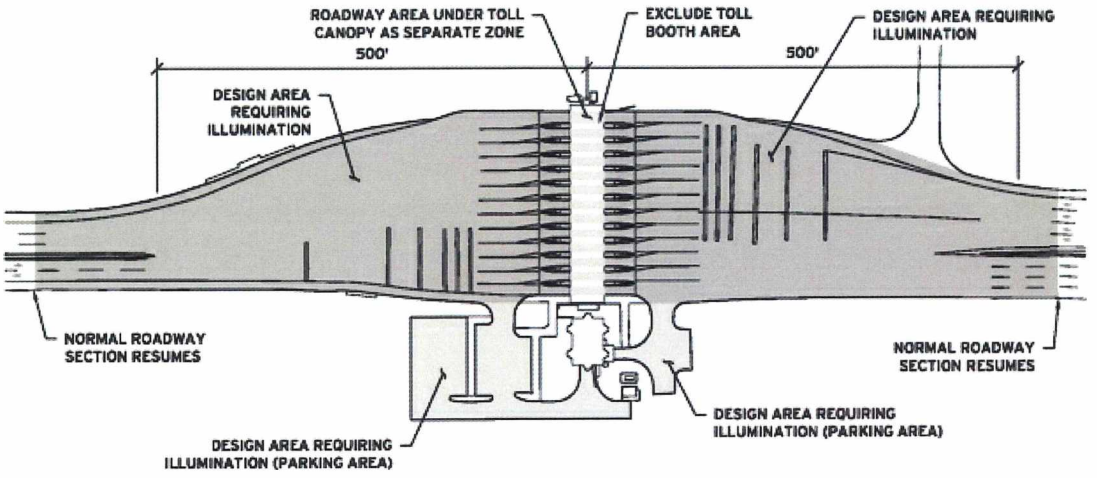
...

Exhibit 8-12 ~~Exhibit 8-10~~ Small Toll Plaza Design Area



The paved area between points located 500 feet on either side of the Toll Plaza centerline as shown above in Exhibit 8-~~2~~12, or

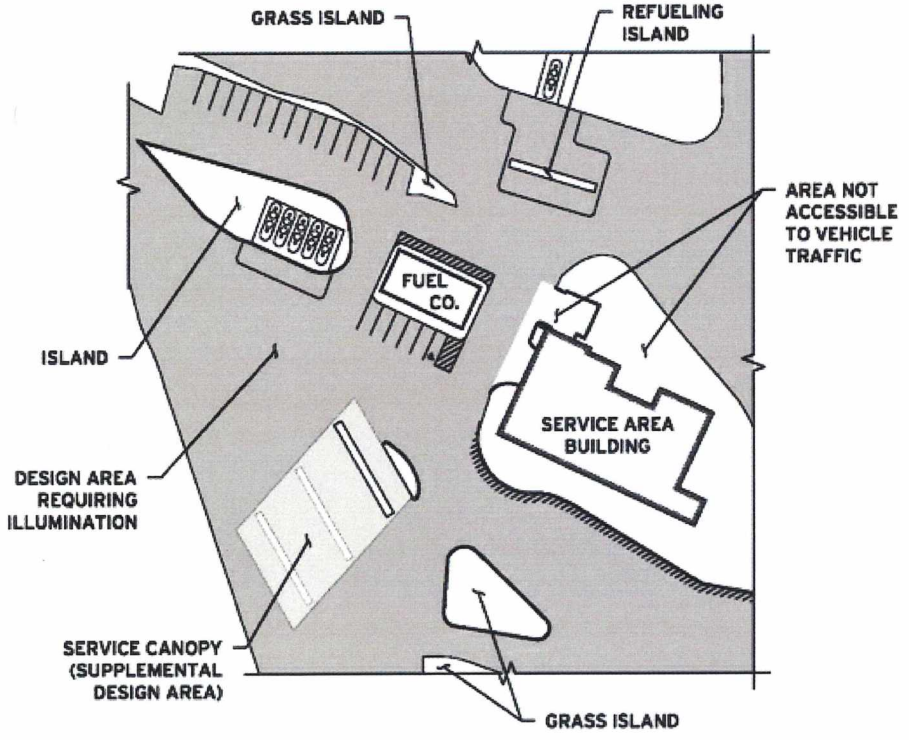
Exhibit 8-13 ~~Exhibit 8-11~~Large Toll Plaza Design Area



The paved area on both sides of the toll plaza that is located between the limits of typical a roadway section as shown above in Exhibit 8-13.

...

Exhibit 8-14 ~~Exhibit 8-12~~ Typical Design Area for Parking Facility



8.2.2.8. Roadway Tunnels

The Design Area for Roadway Tunnels, including Adaptation, Transition, and Interior Zones, shall be as defined and described in ***ANSI/IES~~NA~~ Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting***, Illuminating Engineering Society of North America Publication RP-8.

8.2.3. Lighting Design Criteria

Once the required areas of illumination (Design Areas) are determined, the appropriate lighting design criteria shall be designated for each area.

