



# **FAIRFAX COUNTY PARK AUTHORITY**

12055 Government Center Parkway, Suite 927  
Fairfax, VA 22035-1118



## **ATHLETIC FIELD LIGHTING SYSTEMS**

### **Performance Outline Specifications**

**Revision 4.0**

**April 23, 2019**

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## **ATHLETIC FIELD LIGHTING SYSTEMS SYSTEMS PERFORMANCE OUTLINE SPECIFICATIONS**

### **1.0 APPLICABILITY**

These Specifications are applicable to and prescribe minimum performance requirements for the following types of athletic fields (*see Attachment Figures 1 to 8 for field and court layout drawings*):

<u>Field Type</u>	<u>Field Dimensions</u>
1. Small Rectangular Field ( <i>see Figure 1</i> ) .....	180 ft x 360 ft
2. Large Rectangular Field ( <i>see Figure 2</i> ) .....	210 ft x 360 ft
3. Little League - U13 / Fast Pitch Diamond Field ( <i>see Figure 3</i> ).....	200 ft x 200 ft x 200 ft
4. Slow Pitch / Softball Diamond Field ( <i>see Figure 4</i> ) .....	300 ft x 300 ft x 300 ft
5. Babe Ruth / Baseball Diamond Field ( <i>see Figure 5</i> ).....	310 ft x 380 ft x 310 ft
6. Overlay Field (Slow Pitch / Softball Diamond and Small Rectangular Fields) ( <i>see Figure 6</i> )	
7. Basketball Courts ( <i>see Figure 7</i> ) .....	84 ft x 50 ft
8. Tennis Courts ( <i>see Figure 8</i> ) .....	78 ft x 36 ft

### **2.0 GENERAL DESIGN CRITERIA**

1. IBC International Building Code..... (IBC)
2. Virginia Uniform Statewide Building Code..... (VUSBC)
3. Fairfax County Zoning Ordinance (June 6, 2018)..... (FCZO)
4. Illuminating Engineering Society of North America standards.....(IESNA)
5. American Association of State Highway and Transportation Officials.....(AASHTO)
6. Class of Play Category (IESNA RP-6-15) .....
7. Lighting Environmental Zone Classification (IESNA RP-33-14)..... E2 and E3
8. Luminaires (including spill and glare control devices)..... UL 1598-08
9. Lumen Maintenance – 50,000 hours .....
10. Aimable system .....
11. Luminaire Correlated Color Temperature (CCT) ANSI C78-377..... 5,000 K to 5,700 K
12. Dark Sky (IDA) .....

### 3.0 ELECTRICAL REQUIREMENTS

1. Voltage .....480 Volt, 3 Phase
2. Voltage drop (max)..... 3% in any run, or 5% in the total electrical system
3. Lamps ..... LED
4. Electrical equipment enclosures..... NEMA 3R
5. Remote LED drivers ..... Mounted 10’-0” above grade on each pole
6. Energy efficiency per Fixture ..... Minimum of 70 Lumens/Watt
7. Maximum energy use per fixture..... 1,500 W
8. Maximum energy use per field/court ..... 1 W/Square foot

### 4.0 LIGHTING PERFORMANCE REQUIREMENTS

*(see Table 1 below)*

### 5.0 REMOTE CONTROL SYSTEM REQUIREMENTS

- 5.1 A security code based, 24-hour, remote control system that enables Owner and/or authorized user to remotely turn the system on or off, control the field lighting schedule, and monitor the system, using telephone and web based or software driven computer.
- 5.2 The remote-control system shall be protected against power outages and memory loss, shall reboot to real-time once power is restored, and execute any commands issued prior to the outage.
- 5.3 The remote-control system shall monitor and provide reports of actual lighting system usage.
- 5.4 On-site equipment shall include manual on/off switches for maintenance and for manual operation.
- 5.5 System shall be capable of operating any given field from multiple computers via the Internet.
- 5.6 System shall be provided with a local Wi-Fi network to allow remote control.

### 6.0 POLE AND FOUNDATION REQUIREMENTS

- 6.1 Pole Locations..... As shown on Figures 1 to 8  
Modification of pole locations only by approval of Owner.
- 6.2 Pole Height.....*(see Table 2 below)*
- 6.3 Pole Material .....Hot-dip galvanized ASTM A595 Grade A or A572 Grade 65 steel, or precast concrete
- 6.4 Foundation Material .....Reinforced concrete
- 6.5 Direct-Embedded Steel Poles..... Not acceptable
- 6.6 Design of poles and foundations shall be based on the 2015 edition of the International Building Code, ultimate (Vult) wind speed of 115 mph and exposure category C.
- 6.7 Design of luminaire, visor, and crossarm assembly shall be based on AASHTO: Wind speed of 125 mph with 1.3 gust factor, and maintaining luminaire aiming alignment.
- 6.8 Soil Conditions: Owner to provide geotechnical information (Boring Logs) at time of bid.
- 6.9 Design of poles, pole foundations, and crossarms shall be certified, signed and sealed by a Virginia State licensed Professional Engineer.

## **7.0 WARRANTY AND MAINTENANCE REQUIREMENTS**

- 7.1 The lighting system manufacturer shall provide all materials and labor to ensure all lighting system components remain in good operating condition for a 25- year Warranty Period.
- 7.2 The lighting system manufacturer shall provide all materials and labor to ensure the lighting system performs as designed, throughout the Maintenance Period of 25 years. During the Maintenance Period the manufacturer shall:
  1. Maintain horizontal lighting levels between the minimum and maximum on-field maintained average horizontal illuminance level for the entire field.
- 7.3 All repairs shall be made within 2 weeks of notification.

