OUTDOOR LIGHTING DESIGN STANDARDS UPDATE

PREPARED FOR

CITY OF LINCOLN

LINCOLN, NEBRASKA

(SIGNED AND DATED SEAL)

APRIL 2015

OA PROJECT NO. 014-1552
B.U.G. Revised

OLSSON ASSOCIATES

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Chapter 3.100 DESIGN STANDARDS FOR OUTDOOR LIGHTING – (Proposed Edits in Red Type)

I. BACKGROUND

In the 1970's the Lincoln City Council mandated the City's street lighting system would implement the use of high pressure sodium (HPS) lamps and be designed at light levels no more than 70% of those recommended by the Illuminating Engineering Society of North America (IESNA). This action was taken in the aftermath of the 1972 OPEC oil embargo.

Limits on the surface brightness of commercial signage were adopted in 1979. Updated parking lot lighting standards and a new outdoor recreational standard were approved by the governing body in 1994.

By the year 2005 Lincoln's growth, the resulting increase in development, larger developments and the lighted environments that went with this growth brought to the forefront the need to refine the City's lighting design standards.

In response to this need Lincoln issued an RFP for a Comprehensive Outdoor Lighting Study which would select a lighting consultant to work with a Task Force comprised of neighborhood representatives, business and professional representatives, the astronomical community and representatives of select City of Lincoln departments as well as the Lincoln Electric System (LES).

That group was tasked with taking a wide ranging look at outdoor lighted venues in Lincoln and recommend new design standards or modifications to existing design standards based on their findings and analysis. Special emphasis was placed on the impact lighted environments had on neighboring properties and land uses, concern for good lighting design, and environmental stewardship.

The Task Force held 26 meetings over a period of seventeen months. The hard work and perseverance of the Task Force resulted in a final study that presented several recommendations for improvements to the lighting design standards. These recommendations were ultimately adopted by the Lincoln City Council and were incorporated into the design guidelines.

In the years subsequent to the design standards update resulting from the Comprehensive Outdoor Lighting Study, the real world application of the design standards has been well received by the design/development community and City staff. Some issues have been identified as candidates for further study. These issues are:

- IESNA's new B.U.G. luminaire classification system.
- Light trespass design guidelines from Zero Setback properties.
- Lighting design guidelines for marquees/canopies overhanging public property.

To address these issues the City of Lincoln Planning Department formed a Working Group and tasked that group with identifying recommendations to resolve the issues. The work involved authoring a study and presentation of the recommendations to a panel from the design community, the planning commission, and the City Council.

II. THE WORKING GROUP

The Working Group assembled by the City of Lincoln Planning Department is comprised of individuals who deal with the design standards on a daily basis as members of the planning and building safety departments and a member of the Task Force for the Comprehensive Outdoor Lighting Study. They are:

David Cary	-	Acting Planning Department Director
Tom Cajka	-	Planning Department Planner
Steve Henrichsen	-	Planning Department Manager-Development Review
Terry Kathe	-	Chief Plans Examiner-Building and Safety
Ken Fairchild	-	Olsson Associates

Marvin Krout was the initiator of the Working Group and the Comprehensive Outdoor Lighting Study. Until his untimely passing, he was a member of the Working Group. His dedication to developing effective and usable lighting design standards is a motivation for the group. His leadership is sorely missed.

III. THE RESOLUTION PROCESS

A. Cutoff and B.U.G. Classification Systems

IESNA's Backlight, Uplight, Glare (B.U.G.) luminaire classification system was introduced right as the Comprehensive Outdoor Lighting Study was completed and submitted. The B.U.G. system looks at the amount of light in several zones for each major area (backlight, uplight, and glare) of a luminaire. This allows a lighting designer to be very specific about the luminaire selected for a lighting application. It has become the industry standard for LED luminaires and has no direct correlation to the cutoff classification system used in the current guidelines.

The group focused on looking for an answer to this issue that met the original intent of putting the luminaire classification system in the outdoor lighting design guidelines. The luminaire classification system was used to define the photometric performance of luminaires that were acceptable for use in certain applications covered by the guidelines.

Lighting design software named Photometric Toolbox, by Lighting Analysts, was used to compare the photometric distribution of luminaires acceptable under the former IESNA non cutoff, semi cutoff, cutoff, and full cutoff classification system against how their performance was rated by the new B.U.G. classification system. Figures F-1 through F-6 in the appendix of this report are graphic documentations of the classification systems comparison results using five different fixtures. Four fixtures analyzed were LED units and one was a high intensity discharge (HID) fixture using a 150 watt metal halide lamp. By comparison of luminaire photometric distribution acceptable under the cutoff classification system to that same luminaires photometric distribution rating under the B.U.G. system the group reached the following consensus:

> Put both luminaire classification systems in the design guidelines and define acceptable B.U.G. photometric distribution as Cutoff = B.U.G. 3, 1, 3 and Full Cutoff = B.U.G. 3, 0, 3.

B. Zero Setback Spill Light

The existing outdoor lighting design guidelines define allowable spill light at the property line. At the time these guidelines were adopted no one anticipated the need for similar guidelines for developments utilizing zero setback from property lines.

Zero setback situations most commonly occur in commercial building projects and often in the City core with redevelopment efforts.

Once again the working group focused on the original intent of spill light guidelines and the most frequently encountered setbacks where the guideline would be applicable.

10'-0" setbacks from the property line are common for commercial buildings that need to comply with existing spill light guidelines. Since zero setback situations frequently occur abutting public property that includes roadway right of ways, the center line of the right of way was also a suggested point for compliance.

Olsson again used lighting design software to create a case study. The case study assumed a wall mounted light fixture conforming to the current design standards. It then looked at the spill light levels at 10'-0" from the building and at 50'-0" as the center of the right of way. The center of the right of way was chosen to reflect 100'-0" right of ways common in the City core.

Exhibit 1 in the Appendix shows an initial study for a commercial facility with guidelines compliant wall mounted lighting on a 10'-0" setback. This study is compliant for spill light with the current guidelines. The light levels at 50'-0" are still unmeasurable.

In Exhibit 2 the same facility and wall mounted lighting were utilized but placed on the property line (zero setback). Since it was compliant at a 10'-0" setback, it is also compliant at 10'-0" under these conditions and the spill light at the center of the right of way is negligible. The light levels at 50'-0" are still unmeasurable.

Based on these case studies and the intuitive understanding that a design which is compliant for a 10'-0" setback will be compliant at 10-0" for a zero setback, the group feels that requiring zero setback situations to be spill light compliant at 10'-0" from the property line is a reasonable expectation.

C. Marquee/Canopy Overhanging Public Property Guidelines

The current design guidelines define spill, glare, and average maintained footcandle levels for canopies as used by C-stores, banks, and similar commercial enterprises. There are no such guidelines for marquees/canopies attached to buildings and overhanging public properties. Since these marquees/canopies are overhanging pubic property only the spill requirement is in effect (0.5 fc horizontal at 3'-0" above the ground).

The group's process for resolution of this issue was twofold. First case studies would again be used to study spill light levels for different average maintained light levels under marquee/canopies of heights similar to those found in Lincoln. Secondly each member of the group would take an evening and look for existing examples of marquee/canopy lighting in different areas of Lincoln. Areas selected as known to have, or with potential to have existing lighted marquees/canopies were Havelock, Uni Place, the Haymarket and the downtown core.

The first case study utilized a C-store type canopy at 17'-0" above grade and an 11.3 average maintained footcandle level. The spill light levels at 10'-0" around the perimeter of the canopy were well in excess of those levels allowed by the current guidelines (See Exhibit 3 in the Appendix).

The next case study utilized a marquee at a height (9'-6") equal to the marquee on the Terminal Building at the southwest corner of 10th & O Streets. The average maintained footcandle level was 5.48 fc. At this level of lighting the spill levels at 10'-0" from the marquee perimeter exceeded the guideline allowed levels (Exhibit 4 in the Appendix).

In Exhibit 5 of the Appendix we recreated the light levels of the entrance canopy of the Court Yard Lincoln (Marriott) Hotel in the Lincoln Haymarket. During the design phase this facility applied for and received a waiver from the City of Lincoln Planning Department. The average maintained light level for this facility is about 0.5 fc. It utilizes indirect light bounced off the underside of the canopy, producing a very diffused, lighted environment that does meet the spill light criteria of the existing guidelines.

Interations of the case studies documented in Exhibits 3 and 4 which showed the marquee/canopies average maintained light levels needed to approach 4 fc in order to comply with the spill guidelines. The approved waiver for the Terminal Building with an average maintained level of 4 fc and the visual comparison of the few examples available of existing marquee/canopy lighting (Terminal Building and the Courtyard being two) along with the interations of the case studies led the work group to settle on a 4 fc average maintained light level with no perimeter line defined for spill level measurement.

IV. RECOMMENDATIONS

Based on the analysis done during the resolution process and the consensus of the Working Group on the results of the analysis the recommendations for Lincoln's Outdoor Lighting Design Guidelines are:

A. Put both luminaire classification systems in the design guidelines and define acceptable B.U.G. photometric distribution as Cutoff = B.U.G. 3, 1, 3 and Full Cutoff = B.U.G. 3, 0, 3.

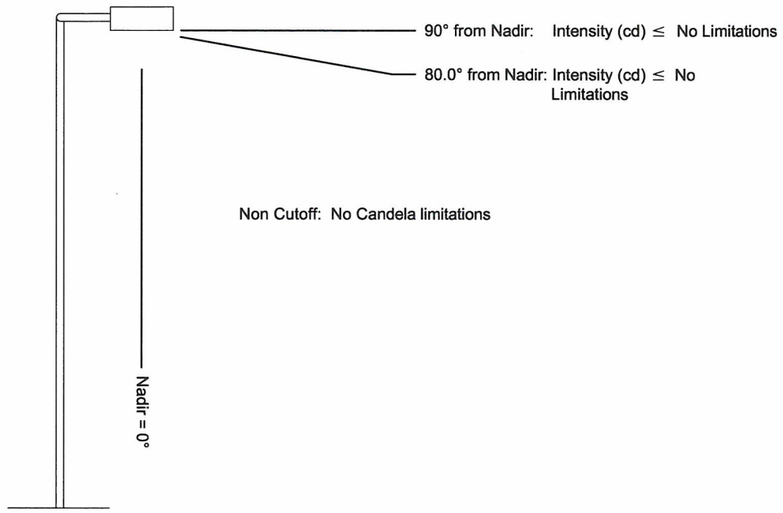
B. Zero setback spill light shall comply with current guidelines at 10'-0" from the property lines.