The Authority utilizes an Illuminance method for the design of all lighting systems, except as required by the ANSI/IES~~NA~~ publications for Roadway Tunnels. Illuminance levels shall be in accordance with the following criteria, shown below in Exhibit 8-~~15~~15:

Exhibit 8-15 ~~Exhibit 8-13~~Table of Illumination and Uniformity Requirements

Usage Classification	Minimum Average Maintained Illuminance (foot-candles)	Maximum Average Maintained Illuminance (foot-candles)	Minimum Point Illuminance (foot-candles)	Maximum Uniformity Ratio (Avg./Min.)[1]
Mainline Roadways and Ramps	0.70	0.85	0.20	4.0:1
Gore Areas (Mainline Roadways and Ramps)	0.70	0.85	0.20	4.0:1
Toll Plaza Merge Area	2.30	2.50	0.60	4.0:1
Toll Plaza Lanes (Area below Canopy)	15.00	20.00	10.00	1.5:1
Major Long Bridges	0.70	0.85	0.20	4.0:1
Service Areas/Parking Areas	1.75	2.25	0.50	4.0:1
Roadway Tunnels	See ANSI/IES~~NA~~ RP-8, Tunnel Lighting			
Other Areas	See the IES Lighting Handbook			

Footnotes:
[1] Higher uniformity values will be acceptable for elevated ramps near highmast poles, when approved in advance by the Authority

Light levels for the Toll Plaza Merge Area shall be as listed in Exhibit 8-~~15~~-15 above~~,~~ and shall transition to the light levels of the adjacent roadways near the limits of the merge area.

Exhibit 8-16 ~~Exhibit 8-14~~ Table of Light Loss Factors

Facility	Light Loss Factor
Authority Roadways	0.85
Other Authority Facilities	0.85
Other Authority Facilities Considered Dirty[1]	0.80
Local, County, and State (NJDOT) Roadways	Per NJDOT requirements
Other Areas outside Authority jurisdiction	Per property owner
[1] Area shall be considered "dirty" if environmental factors (i.e., soot, exhaust, dirt, etc.) are expected to accelerate depreciation of lamp lumen output relative to an average installation.	

To prevent need to redesign lighting systems, Light Loss Factors shall be determined in advance of, and included with the Phase "A" Submission for review by the Authority. See Subsection 8.6.1 for more information.

...

8.2.6. Lighting Calculation Method

This Subsection lists the specific requirements to be used when performing illuminance calculations for Authority projects. These methods are used for most roadway, site, underpass, and other lighting systems. For details of the luminance calculation methods required for certain Tunnel and Sign Lighting installations, see the *Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting* (ANSI/IES~~NA~~ Publication RP-8)

...

8.2.6.3. Luminaires and Photometrics

...

Exhibit 8-17 ~~Exhibit 8-15~~ Lamp Types, Wattages, Lumens, and Rated Life

Lamp Type	Lamp Watts	Initial Lumens	Rated Hours
High Pressure Sodium (HPS)	70	6,400	24,000
	100	9,500	24,000
	150	16,000	24,000
	200	22,000	24,000
	250	27,500	24,000
	310	37,000	24,000
	400	50,000	24,000
	1000	140,000	24,000
The Light Loss Factor for all HPS luminaires shall be 0.75.			

...