## **TABLES**

LIGHTING PERFORMANCE REQUIREMENTS	RECTANGULAR FIELDS			DIAMOND FIELDS				COURTS	
	On-Field	Off-Field Standard A <sup>2</sup>	Off-Field Standard B <sup>3</sup>	Infield	Outfield	Off-Field Standard A	Off-Field Standard B	On-Court	Off-Court

**ON-FIELD ILLUMINATION REQUIREMENTS**

Class of Play Category [IESNA RP-6-01]	III			III				III	
Lighting Environmental Zone Classification [IESNA RP-33-99]	E2 ~ E3			E3					
Lumen Maintenance – 50,000 hours	L70			L70					
Maximum on-field maintained average horizontal illuminance [FCZO Sect.14-904]	50 fc <sup>1</sup>			60 fc	40 fc			50 fc	
Minimum on-field maintained average horizontal illuminance	30 fc			50 fc	30 fc			30 fc	
Uniformity Ratio (max)	2 : 1			2 : 1	2.5 : 1			2 : 1	
On-field/court calculation and measurement grid spacing <sup>5</sup>	30 ft <sup>1</sup> x 30 ft			30 ft x 30 ft				20 ft x 20 ft	

**OFF-FIELD SPILL LIGHT LIMITATION REQUIREMENTS**

Maximum permitted initial vertical spill light		0.2 fc	0.8 fc			0.2 fc	0.8 fc		0.8 fc
Distance from the edge of the playing surface, foul line, or outfield fence line to the off-field Spill Light Measurement Line		150 ft <sup>4</sup>				150 ft <sup>4</sup>			150 ft <sup>4</sup>
Calculation and measurement point spacing along the off-field Spill Light Measurement Line <sup>5</sup>		30 ft				30 ft			20 ft

**OFF-FIELD GLARE (SOURCE INTENSITY) LIMITATION REQUIREMENTS**

Maximum permitted initial glare		1,000 cd <sup>1</sup>	6,000 cd			1,000 cd	6,000 cd		6,000 cd
Distance from the edge of the playing surface, foul line, or outfield fence line to the off-field Glare Measurement Line		150 ft <sup>4</sup>				150 ft <sup>4</sup>			150 ft <sup>4</sup>
Calculation and measurement point spacing along the off-field Glare Measurement Line <sup>5</sup>		30 ft				30 ft			20 ft

**Table 1 • Lighting Performance Requirements**

*Notes:*

1. Units: cd (candela); fc (footcandle); ft (foot)
2. Off-Field Standard 'A' is generally applicable to rectangular fields with an edge of the playing surface within 150 ft from an adjacent residential property line.
3. Off-Field Standard 'B' is generally applicable to rectangular fields with an edge of the playing surface further than 150 ft from an adjacent residential property line.
4. Measurement line will be the property line if less than 150 ft.
5. Max measurement spacing listed. Spacing can be adjusted as needed to fit overall field measurement.

**Table 2 • Lighting Pole Height Requirements**  
*(relative to reference ground elevation of playing field)*

Attachment Figure	ATHLETIC FIELD		POLE HEIGHT (ft)	
	Type	Poles	Min.	Max.
1	<b>Small Rectangular Field</b> (180 ft x 360 ft)	All	70	90
2	<b>Large Rectangular Field</b> (210 ft x 360 ft)	All		
3	<b>Little League - U13 / Fast Pitch Diamond Field</b> (a.k.a. 60 ft Diamond Field) (200 ft x 200 ft x 200 ft)	A		
		B		
4	<b>Slow Pitch Softball Diamond Field</b> (a.k.a. 65 ft Diamond Field) (300 ft x 300 ft x 300 ft)	A	80	
		B		
		C	70	
5	<b>Babe Ruth Baseball Diamond Field</b> (a.k.a. 90 ft Diamond Field) (310 ft x 380 ft x 310 ft)	A	80	
		B		
		C	70	
		D		
6	<b>Overlay Field</b> (Combined Slow Pitch Softball Diamond and Small Rectangular Fields) (see dimensions above)	A	80	
		B		
		C	70	
		D		
7	<b>Tennis Court</b>	All	40	60
8	<b>Basketball Court</b>	All	40	60