C. Lighted marquees/canopies overhanging public property shall be designed for an average maintained level not to exceed 4.0 f.c.

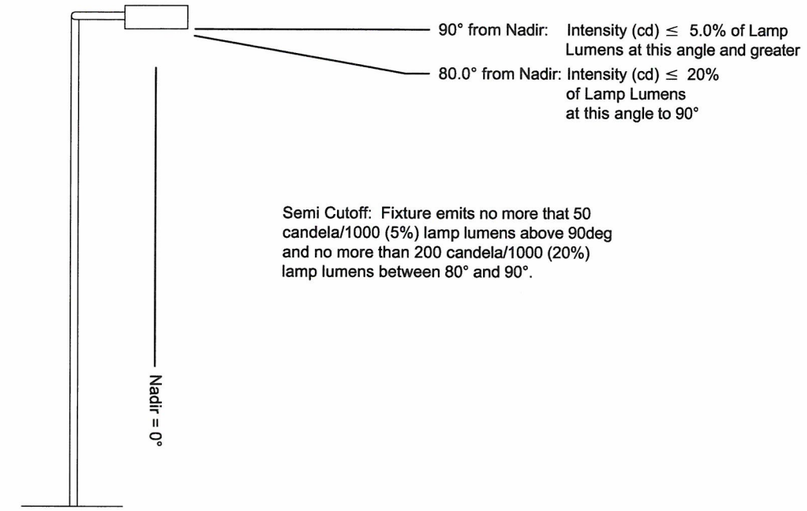
Proposed edits to Chapter 3.100 "DESIGN STANDARDS FOR OUTDOOR LIGHTING" are in the Appendix of this report. The proposed edits are shown in red type and can be found on pages 2, 4 and 8 of Chapter 3.100.

PROFESSIONAL ELECTRICAL ENGINEER
KENNETH
FAIRCHILD
E-4517
4/29/2015
STATE OF NEBRASKA

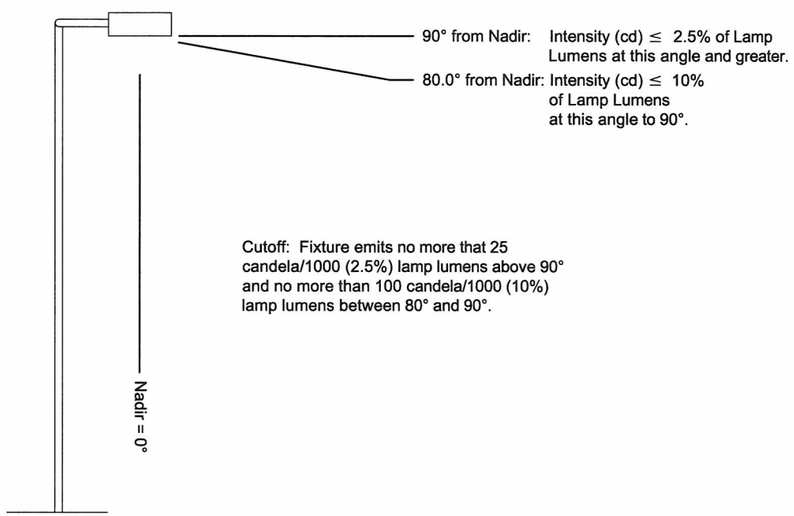
(SIGNED AND DATED SEAL)



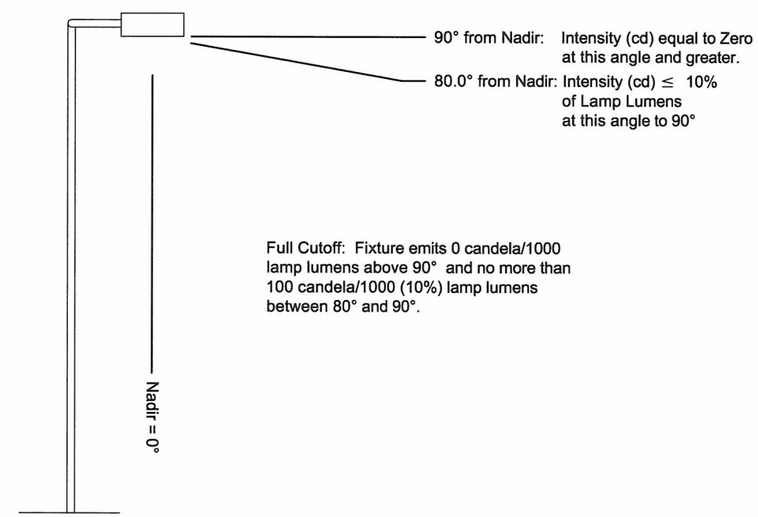
NonCut-Off Luminaire



SemiCut-off Luminaire



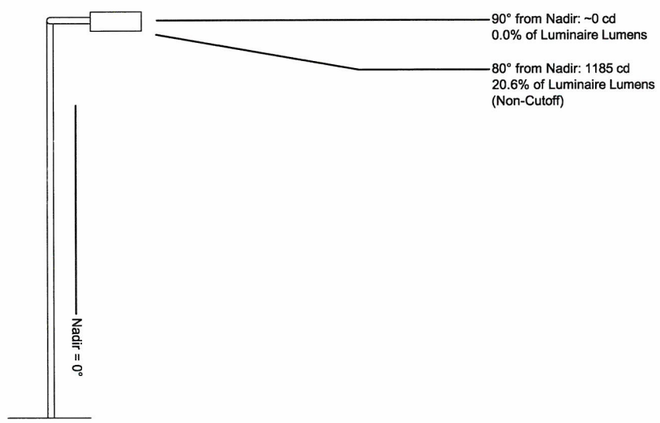
Cut-Off Luminaire



Full Cut-off Luminaire

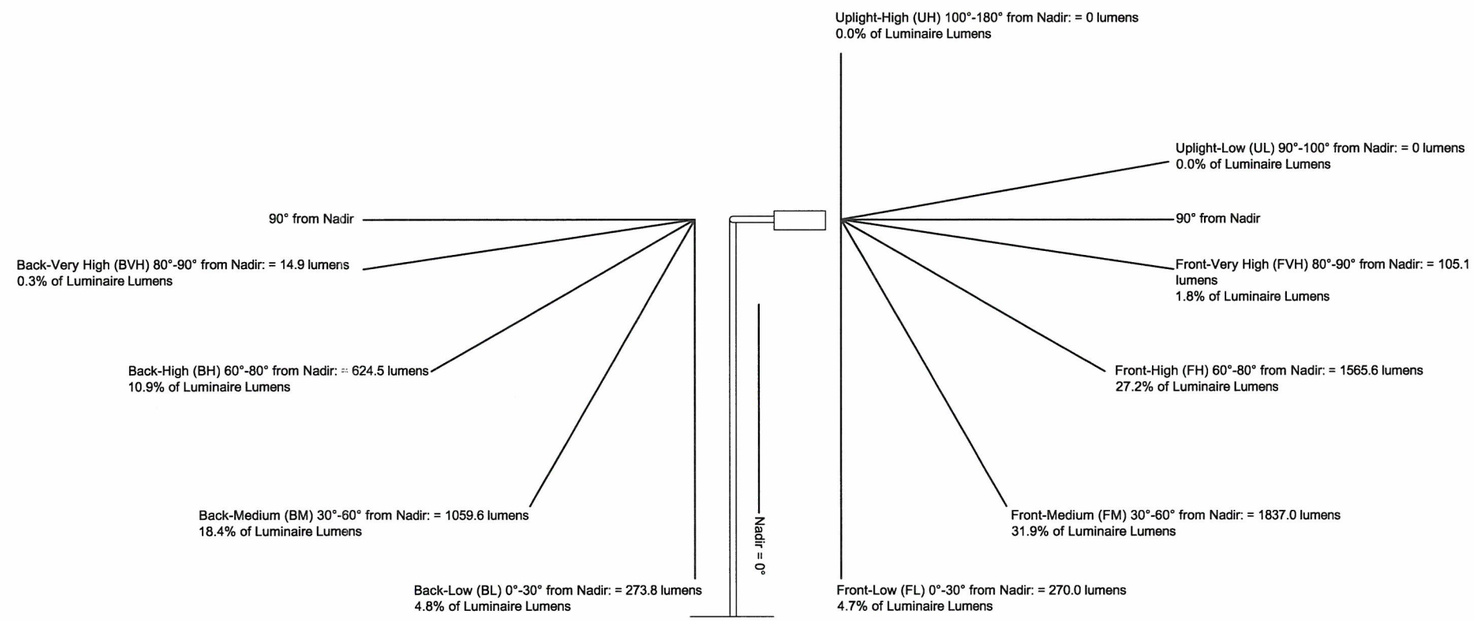
PROJECT: PLANNING	IES CUTOFF CLASSIFICATION PLANNING – LINCOLN, NE	OLSSON ASSOCIATES ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS 1111 LINCOLN MALL – LINCOLN, NEBRASKA 68508 PH. 402-474-6311 – FAX 402-474-5160	FIGURE
DRAWN BY: DGG			F–1
DATE: 04/18/13			

BETA EDGE:
ARE-EDG-_3M-_-04-D-UL-700-43K
(Candela)
LAMP: LED (Non-cutoff)



Luminaire (Absolute)
Lumens: 5,751

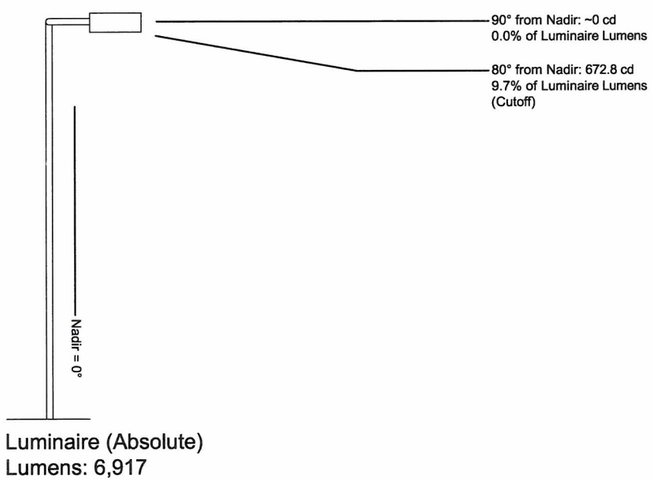
BETA EDGE:
ARE-EDG-_3M-_-04-D-UL-700-43K
(Zonal Lumens)
LAMP: LED (B2-U2-G2)