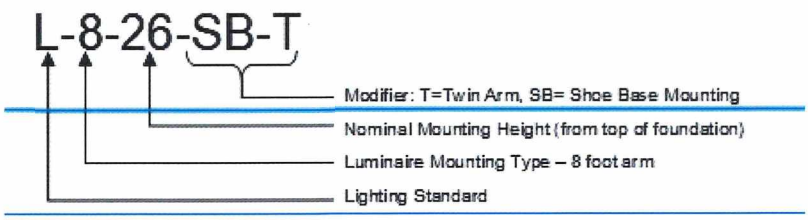
8.3. LIGHTING EQUIPMENT AND MATERIALS

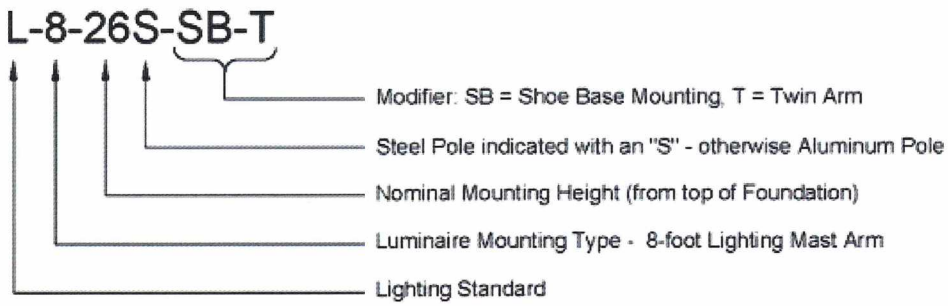
8.3.1. Roadway Lighting Standards

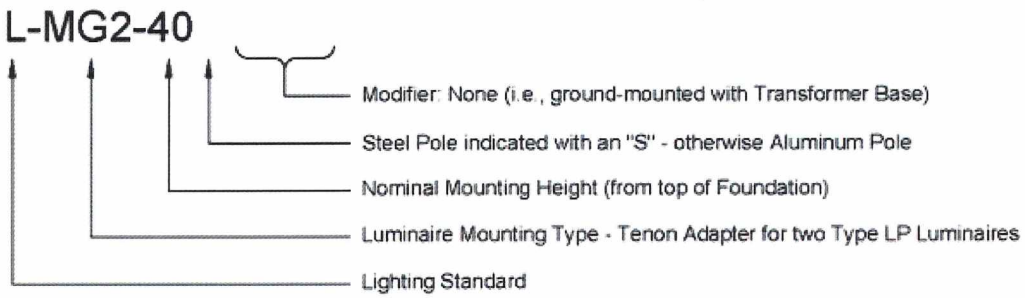
8.3.1.1. Light Pole Type and Construction

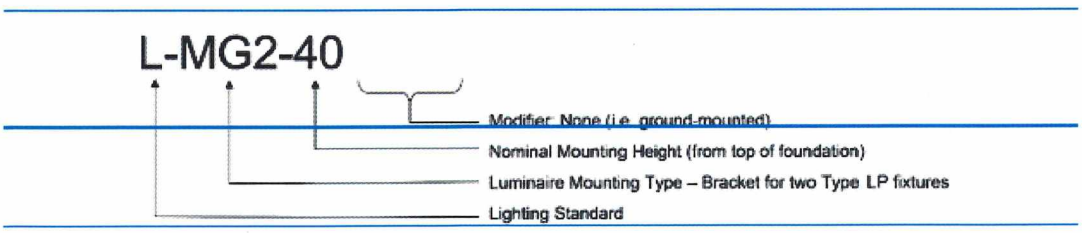
...

Exhibit 8-18 ~~Exhibit 8-16~~ Lighting Standard Designation Method









...

Legacy light poles shall be considered non-standard. Legacy and other non-standard poles are approved for use by the Authority according to other requirements in this Section, the poles shall be designated with the Modifier "NS1", "NS2", etc. for each type of non-standard pole used on a project. The details and model number information for all non-standard poles shall be clearly shown in the Plans. For example, a painted steel Architectural parking lot lighting pole with 20-foot height and 4-foot arm would be designated "L-4-20-NS1." A pole of the same construction, but with 25-foot height would be "L-4-25-NS1". A twin arm pole would be "L-4-25-NS1-T", etc.

For pole-top cutoff lighting installations, "L-MG" type lighting standards with 40-foot nominal mounting heights shall be used for mainline roadway illumination. 40-foot poles with Type LP4 through LP6 luminaires shall be considered for use first, in order to yield a more efficient design. Type LP7 and LP8 fixtures shall be used only for very wide roadways or where the Illumination Design Criteria is greater than 1.0 foot-candles.

