northbrook

SECTION VI

ROADWAY AND PARKING LOT LIGHTING

PART I - ROADWAY LIGHTING

A. PURPOSE

The principal purpose for fixed lighting of public and private roadways for vehicles and pedestrians is to create a nighttime environment conducive to quick, accurate, and comfortable visibility. It is the intent of these Standards to improve traffic safety, pedestrian safety, achieve efficient traffic movement, and promote nighttime use under a wide variety of weather conditions.

B. GENERAL

All development under the jurisdiction of the Village shall include provisions for the construction of roadway and parking lot lighting facilities. Design of these lighting facilities shall be in accordance with this Section and as approved by the Village Engineer.

C. PUBLIC EASEMENTS AND UTILITIES

The roadway lighting system is to be constructed within the right-of-way or utility easements for public improvements in locations shown on the approved plans and accepted by the Village.

All public conduit, cables, or controllers on private lots shall be confined to public utility easements now in existence or to be procured by the developer. A minimum easement of 10 feet centered on the facility shall be provided for all underground roadway lighting supply conduits or cable to be laid across private property. Such easements shall be properly documented by deed or plat, accepted by the Village and recorded. All documents required to properly establish such easements shall be provided by the developer.

D. SUBMITTAL REQUIREMENTS AND APPROVAL

Two sets of complete lighting system plans and photometrics shall be submitted by a registered professional engineer of the State of Illinois along with the catalog cuts to the Village Engineer for approval. The Village Engineer may require lighting systems to exceed minimum standards for public benefit.

E. PERMITS

The Developer shall obtain all Village permits, development permits, highway department permits, certificates of insurance, and licenses required for the work at their expense.

F. LIGHT DISTRIBUTION CLASSIFICATION

Proper distribution of the light flow from luminaires is one of the essential factors in efficient roadway lighting. The light emanating from the luminaires shall be directionally controlled and proportioned in accordance with this Section and meeting the requirements for seeing and visibility.

Light distributions are to be designed for the specific roadway and area classification with a minimum mounting height (MH), overhang, pole spacing, and roadway width to be effectively lighted.

All luminaires can be classified Type I through V according to their lateral and vertical distribution patterns. Different lateral distributions are available for different street width-to-mounting height ratios. Different vertical distributions are available for different spacing-to-mounting height ratios.

Guide for Luminaire Lateral Light Type and Placement

Side of the Roadway Mounting			Center of the Roadway Mounting		
One side or Staggered	Staggered or Opposite	Grade Intersection	Single Roadway	Twin Roadways (median mounting)	Grade Intersections
Width up to 1.5 MH	Width beyond 1.5 MH	Width up to 1.5 MH	Width up to 2.0 MH	Width up to 1.5 MH (each pavement)	Width up to 2.0 MH
Types II-III--IV	Types III and IV	Type II 4-way	Type I	Types II and III	Types I 4-way and V

Note: In all cases suggested maximum longitudinal spacings and associated vertical distribution classifications are: Short distribution = 4.5 MH, Medium distribution = 7.5 MH, and Long distribution = 12.0 MH.

G. LIGHTING DESIGN

The design process and calculations should follow these major steps:

1. Determination of roadway geometrics, adjacent land use and traffic accident experience to obtain quantity of horizontal light required.

2. Formulation of a tentative concept as to luminaire location and mounting height.

3. Selection of a luminaire light distribution type.

4. Detailed photometric calculations (manual or computer generated).

5. Comparative calculations determining maximum-to-minimum uniformity ratios.

6. Selection of final design upon Village Engineer approval.

H. ILLUMINANCE REQUIREMENTS

The recommended illuminance values are specified below:

Roadway/Walk/Bikeway Average
Maintained Illuminance on the Horizontal

Vehicular Roadway Classification	Commercial		Intermediate		Residential	
	Lux	Foot-candles	Lux	Foot-candles	Lux	Foot-candles
Expressway +	15	1.4	13	1.2	11	1.0
Major	22	2.0	15	1.4	11	1.0
Collector	13	1.2	10	0.9	6	0.6
Local	10	0.9	6	0.6	4	0.4

Sidewalk/Bikeway Average Maintained Illuminance
On the Horizontal

Walkway and Bikeway Classification	Minimum Average Levels	
	Lux	Footcandles
Sidewalks (roadside) and bikeways:		
Commercial areas	10	0.9
Intermediate areas	6	0.6
Residential areas	2	0.2
Walkways (distant from roadways) and bikeways:		
Park walkways and bikeways	5	0.5

I. UNIFORMITY

The average level to minimum point method and maximum level to minimum point method should not exceed the 4 to 1 and 8 to 1 limits respectively for local residential streets.