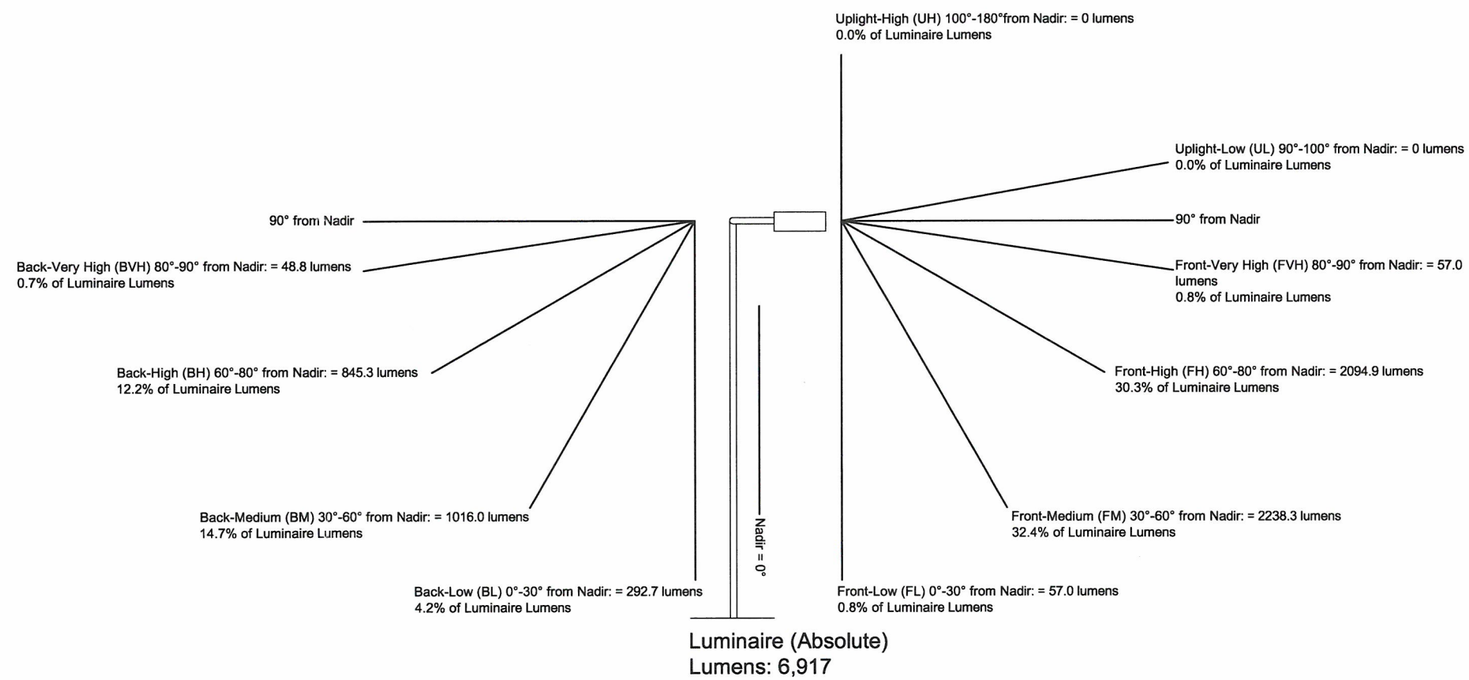
Luminaire (Absolute)
Lumens: 5,751

PROJECT: PLANNING	BETA EDGE PLANNING – LINCOLN, NE	OLSSON ASSOCIATES ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS 1111 LINCOLN MALL – LINCOLN, NEBRASKA 68508 PH. 402-474-6311 – FAX 402-474-5160	FIGURE
DRAWN BY: DGG			F–2
DATE: 04/18/13			

LEOTEK (LES CORE ROADWAY): (Candela) LAMP: LED (Cutoff)

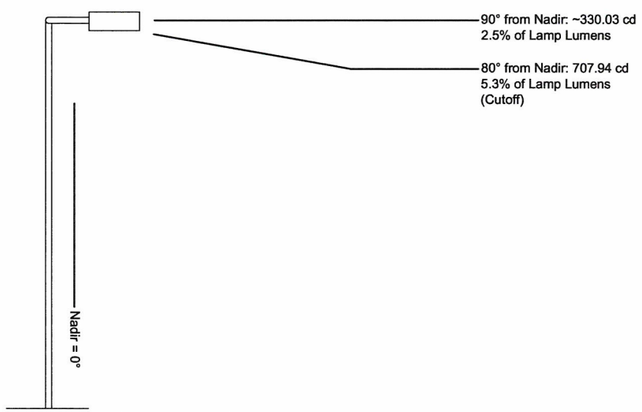


LEOTEK (LES CORE ROADWAY): (Zonal Lumens) LAMP: LED (B2-U1-G2)



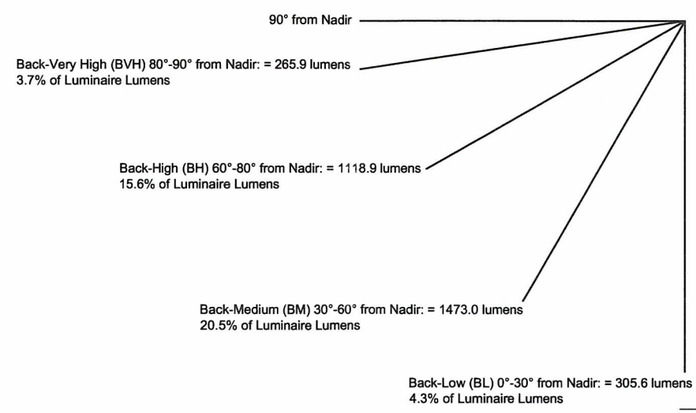
PROJECT: PLANNING	LES LEOTEK	OLSSON ASSOCIATES	FIGURE
DRAWN BY: DGG	PLANNING – LINCOLN, NE	ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS	F–3
DATE: 04/18/13		1111 LINCOLN MALL – LINCOLN, NEBRASKA 68508 PH. 402–474–6311 – FAX 402–474–5160	

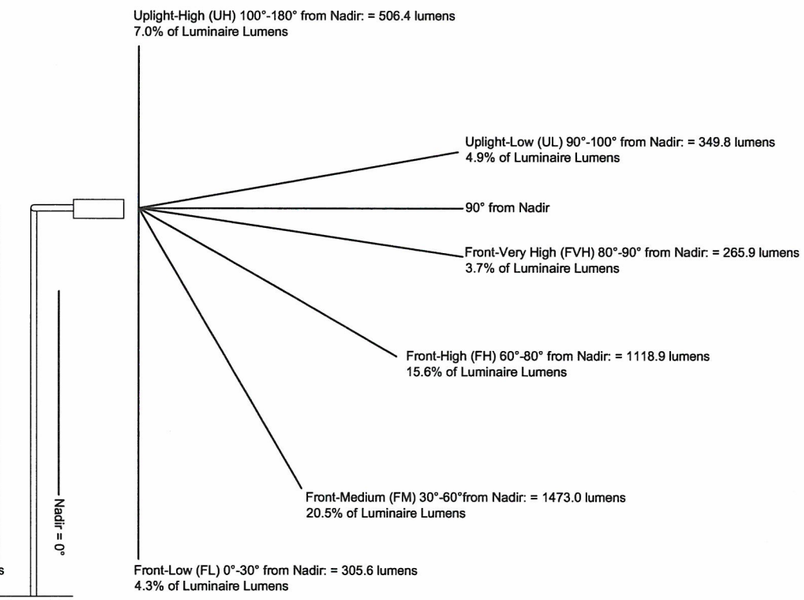
SELUX (CE PED LIGHTING): (Candela) LAMP: 100 watt MH prorated to 150 WATT MH (Cutoff)



Total Lamp Lumens:13,300
Luminaire (Absolute) Lumens: 7,183

SELUX (CE PED LIGHITNG): (Zonal Lumens) LAMP: 100 Watt MH prorated to 150 WATT MH (B3-U4-G2)