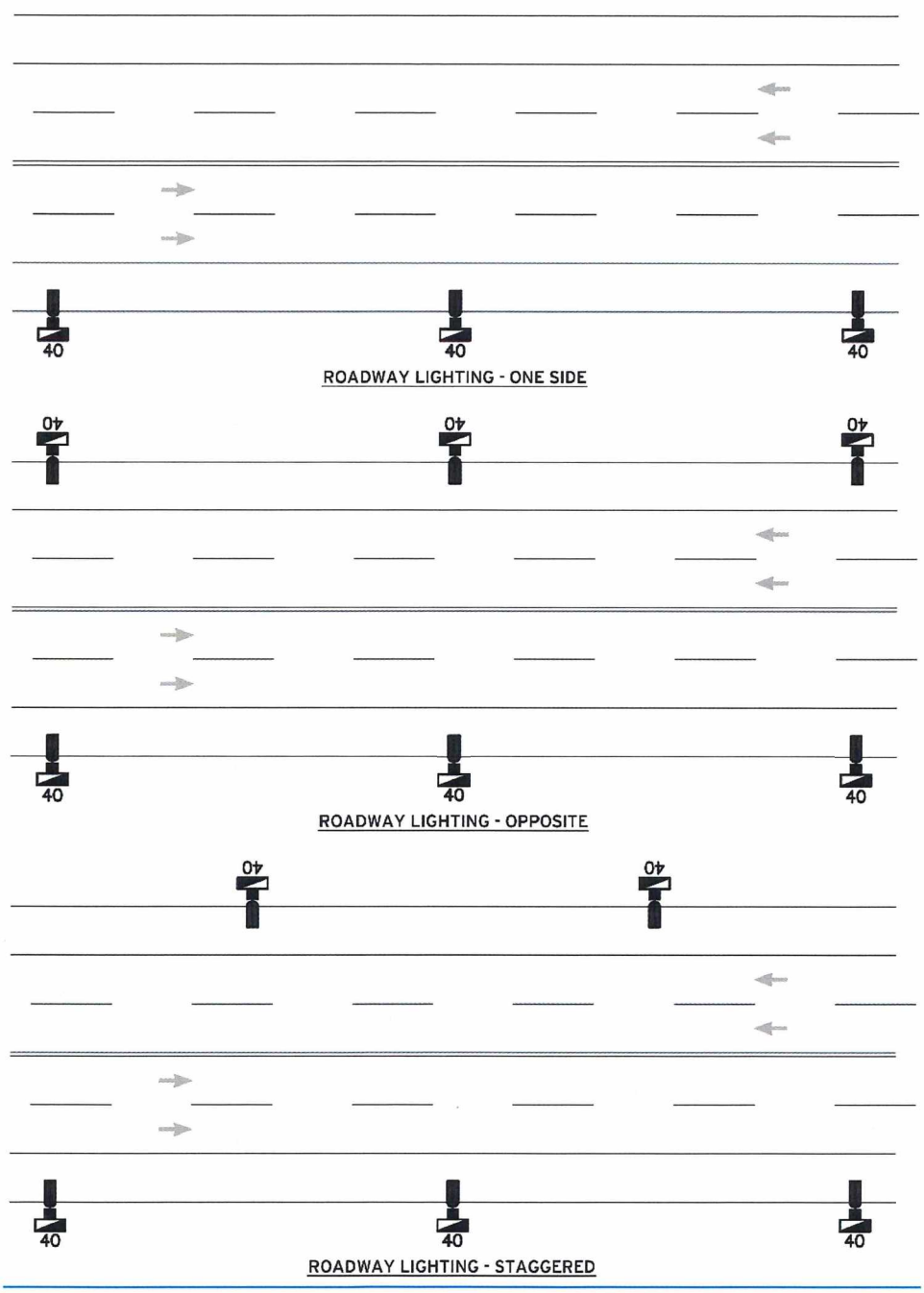
8.3.1.2. Light Pole Arrangement

Type, arrangement, and location of lighting standards to be used in various areas shall conform to the following design criteria:

1. ~~For pole-top cutoff lighting installations, "L-MG" type lighting standards with 40-foot nominal mounting heights shall be used for mainline roadway illumination. 40-foot poles with Type LP4 through LP6 luminaires shall be considered for use first, in order to yield a more efficient design. Type LP7 and LP8 fixtures shall be used only for very wide roadways or where the Illumination Design Criteria is greater than 1.0 foot-candles.~~

2. Lighting standards shall be arranged in one of the following three (3) methods; one-sided, opposite, staggered. Installation of Lighting Standard on a median barrier shall require prior approval by the Authority. An illustration of these arrangements follows in Exhibit 8-19. Selection of the method shall be based on the engineering analyses shown to produce the most effective and economical lighting system. The Engineer shall analyze both installation methods to determine the recommended scenario and shall describe the analysis as part of the submission report. Except where non-symmetrical geometry is encountered, lighting shall be evenly spaced and staggered to yield a pleasing visual appearance. See Subsection 8.2.5 for more information regarding aesthetic treatment of lighting installations.