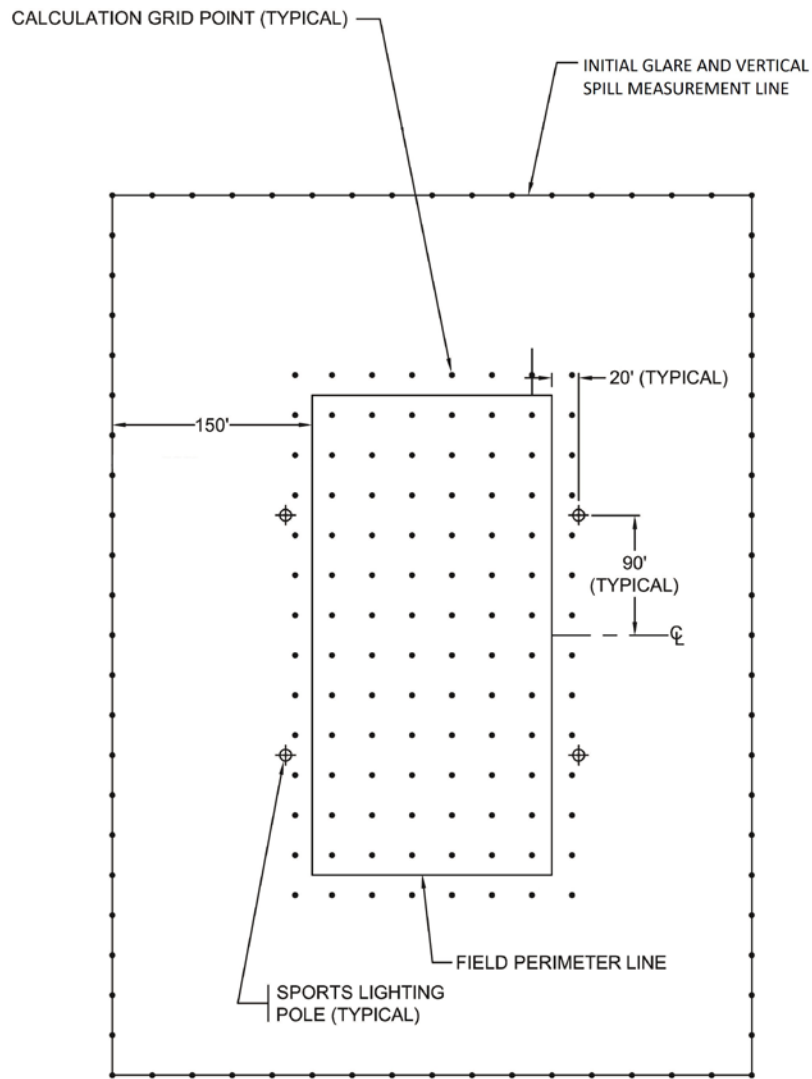


**TYPICAL ATHLETIC FIELD LAYOUTS**

**FIGURES 1 - 8**

**GLARE ANALYSIS**

**FIGURE 9**



**SMALL RECTANGULAR FIELD LAYOUT**  
(180'W x 360'H)

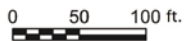
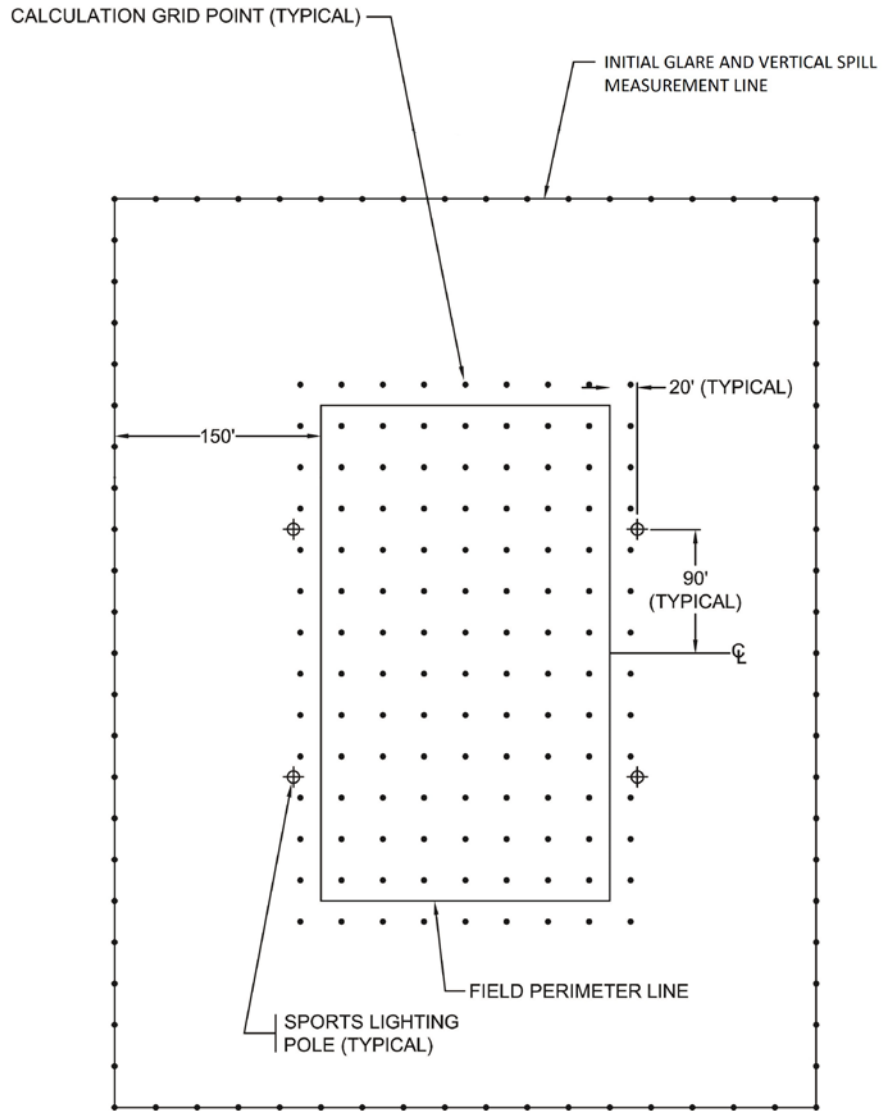
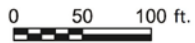