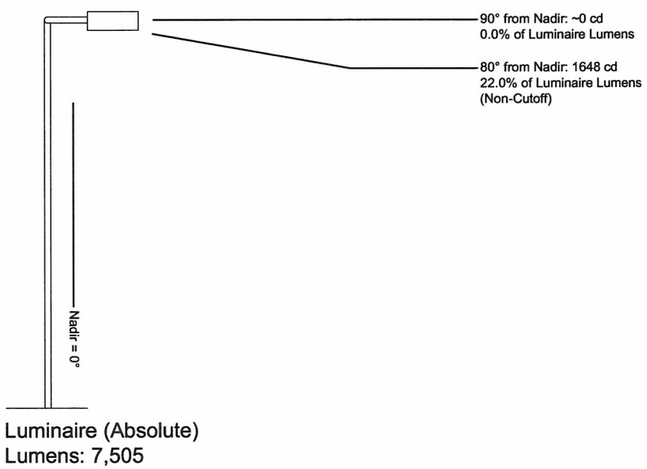




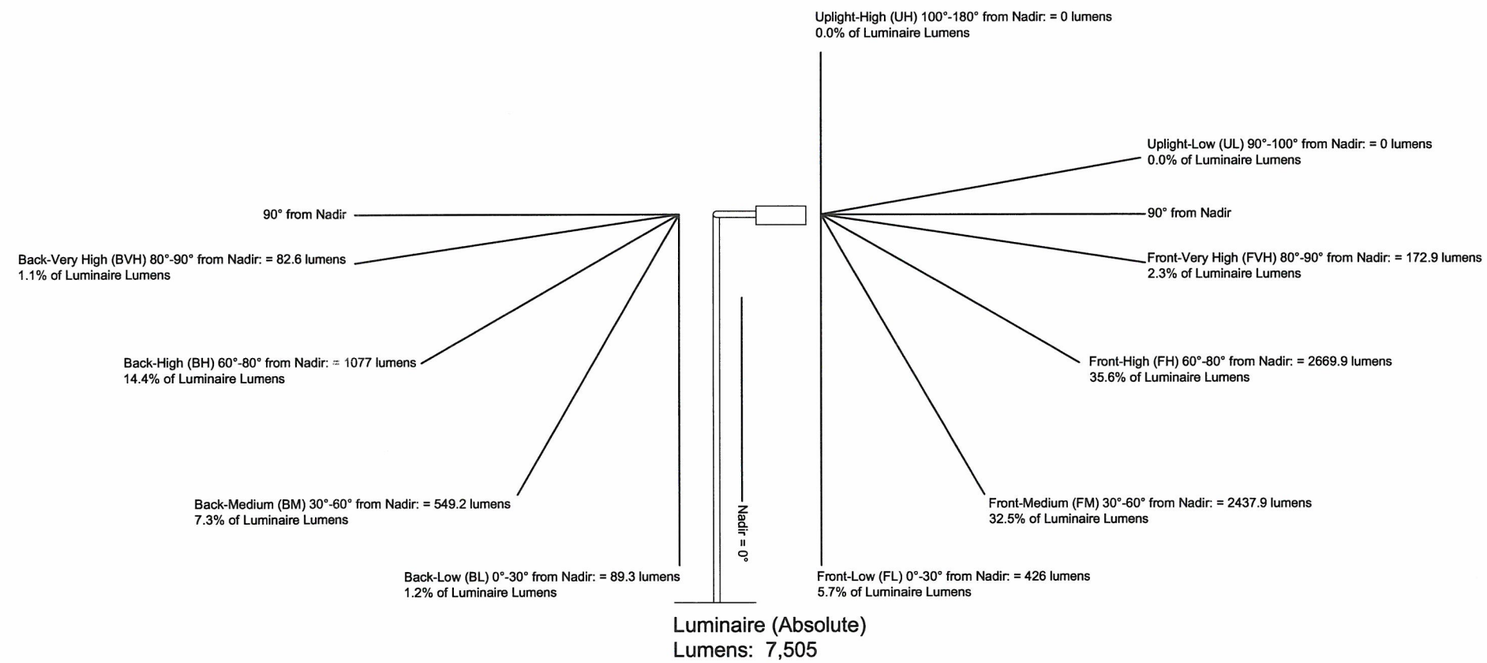
Luminaire (Absolute)
Lumens: 7,183

PROJECT: PLANNING	CE CORE PEDESTRIAN UNIT	OLSSON ASSOCIATES	FIGURE
DRAWN BY: DGG	PLANNING – LINCOLN, NE	ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS	F–4
DATE: 04/18/13		1111 LINCOLN MALL – LINCOLN, NEBRASKA 68508 PH. 402–474–6311 – FAX 402–474–5160	

KIM ARCHETYP LED: AR2-120L5K (Candela) LAMP: LED (Non-Cutoff)

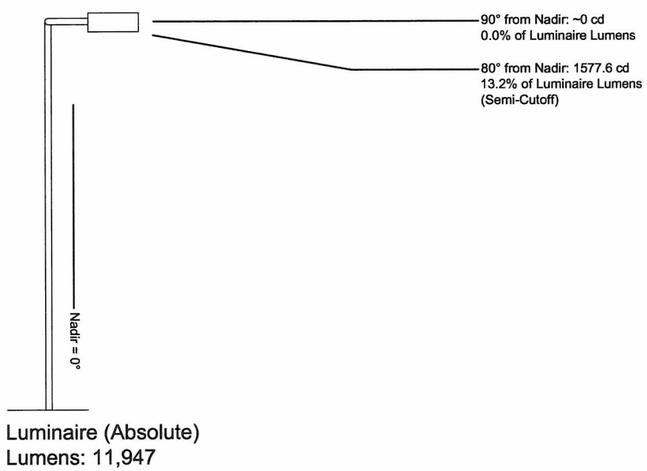


KIM ARCHETYP LED: AR2-120L5K (Zonal Lumens) LAMP: LED (B3-U3-G3)

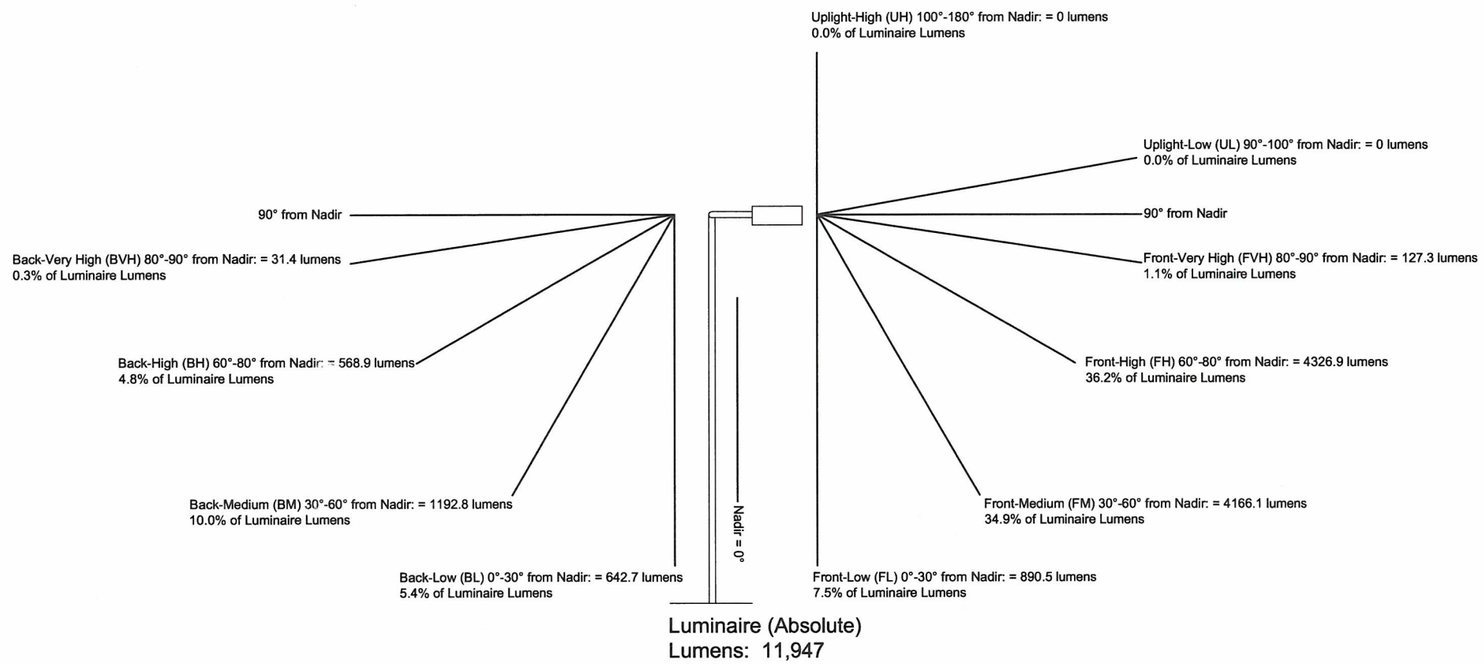


PROJECT: PLANNING	KIM LIGHTING ARCHETYPE LED	OLSSON ASSOCIATES	FIGURE
DRAWN BY: DGG	PLANNING – LINCOLN, NE	ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS	F–5
DATE: 04/18/13		1111 LINCOLN MALL – LINCOLN, NEBRASKA 68508 PH. 402–474–6311 – FAX 402–474–5160	

COOPER LIGHTING STREETWORKS LED: OVFB06LEDEUSL3 (Candela) LAMP: LED (Semi-Cutoff)

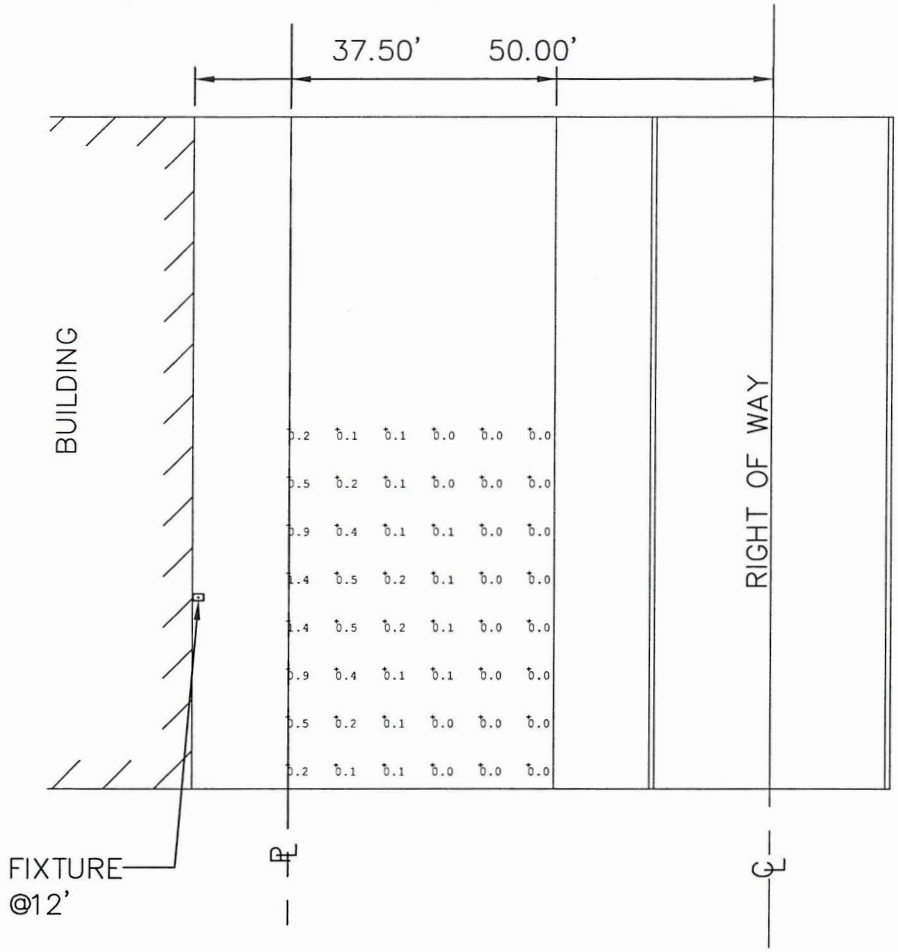


COOPER LIGHTING STREETWORKS LED: OVFB06LEDEUSL3 (Zonal Lumens) LAMP: LED (B2-U2-G2)