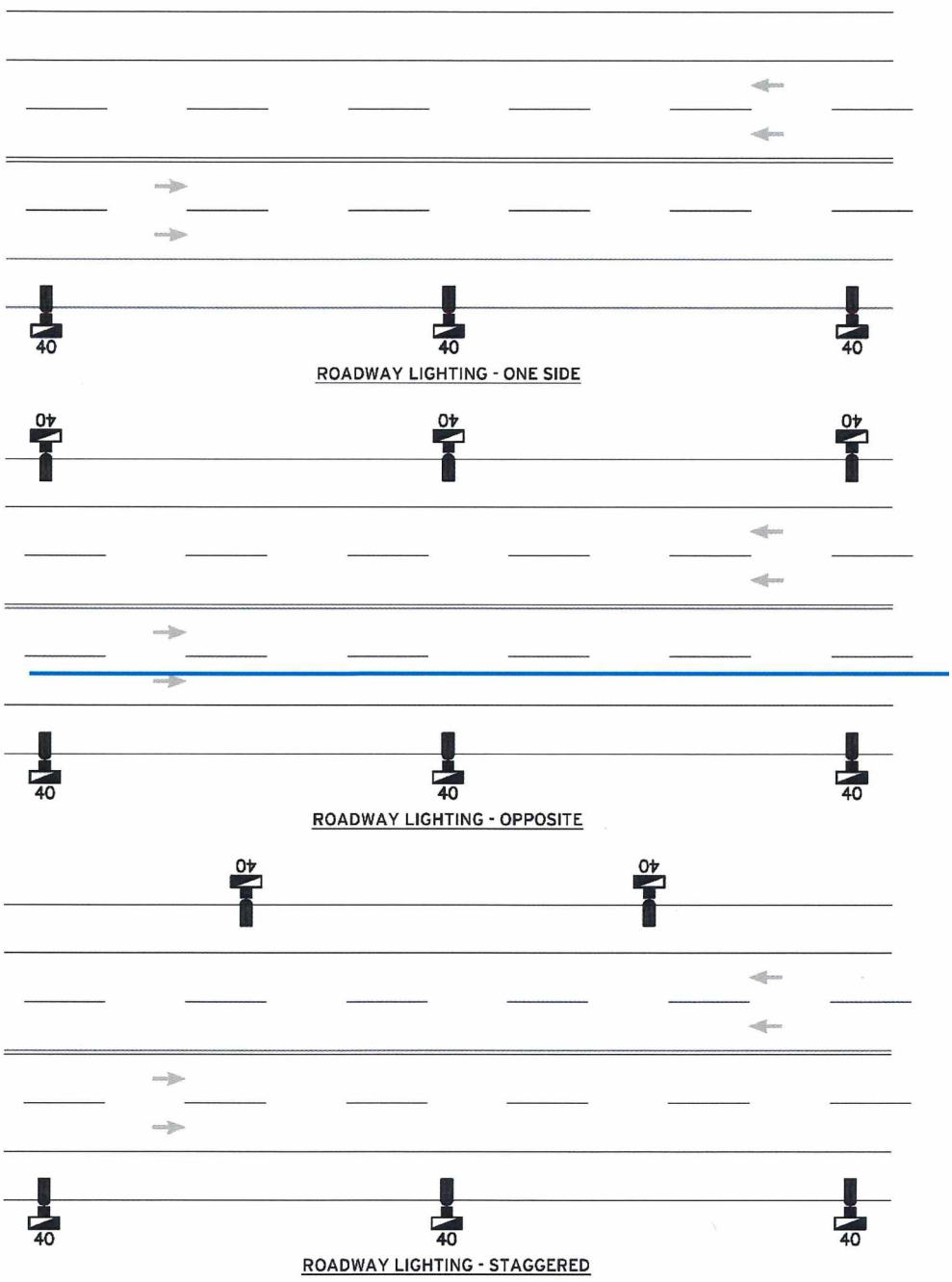
Exhibit 8-19 ~~Exhibit 8-17~~ Typical Roadway Lighting Standard Arrangements



4. Bridge-mounted or parapet-mounted lighting standards shall be 26-foot nominal mounting height. 40-foot poles may only be bridge-mounted or parapet-mounted where the Engineer demonstrates that 26-foot poles cannot light the ramp or roadway within the criteria. For ramp lighting over another roadway, pole installation on the bridge shall be avoided. In any case where the design criteria cannot be met with 26' poles off the bridge, the preference is to place the least number of 26' poles on the bridge structure as necessary to meet the required criteria. The 26' poles in this case shall be mounted nearest to the ends of the bridge or bridge support. Use of 40' poles on elevated structures or over another roadway shall require approval from the Authority.

~~Lighting standards shall be arranged in one of the following three (3) methods; one sided, opposite, staggered. Installation of Lighting Standard on a median barrier shall require prior approval by the Authority. An illustration of these arrangements follows in Exhibit 8-19. Selection of the method shall be based on the engineering analyses shown to produce the most effective and economical lighting system. The Engineer shall analyze both installation methods to determine the recommended scenario and shall describe the analysis as part of the submission report. Except where non-symmetrical geometry is encountered, lighting shall be evenly spaced and staggered to yield a pleasing visual appearance. See Subsection 8.2.5 for more information regarding aesthetic treatment of lighting installations.~~

~~Exhibit 8-17 Typical Roadway Lighting Standard Arrangements~~



~~1.~~5. Lighting standards shall be located along the wide shoulder (10 ft. and 12 ft.) edge of all ramps and mainline roadways in order to facilitate maintenance and re-lamping. In very wide gore areas, however, it shall be permissible to install a small number of supplementary lighting standards along the opposite shoulder in order to achieve illuminance requirements.

~~2.~~6. When a lighting standard is to be located within the vicinity of an exit gore area, a minimum of 50 ft. clearance should be provided beyond the physical bullnose.

~~3.~~7. Lighting standards adjacent to overpasses shall be located to avoid glare affecting traffic on overpasses. Additionally, light cutoff angles produced by structural members should be analyzed when locating such lighting standards. Preferably, the lighting standards should be located equidistant from overpass structures. If this cannot be achieved, a minimum clearance of 35 feet (for 26-foot poles) and 50 feet (for 40-foot poles) shall be provided from the face of parapet of a typical overpass (with standard minimum vertical clearance).

~~4.~~8. Lighting standards adjacent to overhead sign structures should be located equidistant from such structures, if feasible, otherwise minimum clearance requirements set forth for the overpass structures shall be provided.

~~5.~~9. Opposite lighting standard arrangements (see Exhibit 8-19) shall be used in toll plaza areas, except at certain narrow toll plazas where required illuminance levels and uniformity ratios can effectively be achieved by one-sided arrangement. Lighting from the median or median barrier will not be approved.