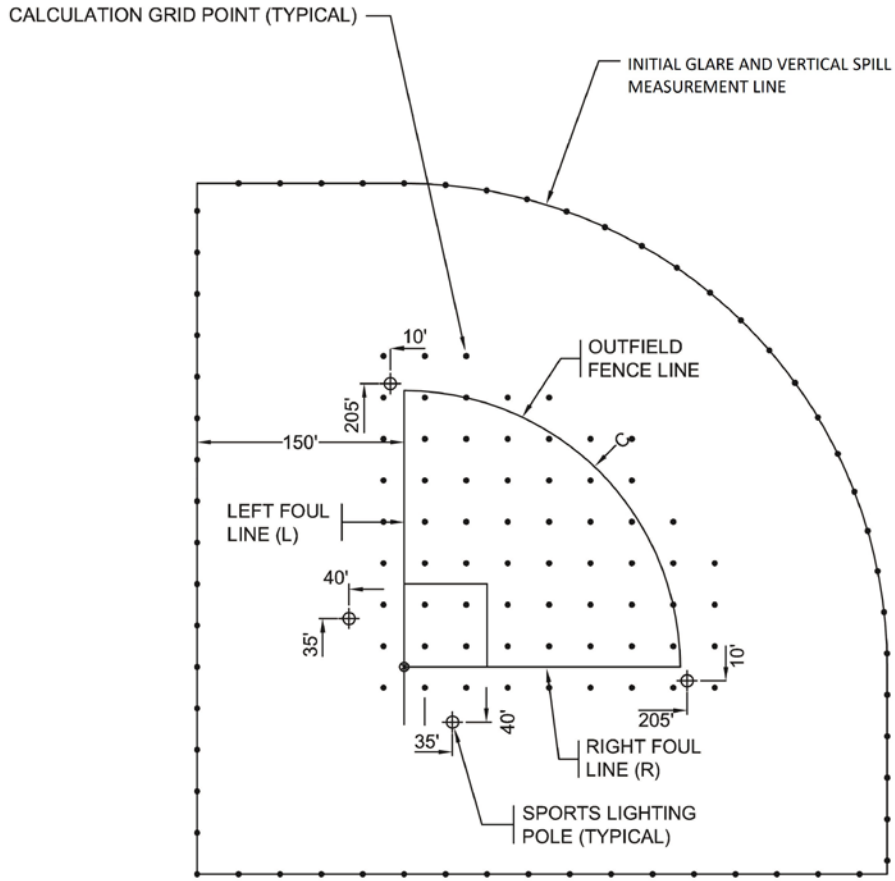
FIGURE 1



**LARGE RECTANGULAR FIELD LAYOUT**  
(210'W x 360'H)



**FIGURE 2**



POLE LOCATION DIMENSIONS ARE RELATIVE TO HOME PLATE (0,0 REFERENCE POINT) ⊗

**LITTLE LEAGUE - U13 / FAST PITCH DIAMOND FIELD LAYOUT**  
(L=200', C=200', R=200')

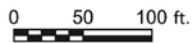
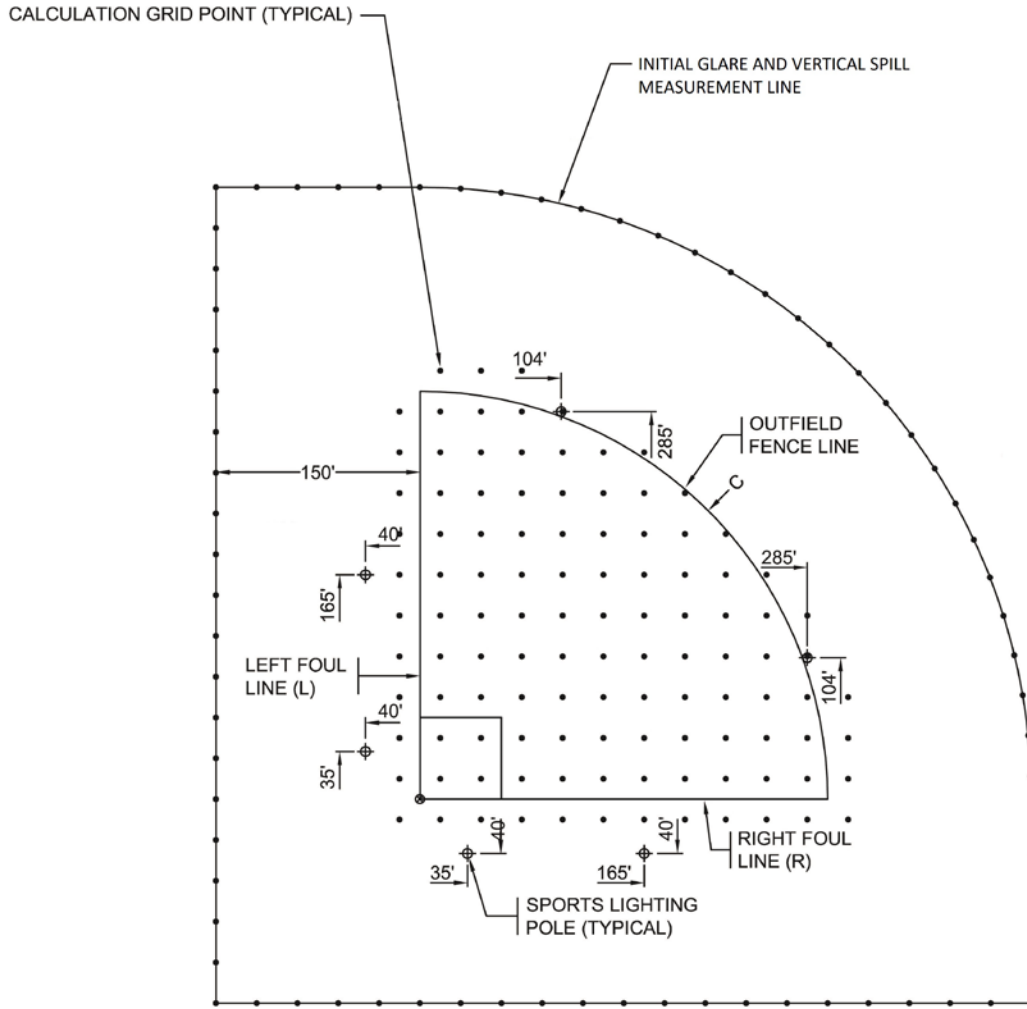