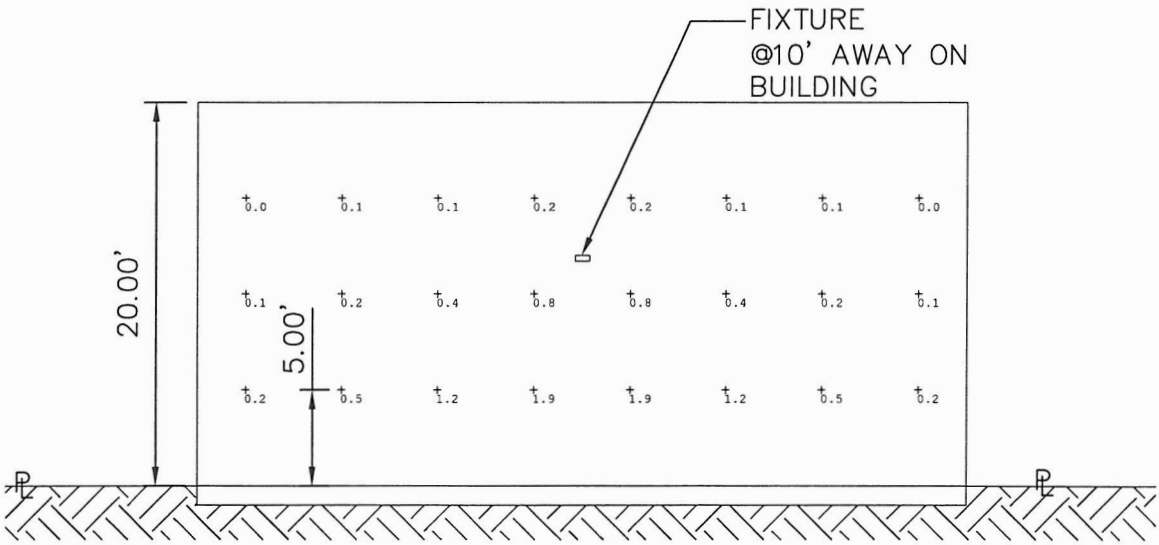


PROJECT: PLANNING DRAWN BY: DGG DATE: 04/18/13	COOPER LIGHTING STREETWORKS LED PLANNING – LINCOLN, NE	OLSSON ASSOCIATES ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS 1111 LINCOLN MALL – LINCOLN, NEBRASKA 68508 PH. 402-474-6311 – FAX 402-474-5160	FIGURE F-6

FIXTURE:
COOPER LIGHTING–LDWP–FC–2A–ED (29WATTS)



HORIZONTAL

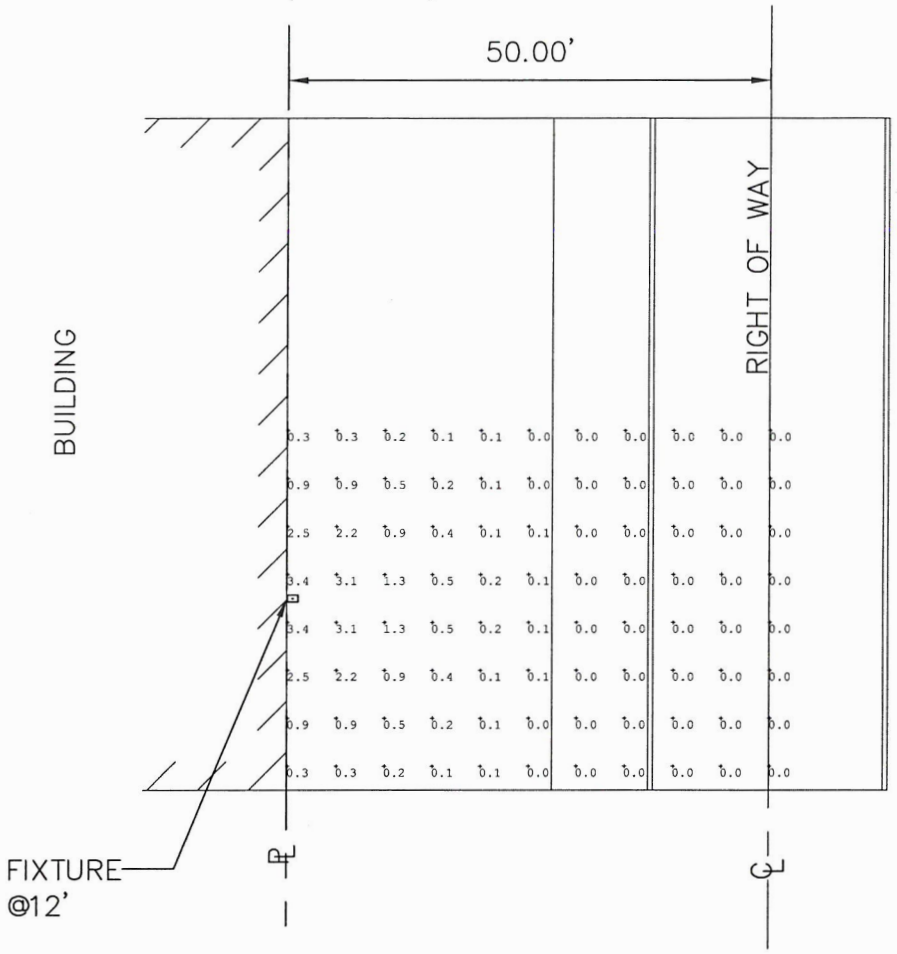


VERTICAL

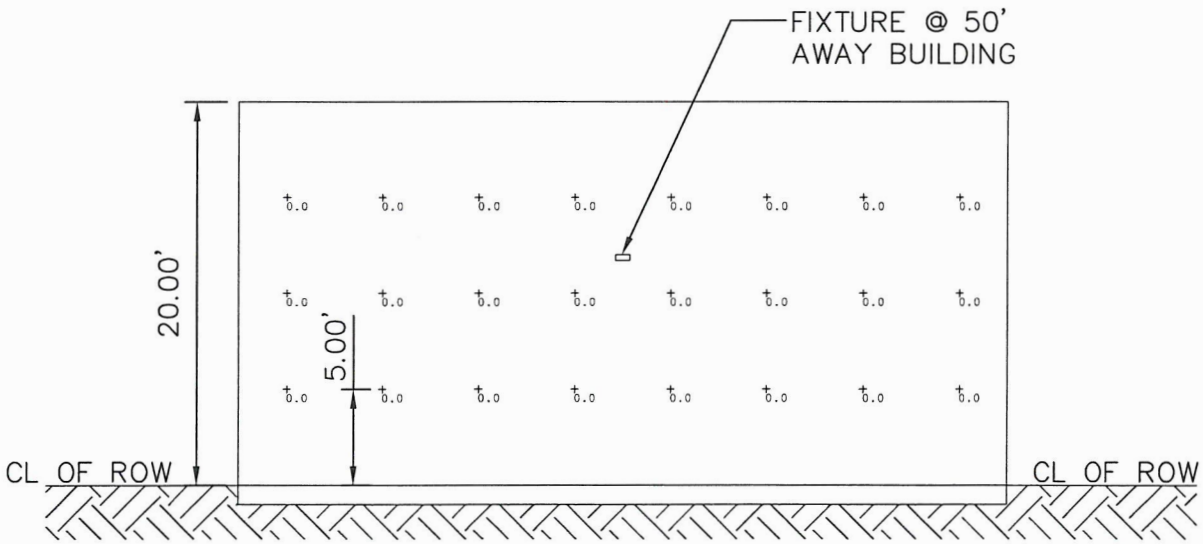
DWG: F:\Projects\014-1552_SPLT\Final_Plans\014-1552-Exhibit1.dwg USER: bsliva
DATE: Mar 16, 2015 10:46am XREFS: Cooperfixture-Option2-Horizontal

PROJECT NO: 014-1552	10' SETBACK CONDITION	OLSSON ASSOCIATES	601 P Street, Suite 200 P.O. Box 84608 Lincoln, NE 68508 TEL 402.474.6311 FAX 402.474.5160	EXHIBIT
DRAWN BY: BTS				1
DATE: 3/16/2015				

FIXTURE:
COOPER LIGHTING–LDWP–FC–2A–ED (29WATTS)



HORIZONTAL

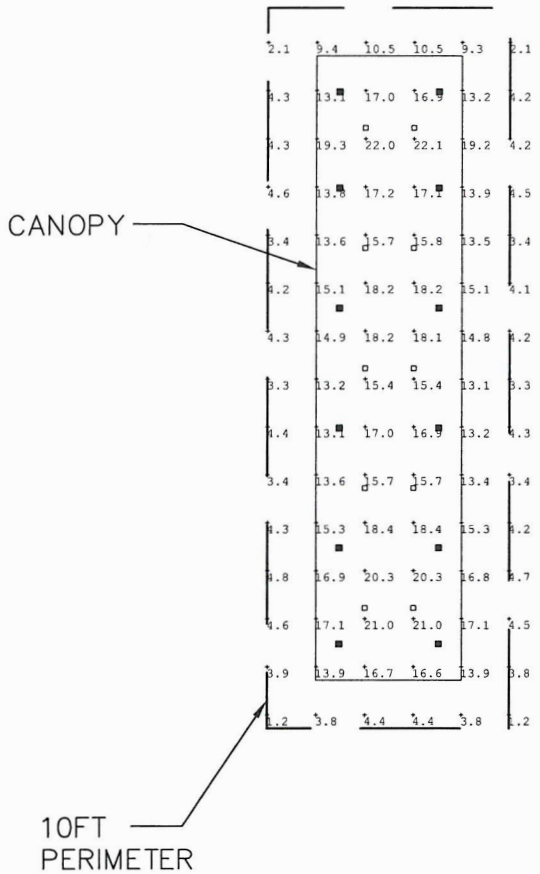


VERTICAL

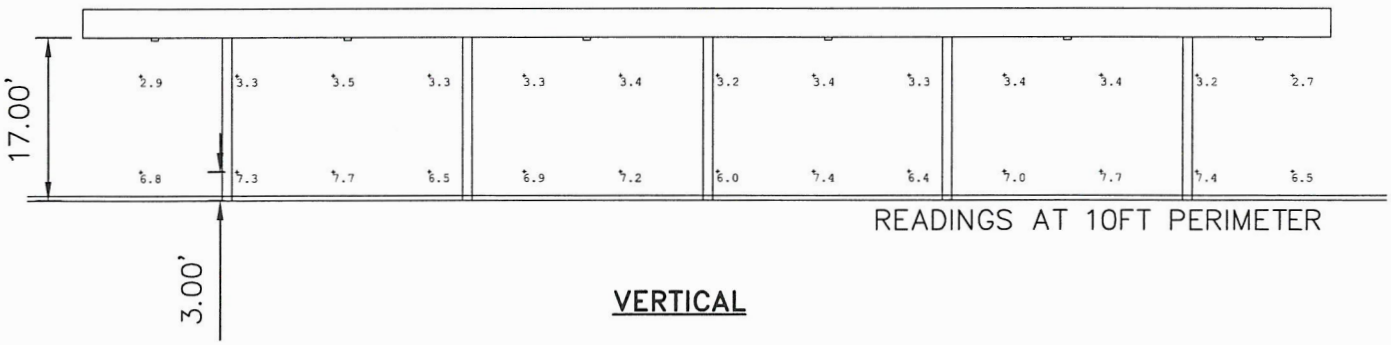
DWG: F:\Projects\014-1552_SPLT\Final_Plans\014-1552-Exhibit2.dwg USER: bsliva
DATE: Mar 16, 2015 10:48am XREFS: CooperfixturebuildingonPL