J. LUMINAIRE MOUNTING HEIGHT AND LOCATION

Use or Roadway Classification	Mounting Height (Feet)	Pole Height (Feet)	Maximum Spacing (Feet)	Bracket Length (Feet)
Arterial Roadways	33'-43'	30'-40'	175'	8'-15'
Collector Streets	31'	28'	200'	8'-15'
Residential Subdivision	14'	14'	300'	N/A
Commercial Subdivision	31'	28'	175'	8'-15'
Industrial Subdivision	35'	32'	200'	8'-15'

K. LUMINAIRE SPACING

The spacing of poles and luminaires is influenced by the location of utility poles, fire hydrants, buried utilities, block lengths, property lines, roadway geometrics, and driveway locations.

The desired luminance at any point on the pavement to the average illuminance should be maintained to prevent loss of object visibility between luminaires.

L. POLE LOCATION

Roadway lights shall be located on one side of the street unless, in the judgement of the Village Engineer, it is impractical to do so. All light poles shall be set two feet back from the curb line. At intersections with only one standard, the bracket shall be pointed toward the center of the intersection. Where two or four standards are located at a major intersection, the bracket of each shall be perpendicular to a street as determined by the Village Engineer.

Other factors to consider in selecting locations are:

1. Access for maintenance
2. Visibility
3. Vehicular - pole collision probabilities
4. Trees
5. Aesthetic appearance
6. Combination traffic signal mast arm poles

At a minimum, residential roadway lights are to be located at all intersections, pronounced street curvatures, cul-de-sac terminations, and at midblock intervals.

Types II, III and IV luminaires are intended to be mounted over or near the edge of the roadway.

Types I and V are generally designed to be mounted over or near the center of the area to be lighted.

M. TRAFFIC CONFLICT AREA LIGHTING

Intersecting, converging or diverging roadway areas require higher illuminances. Very high-volume driveway connections to public streets and midblock pedestrian crosswalks should be illuminated at least 50 percent higher than average. Landscaped border areas, median strips and adjacent school or park grounds require higher than average illuminance.

N. TRANSITIONAL LIGHTING SECTIONS

Roadway lighting systems shall be designed to decrease the driver's blindness when emerging from a lighted section of roadway. Using the design speed of the road, the reduced lighting level zone shall allow for a 10 second eye exposure adjustment.

Heavily traveled roadway intersections and converging and diverging traffic lanes shall have illuminance levels of the summation of each roadway traditionally obtained by using combination traffic signal and lighting poles on both corner approaches.

Special lighting design shall be considered at railroad grade crossings and roadway under and overpasses. Railroad grade crossings must be adequately lighted to permit identification of the crossing, trains, and unlighted vehicles or pedestrians at the crossing. Illuminance levels over and within 100 feet should be increased to twice that of the adjacent roadway.

O. DETAILED MATERIAL AND EQUIPMENT SPECIFICATIONS

1. Trench and Backfill

The conduit trench shall be located 2 feet behind the back of the curb or as otherwise approved by the Village Engineer. Under existing pavement, all excavations shall be backfilled with controlled low strength material to the bottom of the pavement. Under proposed pavement, granular backfill material shall be deposited in the trench in layers, not to exceed 6 inches in depth and shall be mechanically compacted before the next layer is deposited in the trench.

Trenching shall be conducted to avoid disturbing existing trees, utilities, pavement, and equipment. Excavation shall be deeper than minimum as required to avoid existing piping or other obstructions.

All disturbed areas shall be protected and restored in kind as prior to work commencing.

2. Handholes

Handholes are required at the ends of all isolated conduit and at intermediate locations between light poles to facilitate pulling cable. Cables runs shall not exceed 400 feet without a junction. Handholes shall be precast concrete or cast-in-place as approved by the Village Engineer.

3. Ground Wire

In addition to the power circuit, ground wire shall be provided interconnecting all poles, luminaires, controllers, and appurtenances to the electrical system. Ground rods shall be provided at the controller or disconnect location. Ground rods shall be 3/4 inch in diameter and 8 feet long with steel core and heavy exterior layer of pure copper driven into the ground.