FIGURE 3



POLE LOCATION DIMENSIONS ARE RELATIVE TO HOME PLATE (0,0 REFERENCE POINT) ⊗

### SLOW PITCH / SOFTBALL DIAMOND FIELD LAYOUT

(L=300', C=300', R=300')

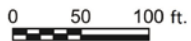
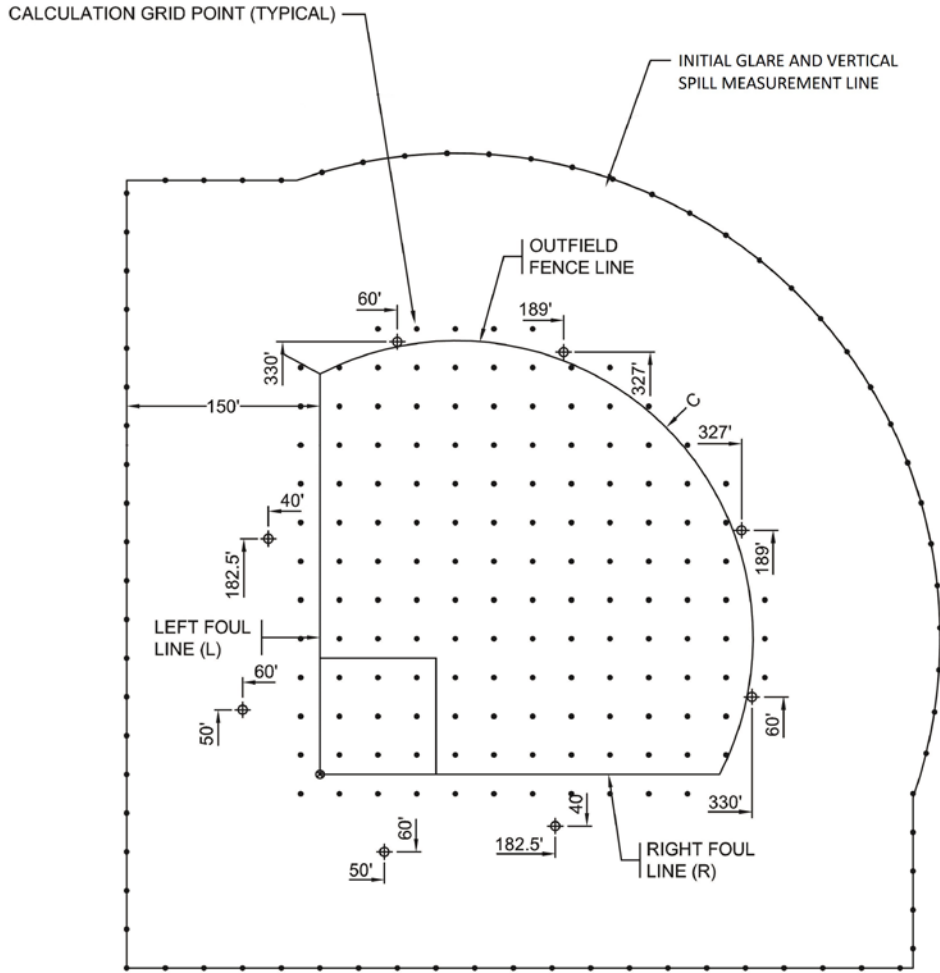
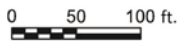