PROJECT NO: 014-1552	0' SETBACK CONDITION	OLSSON ASSOCIATES	EXHIBIT
DRAWN BY: BTS		601 P Street, Suite 200 P.O. Box 84608 Lincoln, NE 68508 TEL 402.474.6311 FAX 402.474.5160	2
DATE: 9/3/2014			

FIXTURE:
PHILIPS DAY-BRITE-CLR150M (180WATTS)
AVG: 11.33FC



HORIZONTAL

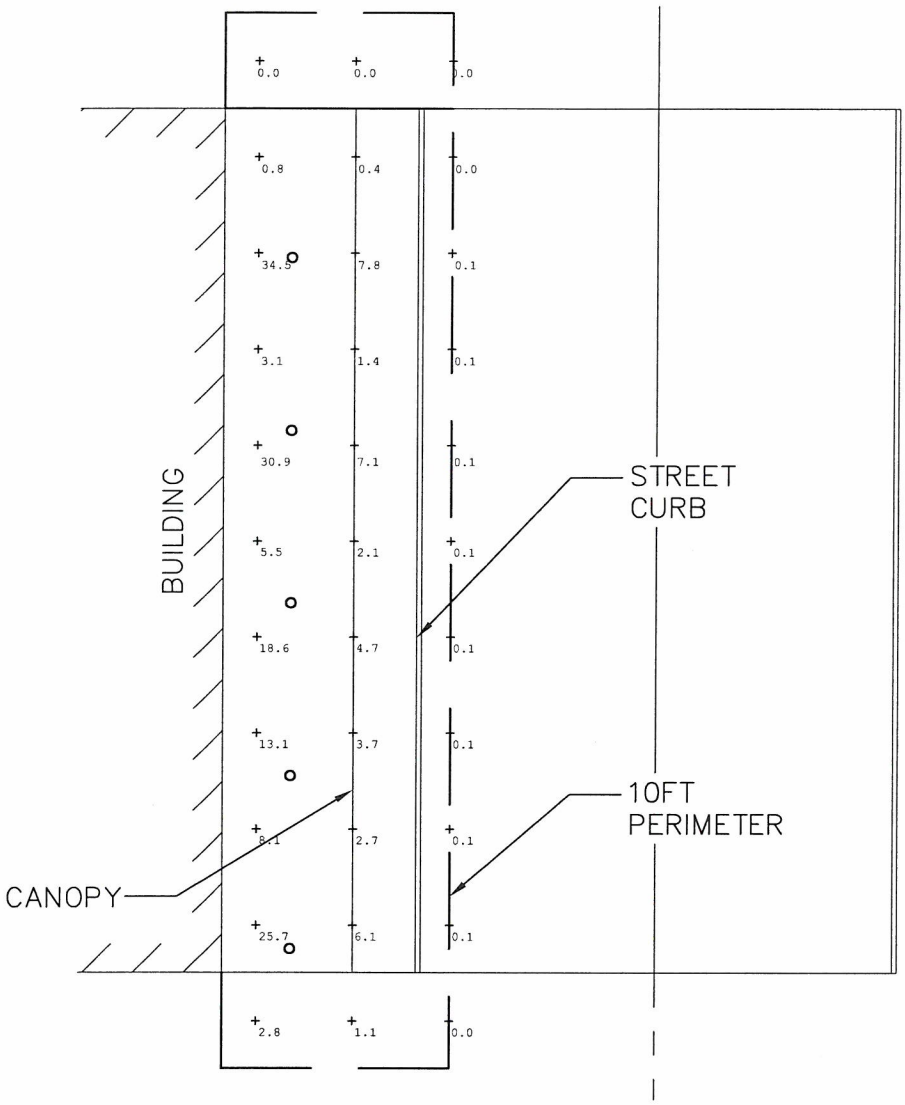


VERTICAL

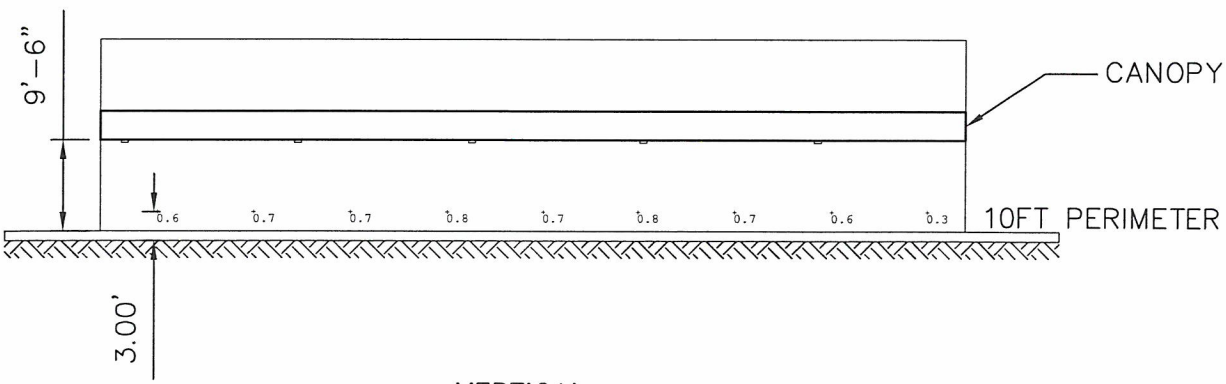
DWG: F:\Projects\014-1552_SPLT\Final_Plans\CANOPY LIGHTING\014-1552-Kwik@10'(MH).dwg USER: bsliva
DATE: Feb 12, 2015 8:07am XREFS: kwik@10'-horizontal

PROJECT NO: 014-1552	10' FT PERIMETER	OLSSON ASSOCIATES	EXHIBIT
DRAWN BY: BTS		601 P Street, Suite 200 P.O. Box 84608 Lincoln, NE 68508 TEL 402.474.6311 FAX 402.474.5160	3
DATE: 9/3/2014			