4. Light Pole Foundations

Pole foundations shall be designed to support the proposed lighting installation given the geotechnical conditions at the installation location. Foundations may be engineered cast in place concrete in accordance with the Standard Specifications for Road and Bridge Construction or engineered helical foundations as approve by the Village Engineer.

5. Conductors

Conductors shall be USE rated stranded copper rated for direct bury and sized for the proposed lighting system. All conductors shall be #6 AWG stranded copper wire and continuous from point to point without splices. Each conductor shall be colored for identification and colored tape is not acceptable.

6. Conduit

All conductors shall be installed in rated polyethylene conduit installed 18 to 27 inches deep and sized for the conductors being carried.

When conduit is to be installed under existing pavement it shall be directionally drilled where possible and open cut excavation and patching avoided.

7. Pole Conductors

Conductors within the pole, from the handhole to the luminaire at a minimum, shall be single conductor, #10 AWG stranded copper wire copper rated for 600 volts. Each conductor shall be color coded for identification and colored tape is not acceptable. Two feet of conductor slack shall be provided in each handhole.

8. Connection Pedestal

Conduit shall be terminated 18 inches from Commonwealth Edison Company pedestal and 27 inches below grade. Eight feet of cable with ends sealed shall be left for connection by Commonwealth Edison Company.

9. Electrical Connection and Power Supply

The developer shall contact the Commonwealth Edison Company to obtain service connection locations. The developer shall be responsible for all service connection charges.

Connection to the power supply shall be made as near to the secondary supply of the distribution transformer as is practical. Such connection shall be made in accordance with Commonwealth Edison Company regulations.

10. Fuses

A weather-proof fusetron HEB-AA holder with a suitably rated fuse shall be placed in the handhole of each light pole and shall be connected in series with the underground conductors feeding each luminaire. Sufficient slack cable shall be provided in each handhole so that socket splices may be removed for inspection and maintenance.

11. Circuitry

No circuit shall be greater than 2,000 feet from power source to the most distant luminaire. Line voltage drop must not exceed 10 percent through such distance. All cable shall be No. 6 in size or larger. Luminaires in the circuit shall be photoelectrically controlled at the pole. Grouped units shall be limited to 4 units unless a relay is used with the group control being mounted on the luminaire closest to the power source. The photoelectric device shall, in all cases, be mounted on the top of the luminaire closest to the power source.

12. Control and Connection

Power for street lighting may be either metered or nonmetered as required by the Village Engineer and Commonwealth Edison Company. Complete wiring schematics shall be provided as part of the plans submitted for approval.

(a) Nonmetered Power

A light pole, designed as the service pole, shall be provided, equipped as follows:

- A circuit disconnect breaker box, 8 inch x 6 inch x 4 inch or larger, of cast aluminum with tamper proof, screwed cover; 1.5 inch back hub; thermal magnetic breaker; back mounted screw hub for ground lug and stainless steel mounting hardware shall be mounted on the pole approximately 10 feet above the ground or approved equal shall be installed next to Commonwealth Edison box as directed by the Village Engineer.

(b) Metered Power

When power is to be metered, a control center shall be provided near the energy source from Commonwealth Edison. The control center shop drawings shall be approved by the Village Engineer and include the following features:

1. Meter socket shall be installed on the side of the control center.
2. Constructed of sheet aluminum with a locking door mounted four to five feet above grade.
3. The cabinet shall be vented and weather tight.
4. Foundation shall be cast in place concrete finished a minimum of two inches above finished grade.
5. A main circuit breaker sized for the proposed lighting system.
6. A photocell-controlled contactor shall be installed prior to individual circuit breakers for each circuit.
7. A single pole, 20 ampere rated toggle switch shall be installed to by-pass the photoelectric control.
8. A duplex receptacle convenience outlet shall be installed on a dedicated circuit within the cabinet.
9. A convenience light shall be installed in the cabinet.
10. A photoelectric cell shall be installed on the bottom side of the cabinet or, shall be installed, complete with pole tap adapter and receptacle on the light post nearest to the control center, interconnected with the control center with a 3 wire, No. 12 color coded circuit.

13. Luminaires

(a) Post Top Luminaires
Luminaires shall be General Electric Company Evolve LED Post Top Town and Country or an approved equal. Light distribution shall be specified by the designer.