~~6.~~10. Ground-mounted lighting standards shall be installed on concrete bases or Junction Box Foundations. Junction box foundations shall be used in lieu of junction boxes and separate concrete bases wherever feasible, while maintaining a standard setback of 3`-6" measured from the edge of pavement to centerline of the lighting standard. Each lighting standard installed on a concrete base shall be provided with a concrete junction box adjacent thereto for cable splicing unless another junction box within the proximity of the lighting standard (up to 50 feet away) can be used for this purpose.

~~7.~~11. Lighting standards on bridge structures shall be located at or as near as possible to piers or abutments to reduce undesirable vibration. Mid-span locations must be avoided whenever possible. See Section 3 (Structures Design) of this Manual for specific locations where lighting standards are allowed. All bridge-mounted light standard mounts shall be capable of supporting all standard Authority poles, up to a height of 40 feet.

~~8.~~12. Lighting Standards shall be installed such that they are located not closer than 20 feet to primary or secondary utility power lines or communication facilities that are mounted to wood or other utility poles. The Engineer shall take into consideration the requirements of the National Electrical Safety Code when designing lighting systems in the vicinity of power distribution lines. Additionally, the Design shall take into consideration the likelihood of pole knockdowns by vehicle impact and ensure that no other critical facility may be rendered inoperable in the event of an accident.

13. The number of various lighting standard assemblies and fixture optics shall be kept to a minimum on each project, for ease of maintenance. Runs of adjacent lighting standards shall be of the same type or fixture. The Engineer shall not alternate lighting standards types, luminaires, or wattages, or install small quantities of non-matching lighting standards in a string of otherwise identical poles. If the Engineer feels there is a valid engineering reason why such a design is required in lieu of other, more standardized designs, the Engineer shall present this reasoning to the Authority for approval.

~~9.~~14. Ground-mounted lighting standards on breakaway transformer bases may be placed within the roadway clear zone and lack roadside protection measures. Where guide rail is present for other warranting obstructions within the clear zone, refer to the roadway lighting installation details in the Current Standard Drawings for lighting standard setback requirements.

8.3.2. Roadway Lighting Luminaires

Various types of luminaires to be used for roadway lighting systems shall be as listed in the Qualified Products List.

...

Exhibit 8-20 ~~Exhibit 8-18~~ Type LP Luminaire Installation Guidelines

Type	Luminaire Optics Type (As defined by IES)	Nominal Mounting Height	Recommended Use
LP1	~~Narrow~~ Medium Roadway	26'	Design Areas ~~<~~ up to 48' in width
LP2	Narrow Roadway	26'	Design Areas up to~~<~~ 48' in width
LP3	~~Narrow~~ Medium Roadway	26' ~~/~~ or 40'	Design Areas up to~~<~~ 60' in width
LP4	Narrow Roadway	40'	Design Areas up to~~<~~ 60' in width
LP5	Wide Roadway	40'	Design Areas ~~< 60' in width~~48' or wider
LP6	Wide Roadway	40'	Design Areas ~~< 60' in width~~48' or wider
LP7	Wide Roadway	40'	Design Areas ~~< 60' in width~~or wider
LP8	Forward Throw	40'	Toll plazas and special geometry [1]
LP9	Forward Throw	26' ~~/~~ or 40'	Special geometry [1]
[1] Luminaire to be used in areas of non-standard geometry, varying widths, or transitions between light levels, and ~~only when~~where other approved fixtures do not work			

Additional luminaire requirements shall be as described elsewhere in this Section, Standard Specifications Division 900.

8.3.3. Highmast and Floodlighting Systems

1. Highmast Lighting systems shall utilize 80- to 100-foot-high galvanized steel towers equipped with four (4) to eight (8) LH1, LH2, or LH3 luminaires as listed in the Qualified Products List, as outlined in the Standard Specifications, or as otherwise approved by the Authority. The number and types of fixtures provided on a given project shall be kept to a minimum.
2. Highmast Lighting Standards shall be located free of the clear zone (usually 30 feet on most roadways) or protected by physical obstruction or a raised foundation with appropriate roadside protection measures.

...

8.3.4. Standby Generator Backup

Where installed at toll plazas or facilities, all new roadway lighting systems shall be ~~fully~~ connected to circuits that are backed up by generator in the case of a loss of normal electrical service. In the event of a power failure, all toll plaza and interchange lighting shall remain functional. The Engineer is responsible to field-verify and validate the capacity of the generator.

Lighting systems powered by remote standalone load centers do not require generator backup, unless otherwise directed.

Engineers shall verify the preferred fuel type appropriate for the installation and location of all new standby generators with the Authority. All generators shall be factory certified to meet all United States EPA emissions requirements so that stack testing will not be necessary.

Generators shall not be installed in parallel. In the case where there may be a need for parallel generator installation, the Engineer shall evaluate the differences between single vs multiple generators based on load requirements, space, size, and cost, etc. The Engineer shall submit the findings to the Authority for review and further direction.

The Engineer shall design and coordinate raceways such that Building Management System (BMS) communication cables may connect the BMS to a generator or UPS.