FIXTURE:
COOPER LIGHTING–PD6P100E–60V1GC_100PAR38 (100WATTS)
AVG: 5.48FC



HORIZONTAL

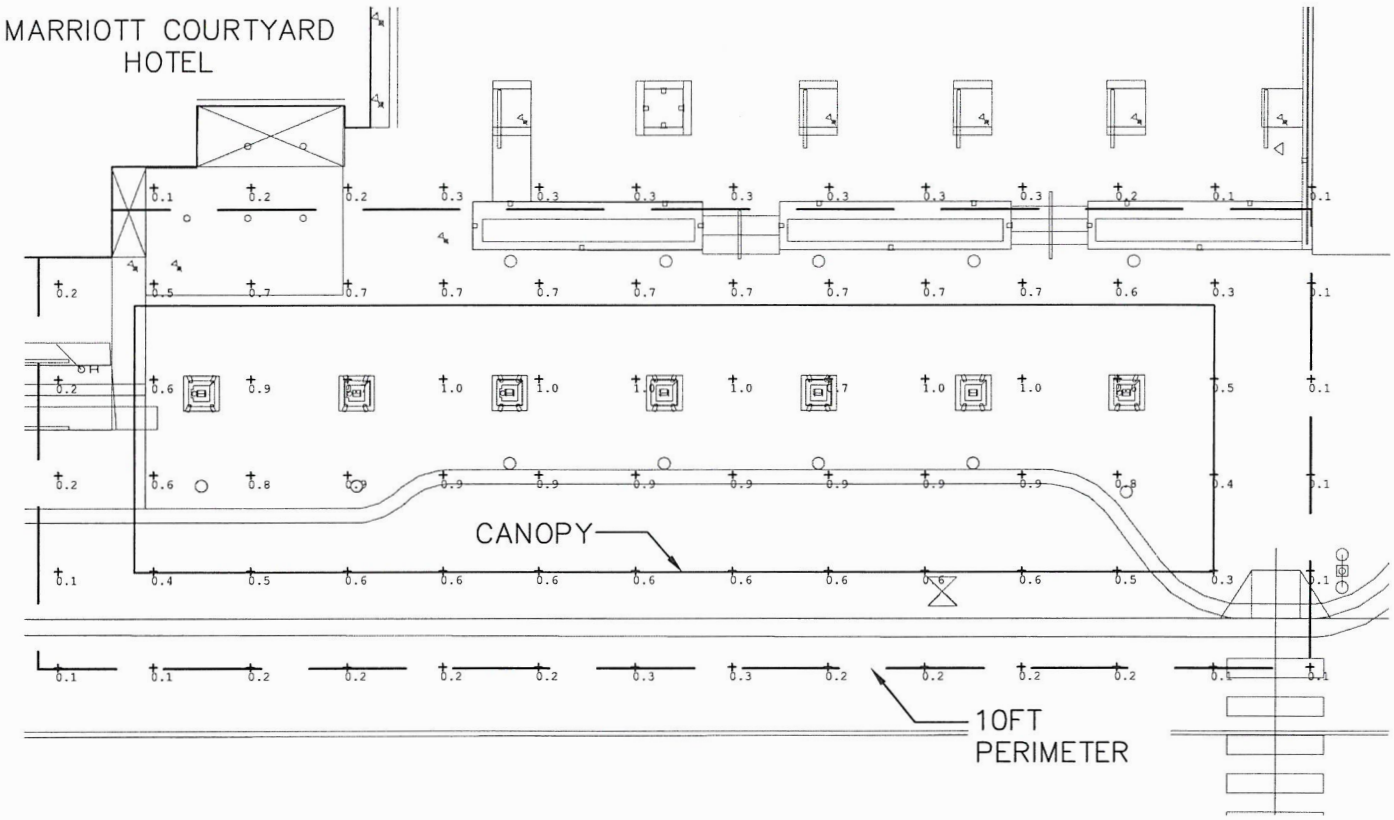


VERTICAL

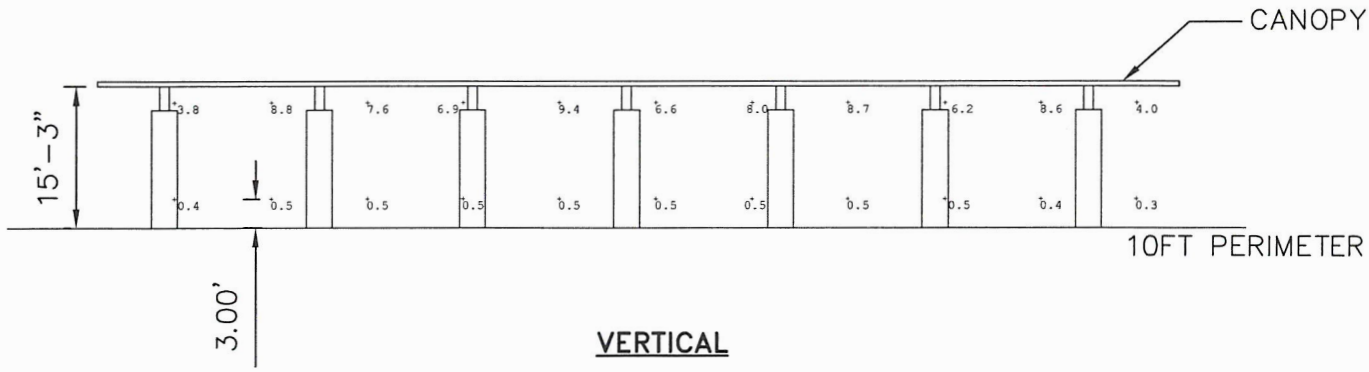
DWG: F:\Projects\014-1552_SPLT\Final_Plans\CANOPY LIGHTING\TERMINAL.dwg USER: bsliva
DATE: Feb 12, 2015 8:08am XREFS: Terminal@10'-horizontal

PROJECT NO: 014-1552	10' FT PERIMETER	OLSSON ASSOCIATES	EXHIBIT
DRAWN BY: BTS		601 P Street, Suite 200 P.O. Box 84608 Lincoln, NE 68508 TEL 402.474.6311 FAX 402.474.5160	4
DATE: 10/2/2014			

FIXTURE:
BEGA LIGHTING–7550LED (49WATTS)
AVG: 0.49FC



HORIZONTAL



VERTICAL

DWG: F:\Projects\014-1552_SPLT\Final_Plans\CANOPY LIGHTING\Marriott.dwg
DATE: Feb 12, 2015 8:05am XREFS: Block 21-horizontal Block 21-plan
USER: bsliva

PROJECT NO: 014-1552	10' FT PERIMETER	OLSSON ASSOCIATES	EXHIBIT
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APPENDIX

Chapter 3.100
DESIGN STANDARDS FOR OUTDOOR LIGHTING

(Proposed Edits in Red Type)

Chapter 3.100

DESIGN STANDARDS FOR OUTDOOR LIGHTING

The Building and Safety Department is assigned responsibility for administration of these design standards.

Section 1. GENERAL PROVISIONS

All outdoor luminaires installed after the date Resolution (Misc. No. 08009) is adopted shall be installed in conformance with the provisions of this chapter and the applicable provisions of the City of Lincoln regulating the installation of such fixtures.

No illumination source shall exceed initial output of 4050 lumens unless it is within a cutoff or full cutoff luminaire, except for luminous tube lighting such as neon, cold cathode and fiber optic cable, or as specified for Class II or Class III lighting, or as otherwise provided in this chapter.

All fixtures greater than 4050 lumens, except as specifically provided for in this chapter, shall be cutoff or full cutoff and mounted level in the horizontal and vertical axis with the central part of the beam directed vertically downward.

The installation of any mercury vapor luminaires for use as outdoor lighting is prohibited.

Section 2. MATERIALS AND METHODS OF INSTALLATION

The City of Lincoln encourages the use of quality materials, methods and designs. It is not the intent of this chapter to prevent the use of any design, material or method of installation not specifically forbidden; provided, any such alternate has been approved. The Building and Safety Department may approve any such proposed alternate if manufacturers' documentation provides satisfactory evidence that the proposed alternate is equivalent to the applicable requirements of this chapter.

Section 3. DEFINITIONS

The following terms and definitions shall apply in the enforcement and interpretation of this chapter:

Class I lighting (General) shall mean all outdoor lighting used to illuminate outdoor areas other than areas described for Classes II through IV.

Class II lighting (Accent/Decorative) shall mean all outdoor lighting used for accent or decorative effects. Examples of Class II lighting include, but are not limited to, the illumination of landscape features, flags, pennants or banners, fountains, statues, art work, and building walls.

Class III lighting (Street Lighting) shall mean all outdoor lighting used to illuminate public streets or highways and private roads subject to public access easement.

Class IV lighting (Outdoor Recreational Facilities) shall mean all outdoor lighting used to illuminate outdoor recreational facilities.

Class V lighting (Salt Creek Tiger Beetle Environs) shall mean all outdoor lighting used to illuminate the area within the Salt Creek Tiger Beetle environs (this is a holding class for anticipated Federal Standards).

Cutoff and Full-Cutoff shall mean outdoor light fixtures shielded or constructed by the manufacturer so as to comply with the former Illuminating Engineering Society of North America (IESNA) luminous classification system definition for cutoff and full cut-off outdoor lighting fixtures as found in the IESNA Lighting Handbook, 9th edition or the new IESNA B.U.G. luminaire classification system where B.U.G. 3,1,3 shall be considered equal to cutoff and B.U.G. 3,0,3 shall be considered equal to full cutoff .

Display Area shall mean the area used for the outdoor display of merchandise for sale including aisles between the display.

Field Angle shall mean the angle of the cone of light from reflector lamps or flood luminaires encompassing the central part of the beam out to the angle where the intensity is 10 percent of maximum.

Foot-candle (abbreviated fc) shall mean a unit of measure of illumination (number of lumens per area) or how much light is on a surface. A foot-candle is defined as one lumen per square foot.

Glare shall mean the amount of direct or indirect artificial light (measured with the meter vertical at 5 feet above ground level and rotated in a horizontal plane so it is facing the brightest source) in excess of the vertical foot candle limits allowed by Section 9 of this chapter.

IESNA shall mean Illuminating Engineering Society of North America.

Illuminance shall mean the amount of light falling onto a unit area of a horizontal surface (luminous flux per unit area) measured in lumens per square foot (foot-candles) at 3 feet above ground level.

Light trespass shall mean the amount of direct or indirect artificial light (measured with the meter horizontal and facing upwards at 3 feet above ground) in excess of the horizontal foot candle limits allowed by Section 9 of this chapter.

Lumen shall mean a unit of light emitted from a source. Where used in this chapter, lumen shall mean the "initial" manufacturer published amount emitted from the lamp or lamps constituting the source. (Note; 4050 lamp lumens is generally equivalent to one 50 watt high pressure sodium or one 200 watt incandescent lamp.)

Luminaire shall mean a complete manufactured and UL listed lighting unit consisting of a lamp or lamps, together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply.

Mounting height shall mean the distance from finished grade to the bottom most portion of any light emitting source, (e.g. lamp, surface of lens).

Nit is a unit of luminance equal to one candela per square meter.

Outdoor recreational facilities shall mean public, or private facilities designed and equipped for the outdoor conduct of sports, leisure time activities, and other customary and usual recreational activities. Outdoor recreational facilities include, but are not limited to, fields or stadiums for softball, baseball, football, soccer, golf courses, driving ranges and other "field sports," and courts for tennis, basketball, volleyball, handball and other "court sports."

Parking area shall mean an area, other than a street, designed or used primarily for parking of vehicles. This includes both "required" and "surplus" parking areas for residential, commercial and industrial uses, and inventory storage areas for automobile dealerships, but not display areas.
Person shall mean any natural person, firm partnership, association, corporation, company, or organization of any kind.

Private shall mean an area, street or facility that is not available for use by the general public.

Public shall mean an area, street or facility, whether publicly or privately owned, that is available for general public use, either free or for remuneration.

Residential shall mean an area or development in which the land use is zoned or used for single family, two-family or multi-family dwelling units. It shall include public streets and private roads within such areas.

Section 4. CLASS I LIGHTING (GENERAL) 4.1

Requirements

A. Exterior lighting for outdoor vehicle display area shall not exceed an average maintained illuminance of 20 footcandles.

If any portion of the outdoor auto display area is within 500 feet of residential zoning, the average maintained illuminance shall not exceed 20 footcandles and the luminaires shall be full cutoff for the entire outdoor vehicle display area.

B. Outdoor areas under lighted canopies, such as gas pump islands and ATM bays, shall not exceed an average maintained illuminance of 20 footcandles.

If any portion of the canopy area is within 500 feet of a residential zoning district, the average maintained illuminance shall not exceed 20 footcandles and the luminaires shall be full cutoff or mounted so that the bottom of the lens is recessed or flush with the bottom surface of the canopy for the entire canopy area.

C. Outdoor areas under lighted marquees (canopies attached to buildings and overhanging public property) shall not exceed an average maintained illuminance of 4 footcandles.

D. Class I lighting in residential zoning districts shall not exceed an average maintained illuminance of 4 footcandles. All other Class I lighting, including but not limited to lighting of entrance ways, dining areas, display of merchandise other than vehicles and outdoor work areas shall not exceed an average maintained illuminance of 6 footcandles.

E. All Class I lighting levels shall be reduced to an average maintained illuminance level of 4 footcandles after business hours.

F. Illuminance level shall not exceed 4 footcandles average maintained on parking surface for off-street parking.

Section 5. CLASS II LIGHTING (ACCENT/DECORATIVE) 5.1

Requirements

A. Luminaires used to illuminate buildings, flags, artwork or other landscape features may have lamps exceeding an output of 4050 lumens and be non-cutoff in design and aimed upward, but the field of angle of the lamp may not extend beyond the surface to be illuminated, or the luminaire must have shielding to provide the same limiting effect.

B. All Class II lighting must be selected, installed and aimed so that the amount of light trespass and glare beyond the area intended to be lighted is minimized or eliminated.