Refractor type: Acrylic
Light Color: 3000K
Control: As designed
Color: Black

(b) Mast Arm Luminaires

Luminaires shall be General Electric Company Evolve ERL series or an approved equal. Light intensity and distribution shall be as specified by the designer and approved by the Village Engineer. Shields shall be installed as directed by the Village Engineer

Voltage: As approved
Light Color: 4000K or as approved by the Village Engineer.
Control: As approved
Color: White

(c) Luminaires shall be controlled by one of the following methods:

(1) Individual (6 standards or less) Each luminaire shall be controlled by an individual photoelectric control unit at each luminaire.

(2) Group (more than 6 standards) The control unit controlling more than one luminaire shall consist of a contactor actuated by a photoelectric control unit approved by the Village Engineer.

14. Light Standards

(a) Light Standards

Residential light standards are to be direct bury poles as approved by the Village Engineer.

Residential light standards to be accepted by the Village for maintenance may be manufactured of concrete, centrifugally cast, pre-stressed and steel reinforced. The standards shall have smooth ground and polished surfaces with a sky gray finish. The cross section of the standard shall contain a raceway extending throughout the length of the standard and dual cable entrances below grade. The raceway shall have a minimum opening of 1-1/2 inches and shall not exceed 2 inches at the top of the standard. A handhole shall be provided on the opposite side from the luminaire and shall be covered with a heat-treated cast aluminum door, fastened to nonferrous inserts in the standard with stainless steel bolts 18 inches above finished grade.

All standards shall be provided with an aluminum mast cap held to the top of the standard by stainless steel screws and nonferrous inserts.

Roadway lighting standards shall not be less than 8 inches in diameter with a butt base below final grade level. It shall be equipped with mast arm brackets securely attached to the standard.

Poles shall be set vertical in tamped wet screenings, at proper grade, and shall be straight to within one degree of vertical, straightened and maintained throughout the duration of the guarantee period.

(b) Pre-Approved Summary

The following standards and appurtenance, or approved equals, may be used for lighting systems.

Concrete Pole Specifications

Manufacturer	Height (Feet)	Finish
Centrecon	14-28	Gray

Brackets (variable)

Single	Double	Length (Feet)
AD	ADD	8, 10, 12, 14

Power Cap - AP-490 or an approved equal

Aluminum Pole Specifications

Manufacturer	Height (Feet)	Arm Length (Feet)
Hapco	30-45	12-15

(c) Materials and Equipment:

1. Equipment Standardization

In the interest of encouraging uniform appearance, standardization of replacement parts and familiarization of maintenance personnel with the equipment, the Village has selected certain equipment which is to be incorporated.

2. Materials

All materials comprising the lighting systems shall be the product of a firm or firms regularly engaged in the manufacture of such materials and shall be covered by the manufacturer's or installing contractor's warranty or guarantee. The materials shall be new, of current manufacture, and of standard design free from all defects.

3. Other Equipment

All other components of the street lighting system not covered or detailed by these specifications shall be designed and provided in conformance with currently accepted practices of good engineering

and in full compliance with the requirements of the Commonwealth Edison Company.

4. Substitute Material or Equipment

If the general requirements, law, ordinance or applicable rules or regulations permit the developer to furnish or use an approved substitute that is equal to any material or equipment specified, and if the developer wishes to furnish or use a proposed substitute, they shall make written application to the Village Engineer for approval of such a substitute certifying in writing that the proposed substitute will perform adequately the function called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same function as that specified; stating whether or not its incorporation in or use in connection with the project is subject to the payment of any license fee or royalty; and identifying all variations of the proposed substitute from that specified and indicating available maintenance service. No substitute shall be ordered or installed without the written approval of the Village Engineer who will be the judge of equality and may require the developer to furnish such other data about the proposed substitute as he considers pertinent.

P. SUPERVISION AND SAFETY

A licensed electrical contractor shall supervise and direct the work efficiently and with the upmost skill and attention.

The developer shall be responsible for coordinating the improvement work, correcting faulty work, and consulting with the design engineer and Village Engineer in the settlement of any disputes, plan changes, or plan adjustments.

Q. INSPECTION AND TESTING

After the installation is complete and at a time convenient to the Village, all equipment shall be demonstrated to operate in accordance with the drawings and specifications. Record drawings shall be provided to the Village Engineer for approval prior to scheduling testing.