FIGURE 4

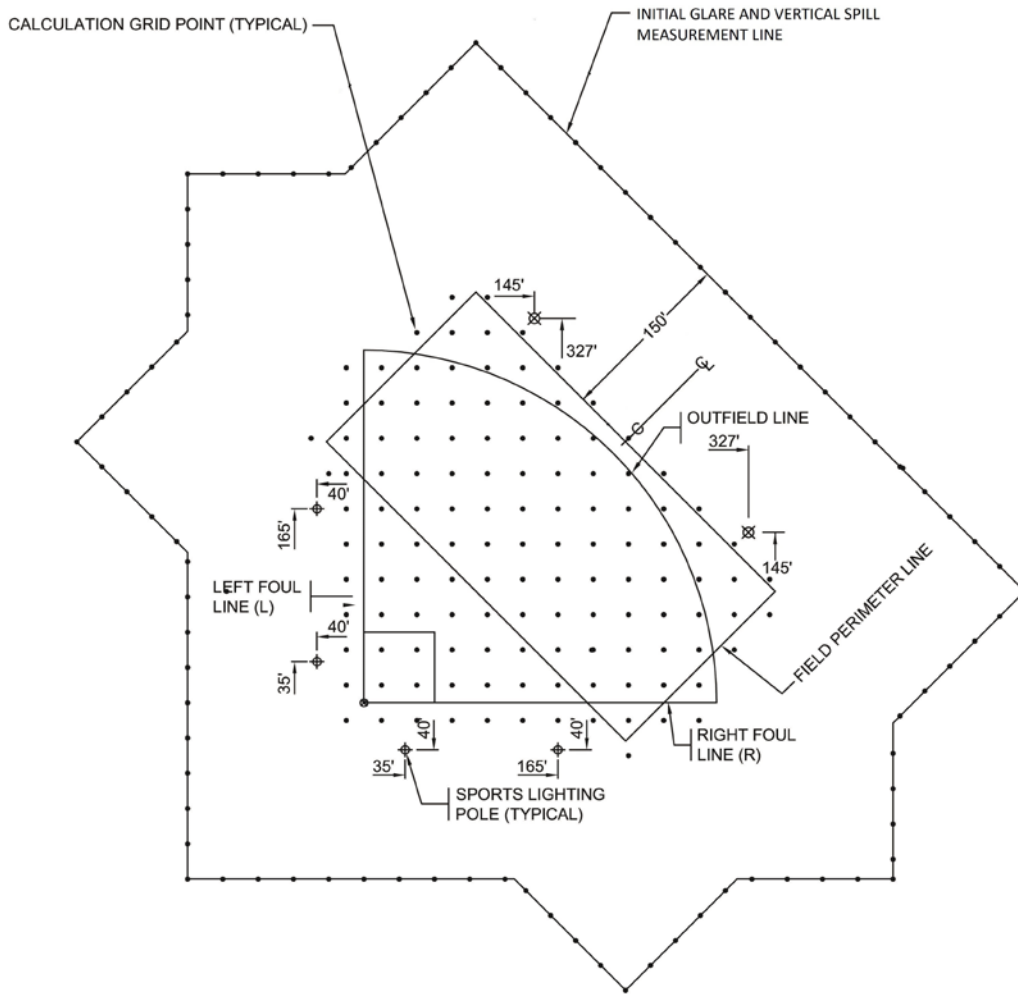


POLE LOCATION DIMENSIONS ARE RELATIVE TO HOME PLATE (0,0 REFERENCE POINT) ⊗

**BABE RUTH / BASEBALL DIAMOND FIELD LAYOUT**  
(L=310', C=380', R=310')



**FIGURE 5**



POLE LOCATION DIMENSIONS ARE RELATIVE TO HOME PLATE (0,0 REFERENCE POINT) ⊗

**SLOW PITCH / SOFTBALL DIAMOND - SMALL RECTANGULAR FIELD  
OVERLAY FIELD**

(L=300', C=300', R=300') (180'W x 360'H)

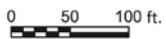
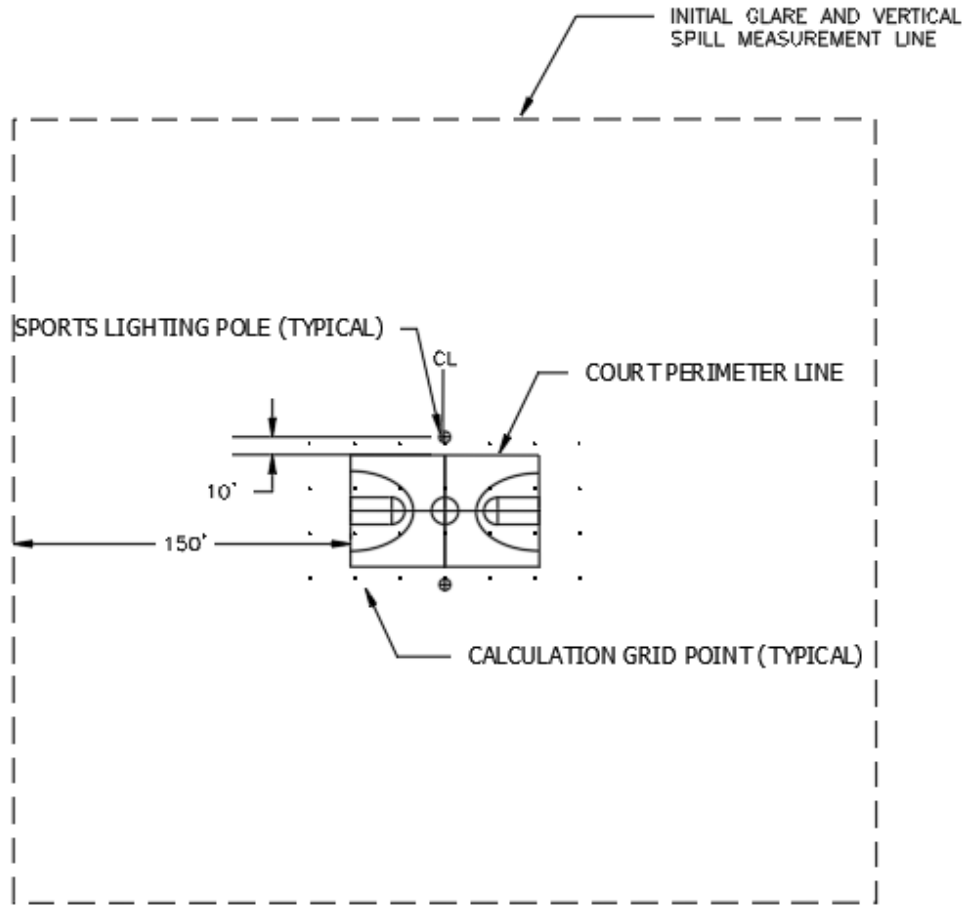