Section 6. CLASS III LIGHTING (STREET LIGHTING)

6.1 General Requirements

A. LES shall prepare or approve all designs for all lighted streets. LES will install and/or operate and maintain City of Lincoln street lighting for all lighted streets. LES shall establish, encourage, promote and employ energy conservation measures in the design, operation and maintenance of these street lighting systems.

B. Only high-pressure sodium (HPS) sources or an equivalent or higher efficiency source shall be used.

C. Street lighting may exceed trespass and glare standards.

D. All luminaires for street lighting shall be mounted level in the horizontal and vertical axis.

6.2 Design Requirements

Street lighting design shall be done in accordance with the IESNA "AMERICAN NATIONAL STANDARD PRACTICE FOR ROADWAY LIGHTING", 9th edition, except as specifically provided in this section.

6.3 Standard Street Lighting

LES may install/replace and maintain, "standard lighting" in any area where the City Council has not provided for "ornamental street lighting." Informal petitions signed by affected property owners or requests by the Mayor, City Council, Police Department or Public Works Department will precipitate investigation by LES Street Light Engineering to design and order the installation of justifiable lighting.

The standard street light shall normally consist of a wood pole and bracket with a pendant luminaire. Wiring will be underground in areas with an underground source and overhead in areas with an overhead source. Whenever directed by the Public Works Department, wiring shall be installed underground.

For local residential streets, lamps shall be 70 watt high pressure sodium sources or equivalent efficiency sources. Poles shall generally be twenty feet high mounting height and placed at street intersections and mid-block with normal interval spacing of 240 feet.

For all other streets, the street lights intensity will be designed to 70% or higher of IESNA recommended practices depending on the uniformity.

6.4 Ornamental Street Lighting

Ornamental Lighting shall be constructed in areas designated by the City Council as "Ornamental Lighting Districts" or mayoral "Executive Order" areas and shall be of a design specified to provide illumination in accordance with these standards. Such systems are to be served by underground wiring and design/construction will consist of a metal, concrete or fiberglass Standard (pole).

For local residential streets the standard street lamp/luminaire will be post top with a 70 watt high pressure sodium vapor type light, or an LES approved lamp/luminaire source of equal or greater efficiency, mounted generally 20 feet above grade. The units shall be located at all intersections and at approximate mid-block normal interval spacings of 240 feet.

For all other streets, the street lights intensity will be designed to 70% or higher of IESNA recommended practices depending on uniformity. The City Council authorizes the City Engineer or subdivision developer (in the case of "Executive Order" areas) to advertise for equipment and

installation-construction bids for ornamental lighting. LES is responsible for inspecting and monitoring work done by contractors and maintaining the lighting after its installation.

6.5 Supplemental Streetscape Lighting

Supplemental streetscape lighting shall be for decorative purposes only and are not intended to light the street. No supplemental streetscape light shall exceed 4050 lumens unless it is within a cutoff luminaire.

6.6 Existing Street Lighting (replacement)

LES will replace existing street lighting if it has been determined that maintenance of the existing system is no longer economically feasible. LES will replace the system with standard components equivalent to those currently being installed. Requests for special lighting equipment requires specific action by property owners/developers and approval by the LES Engineering staff.

If an existing wood pole (bracket style) area desires ornamental lighting, the property owners in that area shall pay the difference between such "standard street lighting" and "ornamental residential street lighting."

6.7 Arterial Street Lighting

"Permanent" arterial lighting consists of metal, concrete or fiberglass poles specifically designed to support bracket mounted pendant street lights, generally served with underground wiring. The street lights intensity will be designed to 70% or higher of IESNA recommended practices depending on uniformity.

"Temporary" arterial lighting may consist of wood utility poles supporting bracket mounted fixtures served overhead. Such systems will be converted to permanent at such time as roadway improvement factors, capital improvement funds and system age priorities permit.

6.8 Street Light Maintenance

LES will responsibly maintain street lighting in a manner recognizing public safety and convenience needs of such systems.

The principal objective is to keep as many lights as possible functioning properly and responding promptly to "light-out" call-ins.

Lighting which becomes unreliable and maintenance prone will be replaced as expeditiously as possible, within budget limitations.

Section 7. CLASS IV LIGHTING (OUTDOOR RECREATIONAL FACILITIES) 7.1 Requirements

A. Except, as noted in this section hereinafter, recreational facilities shall be lighted in accordance with the IESNA RP-6 standards for "SPORTS AND RECREATIONAL AREA LIGHTING," latest edition, including standards for illuminance and uniformity ratio.

B. Glare Control

1. The luminaires shall meet, when installed and aimed, IES "Cutoff" type luminaire designation as defined in the IESNA Lighting Handbook, 9th edition.

2. Sports flood luminaires shall have a maximum aiming angle up from nadir (the point 90 degrees down from horizontal) of seventy-two (72 degrees) above nadir or two times the mounting heights out from the pole the fixture is mounted on, whichever is less.

C. Time of Operation

1. Outdoor recreational and sports facilities, except golf driving ranges, may remain lighted past 12:00 midnight to complete recreational and sports activities that are in progress and under illumination at 12:00 midnight and still be in conformance with this chapter, i.e., activities in progress may complete after 12:00 midnight, but they cannot start under illumination after 12:00 midnight, However, in no case shall the illumination stay on past 12:30 a.m..

   Lighting for golf driving ranges shall be off between 11:00 p.m. and sunrise.

Section 8. CLASS V LIGHTING (SALT CREEK TIGER BEETLE ENVIRONS)

These requirements will be developed by the United States Fish and Wildlife Service and amended into this code when available.

Section 9. LIGHT TRESPASS AND GLARE

A. All lighting except, Class III (street lighting) or as otherwise exempted elsewhere in this chapter, shall meet the requirements for luminaire, shielding, placement and aiming to minimize light trespass and glare such that:

1. No more than 2.0 foot-candles is measured on a vertical plane located at the property line of the adjacent property.

2. For zero setback properties the glare measurement shall be no more than 2.0 foot-candles measured in a vertical plane located 10'-0" from the building/property line and parallel to the property line of the zero setback property.

3. Light trespass from a non-residential use abutting, or across the alley from, a residential district shall not exceed 0.5 footcandles at the residential property line measured on a horizontal plane.

B. Exterior building surfaces shall not exceed an average surface brightness of 750 nits.

C. Signs are regulated for surface brightness by Chapter 27.69 of the LMC. Sign illumination shall be included in the measurement of light trespass.

Section 10. SUBMISSION OF PLANS AND EVIDENCE OF COMPLIANCE

A. The application for a building permit involving outdoor lamps (except Class III lighting) that exceed 4050 lumens shall include evidence that the proposed work will comply with this chapter. Single-family and two-family dwellings are exempt from the requirements of this section. The submission shall contain, but not be limited to, four complete sets of the following:

1. The location of the site where the outdoor luminaires or outdoor light fixtures will be installed;

2. Plans showing the location, type and the mounting heights of all fixtures, both existing and proposed, on the premises, including point-by- point lighting level (initial and maintained) printouts with calculation areas delineated and average values and initial horizontal and vertical values at 20 foot intervals across all property lines.

3. A description of the outdoor light fixtures including, but not limited to, manufacturer's catalog cuts, ITL photometric report with candela distribution, drawings, and shielding information.

4. Justification for light loss factors (LLF) utilized by the calculations for the light levels submitted.

B. The above required plans and descriptions shall be sufficiently complete to enable the City to readily determine whether compliance with the requirements of these design standards will be met. At a minimum, the plans shall show point-by-point horizontal foot-candle levels (initial and maintained) for all areas of the project subject to these Design Standards for Outdoor Lighting. The plans shall also include horizontal and

vertical foot-candle levels at twenty foot intervals at all property lines. These horizontal and vertical levels shall be taken at the heights required by this code. If such plans and descriptions cannot enable the City to make a determination

of compliance with the requirements of these design standards by reason of the nature or configuration of the devices, fixtures or lamps proposed, the applicant shall submit further evidence of compliance enabling such determination.

C. Submittal and drawings shall be signed by a professional engineer licensed in Nebraska, a lighting designer certified by the National Council on Qualifications for the Lighting Profession (NCQLP) or by the licensed electrical contractor that is performing the work. This engineer, lighting designer or contractor shall certify that the submitted design meets these design standards. Submittal must contain the name of the company that prepared the drawings and the name, title and telephone number of the person that performed the design work.

D. All projects resubmitted for approval shall include a written description of all changes and comments keyed and attached to the plan check comments.

E. Plans and calculations are not required when an electrical contractor submits an application for an electrical permit; however, the contractor or associated engineer or lighting designer shall certify that the intended work meets these design standards.

Section 11. INSTALLATION

The owner or contractor of record (except Class III lighting) shall install the approved outdoor luminaires or outdoor light fixtures in conformance to the listing, manufacturer's installation specifications, and all applicable local and state electrical codes. An electrical permit and inspection by the City of Lincoln Department of Building and Safety is required.

Section 12. PERMANENT EXEMPTIONS

A. Nonconformance. All outdoor luminaire existing and legally installed prior to the adoption of Resolution (Misc. No. 08009) are exempt from the requirements of this chapter, except that when existing luminaires are reconstructed or replaced, such reconstruction or replacement shall be in compliance with this chapter, unless it is part of a larger set of the same fixtures, being replaced with the same type of fixture, and no other fixture in that set has been replaced in the past 3 months.

B. Fossil Fuel Light. All outdoor light fixtures producing light directly by combustion of fossil fuels (such as kerosene lanterns and gas lamps) are exempt from the requirements of this chapter.

C. Holiday Decorations. Lights used for holiday decorations are exempt from the requirements of this chapter.

D. Other Uses. Airport lighting which is required for the safe and efficient movement of aircraft during flight, take off, landing, taxiing, loading, unloading, and servicing

areas is exempt from the provisions of this chapter. All other outdoor lighting at airport facilities shall comply with the provisions of this chapter. These standards also shall not apply to correctional facilities, heliports, hospital emergency entrances, outdoor workers governed bu OSHA standards, or other uses for which lighting standards are preempted by federal or state regulations.

E. This chapter shall not apply to portable temporary lighting used by law enforcement, utilities or emergency services personnel.

Section 13. TEMPORARY EXEMPTIONS

A. General. Temporary exemptions are required to be approved for any situation that is not allowed by this chapter where temporary lighting is required including, but not limited to, search lights, construction, parades, special civic or public events, special business events, grand openings of businesses, etc: The exemption shall be permitted on the premises for no more than two occasions and for no more than a combined total of ten days in any calendar year.

(New Chapter 3.100 adopted by Resolution No. A-85012, 9-15-08)