Generators shall include a load bank in the design, sized as recommended by the generator manufacturer. The Engineer shall evaluate and specify load bank mounting type to assure a cost and space efficient design, guided by the constraints of the site and project. Load banks shall be provided with automatic load control to assure the generator manufacturer's minimum recommended load is maintained at all times.

See 8.4.2.1 for more information regarding generators, load centers, BMS monitoring equipment, and transfer switches.

...

8.3.13. Lighting Standard Bases and Junction Box Foundations

Construction methods and typical installation details for standard concrete bases, Junction Box Foundations, junction boxes, and roadway lighting manholes shall be in accordance with Standard Specifications and Current Standard Drawings. All other special details required for the Project shall be prepared by the Engineer.

While it is recognized that many existing Parkway lighting systems have the Junction Box Foundations oriented with the boxes closer to the road, all new JBF installations shall be oriented with the pole closer to the roadway on all Authority projects.

Junction Box Foundations shall be used wherever possible. Concrete Light Standard Bases with separate Type C or Type D Junction Box shall be used only where specific right of way or project constraints prevent the installation of Junction Box Foundations.

Junction box and Junction Box Foundations shall not be installed in areas where the grade is greater than 4:1. Junction boxes and junction box foundation locations shall be investigated to determine if grading is required, or slopes are too steep (greater than 4:1) for installation. Engineers are to review existing and proposed grading in the area of each junction box. The Engineer shall determine the type of erosion control around all boxes on slopes and include it in the plans. Standard guiderail offset, grading, and berm dimensional requirements shall be as directed in the Standard Drawings.

8.4.2. Electric Service

8.4.2.1. General

Secondary electrical service shall be obtained from the local utility company and utilized for the complete lighting system in each area. The Engineer shall coordinate with the utility company on behalf of the Authority to obtain new, modified, and upgraded utility services as project may require. The Engineer shall identify utility company specific requirements regarding equipment and materials between the utility service drop and the meter, and include them in their design. Utility service drops shall be located to minimize interference with other project work and as required below in Subsection 8.4.3. The Engineer shall also make every attempt to locate load centers, select voltages and coordinate with the utility company to minimize costs and the extents of Authority maintenance on all new utility services. Coordination shall be as described in Section 8 (Utilities) of the Procedures Manual.

...

Certain older installations on the Turnpike may utilize three-phase 460Y/265V services. The Engineer shall perform all calculations using the 480Y/277V service but shall note the 460Y/265V installation methods in the plans accordingly in cases where 460Y/265V services are used.

1. Primary Service: 4,160Y/2,400V and 13,200Y/7,620V.

4,160 Volt service should be used, except in those restricted areas where only 13,200 Volt service is available. This matter should be checked with the utility company.

All new roadway lighting power distribution systems shall be equipped with a manual transfer switch with integrated external generator docking station (MTS-DS) for connection of a portable generator. An MTS-DS shall also be installed at lighting systems where a manual transfer switch is to be replaced.~~A manual transfer switch with integrated external generator docking station for connection of a portable generator shall be included for all new load centers and replacement manual transfer switches.~~ Where an existing manual transfer switch is to remain, ~~Existing load centers shall require a separate~~ an **external generator docking station** (GDS) ~~if a manual transfer switch exists and is not being replaced~~shall be installed if one does not already exist. ~~See the Standard Specifications, Division 900 and Qualified Products List for specifications and model numbers for these docking stations.~~

All transfer switches shall be sized appropriately for the incoming utility ~~servic~~service and ~~e.~~ designed in accordance with the NEC, in particular NEC Article 250.30, Grounding Separately Derived Alternating-Current Systems. ~~All transfer switches shall operate in a manner that disconnects all phases, including neutral, regardless of switch type. Any~~In cases where an existing transfer switch installation ~~that~~ does not meet ~~these~~ requirements of NEC Article 250.30 the Designer ~~will require replacement.~~shall document the non-compliant installation via a memo with a proposed solution to make the installation comply with the NEC and submit the memo to the Authority for review and approval.

See the Standard Specifications, Division 900, and Qualified Products List for specifications and model numbers for the MTS-DS and GDS.

...

8.4.2.3. Services Not Located at Buildings

...

Where lighting loads and the physical limits of circuitry prohibit the utilization of existing load centers, new outdoor type load centers shall be provided as described in Subsection 8.~~4~~5.3.

...

8.4.3. Circuitry and Voltage Drop

...

All single-phase and three-phase systems shall be analyzed using a single-phase method utilizing the Authority's *Standard Voltage Drop Computation Form*. An electronic version of the Excel Spreadsheet is available on the Authority's website. Each leg/phase of the circuit shall be analyzed separately. A sample completed form and sketch are shown following in Exhibit 8~~21~~-21.

20. It is the Engineer's responsibility to ensure all circuit breakers are sized in full compliance with the NEC. If a design based on Authority Standards has a condition which violates code, the Engineer is obligated to address the exception so that it complies with code.

~~21.~~ Circuit breakers supplying transformers shall be sized to account for transformer magnetization current.

...

8.4.4.2. Conduits and Raceways

...