Each standard, controller, and all appurtenances shall be visually inspected to verify proper installation. Photoelectric cell controls shall be inspected with an after dark inspection performed initially and again after a minimum of 30 days to ensure proper operation.

R. RECORD DRAWINGS

Prior to acceptance of the lighting system, Record Drawings shall be submitted to the Village in electronic and hard copy formats as approved by the Village Engineer. The Record Drawings shall indicate the roadway lighting system demonstrating the location of all conduits, controls, standards, and handholes. It shall be certified as to accuracy by an Illinois licensed Professional Engineer or Illinois licensed Professional Land Surveyor. See As-Built Checklist for required format of As-Built submittals.

S. GUARANTEE PERIOD AND WORKMANSHIP

All work shall be performed in a neat and workmanlike manner and shall be guaranteed by the developer and their surety against defects in workmanship and materials, of whatever nature, for a period of 12 months from the date of final acceptance of the work. Any defective

material or workmanship shall be repaired or replaced to the satisfaction of the Village without cost to the Village.

PART II - PARKING LOT LIGHTING

A. ILLUMINANCE

1. Uniformity/Intensity

The horizontal illuminance method shall be utilized on an average-to-minimum ratio and maximum-to-minimum ratio as designated below:

Horizontal Illuminance Table

General Parking and Pedestrian Area

Level of Activity	Lux (Minimum on pavement)	Footcandles (Minimum on pavement)	Uniformity Ratio (Average/Minimum)	(Max./Min.)
High	10	0.9	4:1	9:1
Medium	6	0.6	4:1	9:1
Low	2	0.2	4:1	9:1

2. Glare

Efforts must be made to use luminaires that control the view of the light source from drivers and pedestrians. Both disability and discomfort glare must be avoided.

B. LIGHT SOURCE

1. Atmospheric Conditions

All exterior fixtures shall be totally enclosed and gasketed for protection from the elements.

2. Lamp Position

Each lamp shall be positioned to achieve the maximum light output for even distribution within the parking lot.

C. LIGHTING EQUIPMENT

A variety of luminaires are used for lighting parking facilities such as area lighting, architectural, post top, wall mounted, and roadway lighting. “Shoe box” style shall be used with sharp cut off designed to confine light to specific designated areas.

Floodlight luminaires, adjustable wall packs, and high-mast aerial lighting greater than 60 feet in height shall not be acceptable.

The luminaire types that are suited for a specific application can be determined by comparing luminaire and lamp combinations to basic considerations, such as:

1. Size and shape of area.
2. Mounting height of luminaire.
3. Location requirements of poles and luminaires:

When perimeter poles are used a light cut off design or lens shall be considered capable of producing a rectangular pattern.

4. Illuminance requirements.
5. Quality of uniformity requirements (maximum to minimum).
6. Energy requirements (lamp source and ballast). PF-90 CWA energy efficient constant wattage auto factor type ballasts shall be used.
7. Code restrictions.
8. Effects of spill light, street and house side light must be controlled by optics, reflectors or visors to minimize unwanted light. If visors are used the structural integrity of the pole and lamp combination must be safely determined as acceptable for local wind conditions.

D. ARCHITECTURAL LUMINAIRES

These varied types of luminaires are designed to blend with the total architectural environment and shall be capable of producing efficient, uniform illumination while offering control of undesirable light or glare.

E. POST TOP LUMINAIRES

The mounting height for this type of luminaire shall not exceed 15 feet when adjoining residential uses. Mounting heights up to 25 feet may be permitted adjoining other uses as approved by the Village Engineer.

F. WALL MOUNTED LUMINAIRES

The cutoff type shall be used with a maximum mounting height of 25 feet and maximum spacing of 4 times the mounting height and maximum lamp of 400 watts or equivalent.

G. SPECIAL LIGHTING

Should closed circuit television monitoring equipment be necessary, special considerations will be given to the lighting level, type of light source, and distribution pattern to ensure effective results.

H. ENERGY MANAGEMENT

Developers are encouraged to include provisions for reducing the lighting levels for area security only during reduced activity periods.

I. DESIGN AND SUBMITTAL PROCEDURES

Private parking lot and area lighting will be reviewed on an individual basis for meeting the intent of these provisions. Catalog cuts and photometrics must be submitted for approval by the Village Engineer.

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