FIGURE 6



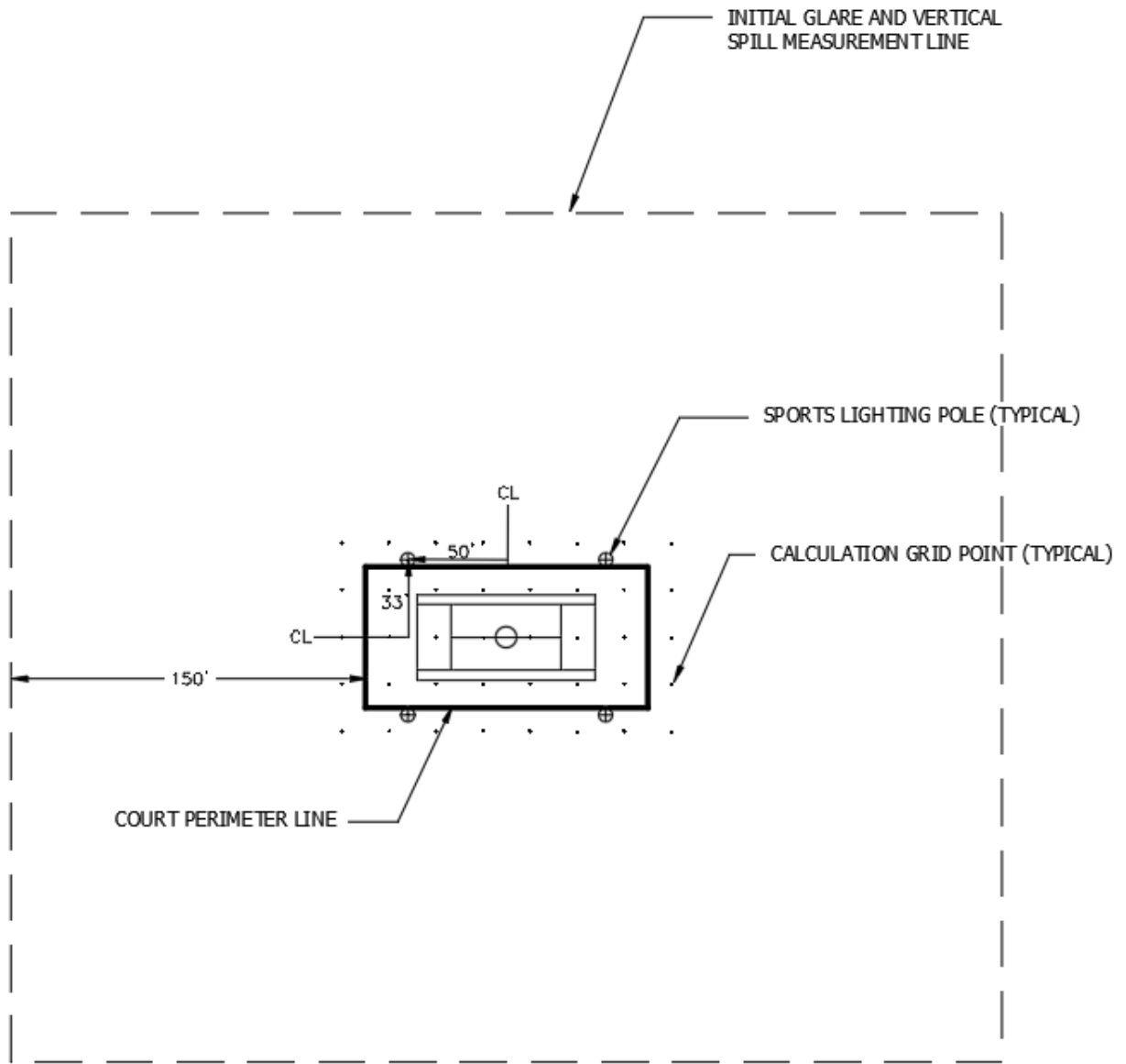
**BASKETBALL COURT LAYOUT**

(84'W x 50'H)