6. Unless otherwise directed by the Authority, all existing transite conduit (or any other asbestos duct or duct bank) shall not be reused for any design and shall be called out to be abandoned in place and have tracer wire installed. See Specifications for procedures regarding transite conduit including the installation of tracer wire.

...

8.5. POWER DISTRIBUTION EQUIPMENT AND MATERIAL

8.5.1. Conduits, Cabinets, Wireways, Hangers, and Fittings

The Various types of conduits to be used shall be as specified in the Standard Specifications, shown on the Current Standard Drawings and further prescribed hereinafter.

1. In general, nonmetallic PVC Schedule 80 conduit shall be used for installations under paved roadways, ramps, and parking areas. PVC Schedule 40 conduit shall be used in all underground installations where vehicular traffic is not expected.

2. With the exception of conduits on buildings away from roadways, conduits installed on concrete, steel, or other exterior structures, and in any location that is not environmentally controlled shall be PVC-coated rigid metallic conduit (PCRMC). All attachment hardware, hangers, and support struts shall be stainless steel or PVC-coated ~~cast malleable iron~~ rigid galvanized steel. In order to minimize corrosion and prevent damage where conduits transition from an underground distribution system to a structure that is exposed to the air, a ~~short~~ section of PVC-coated galvanized rigid steel conduit at least five feet in length shall be installed from ~~a location~~ 3 feet above grade to at least 2 feet below grade. This PVC-coated RMC shall then be ~~permitted to be~~ coupled to a PVC conduit via a PVC-coated expansion/deflection fitting at ~~or below~~ a minimum of 2 feet below grade to continue its run to the nearest underground junction box or manhole. A continuous insulated, impregnated solid color green equipment grounding conductor shall be provided in all conduits. Conduits on exterior of buildings away from roadways shall be galvanized rigid steel (RMC), using only stainless steel attachment hardware.

...

14. All wireways and enclosures shall be constructed of ~~corrosion resistant material, such as~~ Type 304 stainless steel and provided with a NEMA 3R ~~or 4X~~ rating, as indicated on the plans and in the specifications. The Engineer shall indicate the appropriate enclosure rating for the purpose, location, and conditions where it is installed. Details of mounting shall be included that

show mounting without compromising the NEMA rating of the wireway or cabinet. Where it is likely that water could collect in a NEMA 3R wireway or enclosure, a breather/drain ~~hole~~ shall be ~~provided~~ installed in the bottom such that insects cannot enter and sized so that it will not easily be clogged. ~~a location that will not allow water entry.~~ NEMA 4X wireways and cabinets may be used where determined necessary by the Engineer, and shall be constructed of ~~corrosion resistant material, such as~~ Type 304 stainless steel. All mounting and installation methods shall be such that they do not compromise the rating of the enclosure. See the Standard Specifications, Division 900 Material Specifications, and the Qualified Products List for details on acceptable wireway and enclosure materials.

...

8.6.2. Phase "B" Submission

with subsection 8.7

f. Navigation~~/aviation~~ and/or aviation lighting luminaires, where required

8.7.1.1. Required Plans

...

Exhibit 8-22 ~~Exhibit 8-20~~ Schedule of Lighting Standards and Luminaires

CIRCUIT No.1						
LIGHTING STANDARD OR LUMINAIRE No.	LIGHTING STANDARD TYPE	LUMINAIRE		BASE OR JBF TYPE	REMARKS	
		TYPE	LAMP WATTS			
1–1–A	L–MG–40–SB	LP2	166	PLB		
2–1–B	L–MG–40–SB	LP2	166	PLB		
3–1–C	L–MG–40–M	LP2	166	CB–M		
4–1–A	L–MG–40–M	LP2	166	CB–M		
5–1–B	L–MG–40	LP3	238	JBF		
6–1–C	L–MG–40	LP2	166	JBF		
7–1–A	L–MG–40	LP2	166	JBF		
8–1–B	L–MG2–40	LP4	238	JBF		
9–1–C		LP4	238			
UB3–1–A	–––	LW1	63	–––		
TOTALS			1773			
SIGN LIGHTING SUMMARY						
STRUCTURE	QUANTITY OF LUMINAIRES	LOAD (kW)				
		øA	øB	øC	TOTAL	
STR. 091.36A	5	0.580	0.290	0.580	1.450	
STR. 091.38	2	–	0.290	0.290	0.580	
TOTAL		0.580	0.580	0.870	2.030	
CONNECTED LOAD (KW)						
–		øA	øB	øC	TOTAL	
ROADWAY LIGHTING		0.498	0.642	0.570	1.710	
UNDERBRIDGE LIGHTING		0.063	–	–	0.063	
SIGN LIGHTING		0.580	0.580	0.870	2.030	
OTHER		–	–	–	–	
TOTALS		1.141	1.222	1.440	3.803	
						LOAD (kW)
					TOTAL EXISTING LOAD	0
					TOTAL CHANGE IN LOAD	+ 3.803
					TOTAL FINAL LOAD	3.803