FIGURE 7

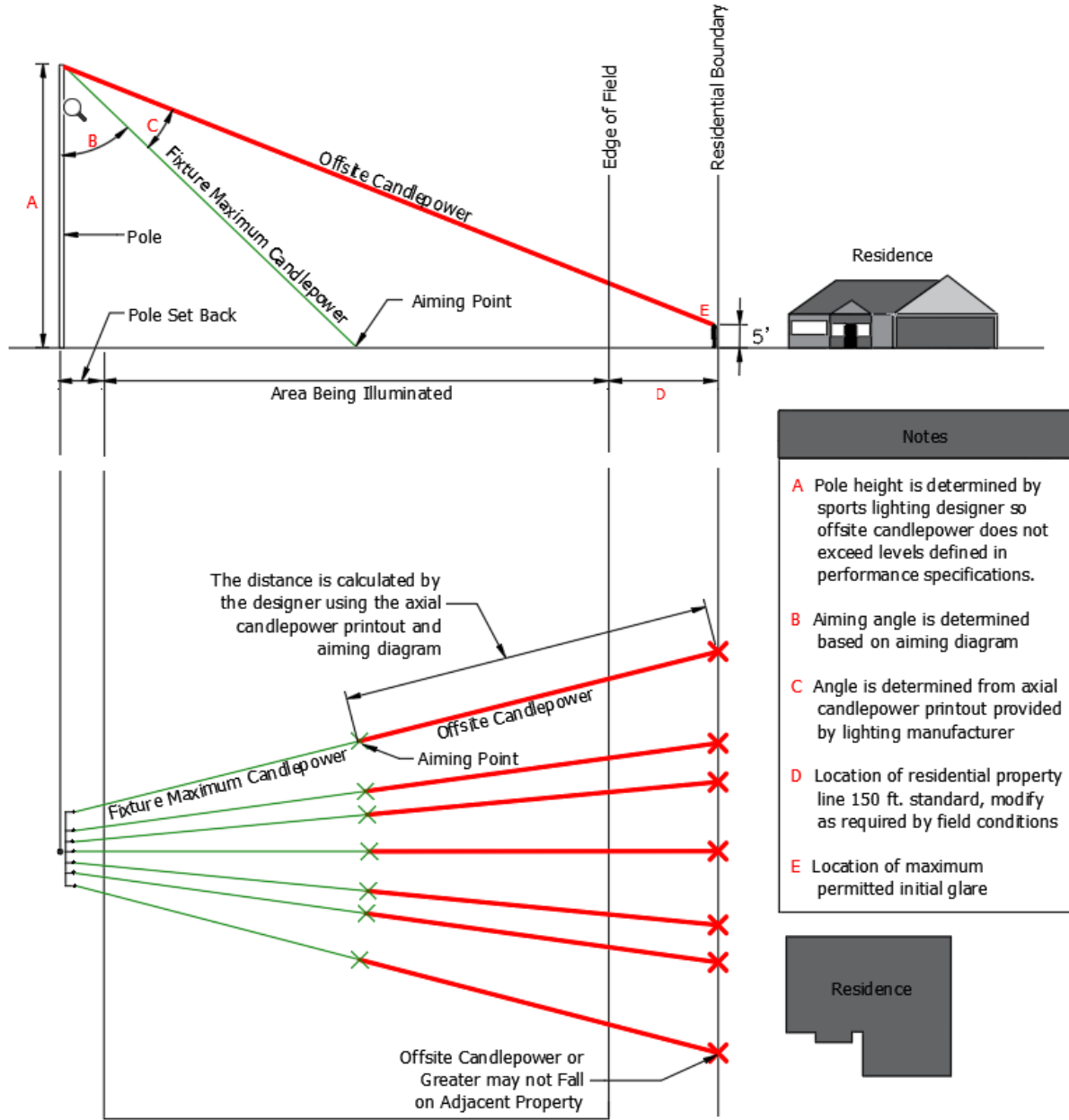




**TENNIS COURT LAYOUT**  
(120'W x 60'H)

0 25 50 ft.

**FIGURE 8**



Glare Analysis

**FIGURE 9**

## GLOSSARY

**Authorized User** A person to which the Owner has given authorization to control the remote-control system

**Average Horizontal Illuminance** The arithmetic average of a set of calculation points or readings taken over a specified area at a specific time<sup>1</sup>.

**Ballast** A device used with an electric discharge lamp to obtain the necessary circuit conditions (voltage, current, and wave form) for starting and operating<sup>1</sup>.

**Candela (cd)** The SI unit of luminous intensity<sup>1</sup>.

**Candlepower (cp)** luminous intensity expressed in candelas<sup>1</sup>.

**Footcandle (fc)** A unit of illuminance. One footcandle is one lumen per square foot (lm/ft<sup>2</sup>)<sup>1</sup>.

**Glare** The sensation of light produced by luminances within the visual field that are sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort, or loss in visual performance and visibility<sup>1</sup>.

**Illuminance** The areal density of the luminous flux incident at a point on a surface<sup>1</sup>.

**Lamp** A generic term for a man-made source of optical radiation. By extension, the term is also used to denote sources that radiate in regions of the spectrum adjacent to the visible<sup>1</sup>.

**Lumen (lm)** The SI unit of luminous flux. Radiometrically, it is determined from the radiant power. Photometrically, it is the luminous flux emitted within a unit solid angle (one steradian) by a point source having a uniform luminous intensity of one candela<sup>1</sup>.

**Luminaire (light fixture)** A complete lighting unit consisting of a lamp(S) and ballast(s) (when applicable) together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply<sup>1</sup>.

**Luminous Flux** The time rate of flow of radiant energy, evaluated in terms of a standardized visual response<sup>1</sup>.

**Manufacturer** Provides the luminaires and any material and labor needed to ensure the lighting system performs as designed during the warranty period.

**Notification** The official notice given to the lighting system manufacturer to inform the manufacturer that the system must be repaired.

**Owner** Is responsible for the remote-control system and determines when to turn the system on or off, controls the field lighting schedule, and monitors the system.

**Remote-control System** A lighting system that allows the Owner and/or authorized users to have the ability to control when the field lighting is scheduled to turn on and off.

**Spill Light** The light shining beyond the sports facility caused by the uncontrolled direct light component from the luminaires<sup>1</sup>.

**Uniformity Ratio** A design criteria used to ensure evenly distributed light across a field. A uniformity ratio of 2:1 means that the brightest pole is no more than double any other point.

**Warranty Period** A period of time during which free maintenance is provided to ensure that lighting system components remain in good operating condition.

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<sup>1</sup> IES RP-6-15 Sports and recreational area lighting. (2015). New York, NY: Illuminating Engineering Society of North America.