



Frank Zaino & Associates, Inc.

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Dear Mr. Pannone:

Frank Zaino & Associates, Inc. has been retained to provide a comparison review of the sports lighting design for the new multi-purpose field located at The Prout School, 4640 Tower Hill Road, Wakefield, RI. The project's engineer of record is Vincent A. DiOrio, Inc. of Norwood, Massachusetts. Our summary has been based on the Construction Documents provided to us dated 10/02/2018, the Basis of Design photometric study prepared by Musco Lighting on 12/17/2018 (Exhibit A), and the subsequent substitute photometric study provided by Techline Sports Lighting dated 3/24/2022 (Exhibit B).

During our review, our team determined the following:

	Musco Lighting	Techline Sports Lighting
Number of Luminaires	34	64
Wattage of Luminaires	1150 W	650 W
Total Electrical Lighting Load	39.10 kW	40.32 kW
Average Illumination Level	51.0 fc	53.0 fc
Maximum Illumination Level	63 fc	59 fc
Minimum Illumination Level	42 fc	46 fc
Uniformity Ratio (Max/Min)	1.52 : 1	1.28 : 1
Uniformity Gradient	1.20	1.49
150'-0" Spill Line Maximum	0 fc	0 fc
150'-0" Spill Minimum	0 fc	0 fc

Total Electrical Lighting Load

The total connected load is the sum of all the loads attached to the sports lighting system. In this case, it is as simple as multiplying the number of luminaires by the wattage of each luminaire. The Musco system uses fewer luminaries at a higher wattage, as the Techline system utilizes more luminaries at a lower wattage. Overall the Musco system is slightly more efficient, but the difference between the total connected loads is insignificant.

Illumination Level

The illumination or lighting level describes the quantity of light that falls on the playing surface. This fundamental parameter is measured in either lux or footcandles (fc). Lighting levels are calculated to ensure good visual conditions for players, referees, and spectators. Overall the Techline system provides a higher overall average illumination level.

Uniformity

Variations in light and shade are a nuisance to both players and spectators and thus require careful attention. The level of illuminance variation on the field is called uniformity. It is expressed as a ratio of the lowest to the average illuminance. Increasing the uniformity value will help optimize the perception of the visual information used during sporting events. Overall the Techline system provides more uniform illumination on the playing surface.

Light Trespass

Light trespass occurs when spill light is cast where it is not wanted. The specification has called for a photometric reading to be taken at the 150' spill light line. The Musco and Techline system both provide a reading of 0 fc at this spill line.

Summary

Although the Musco Lighting system is more efficient and consumes slightly less wattage, the Techline Sports Lighting System outperforms photometrically, delivering higher illumination levels on the playing surface while being more uniform, providing a better field of vision for both players and spectators. Both the Musco and Techline systems measure a 0 fc level at the required 150' spill line measurement; with that being said, this office's opinion that the Techline Sports Lighting system meets and exceeds all design parameters set by the Musco Lighting basis of design.

Respectfully,

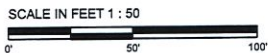
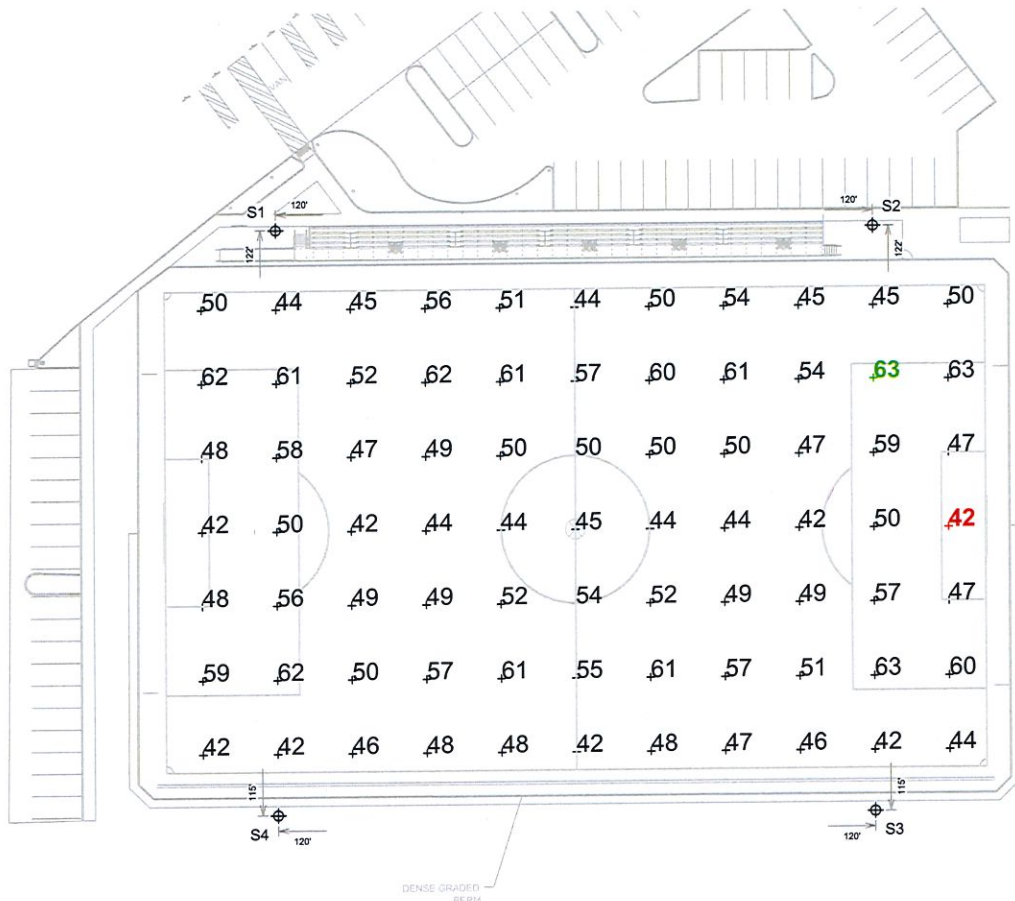
Frank Zaino III

Frank Zaino III
Project Manager

Reviewed by: Michael J. Donovan, PE
RI# 14014

Exhibit A

EQUIPMENT LIST FOR AREAS SHOWN							
Pole			Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID
2	S1-S2	70'	-	70'	TLC-LED-1150	9	9
2	S3-S4	70'	-	70'	TLC-LED-1150	8	8
4	TOTALS					34	34



Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

The Prout School Wakefield, RI

GRID SUMMARY	
Name:	Soccer
Size:	330' x 195'
Spacing:	30.0' x 30.0'
Height:	3.0' above grade

ILLUMINATION SUMMARY			
MAINTAINED HORIZONTAL FOOTCANDLES			
Entire Grid			
Guaranteed Average:	50		
Scan Average:	51.0		
Maximum:	63		
Minimum:	42		
Avg / Min:	1.23		
Guaranteed Max / Min:	2		
Max / Min:	1.52		
UG (adjacent pts):	1.49		
CU:	0.87		
No. of Points:	77		
LUMINAIRE INFORMATION			
Color / CRI:	5700K - 75 CRI		
Luminaire Output:	121,000 lumens		
No. of Luminaires:	34		
Total Load:	39.1 kW		
Lumen Maintenance			
Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1150	>81,000	>81,000	>81,000
Reported per TM-21-11. See luminaire datasheet for details.			

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



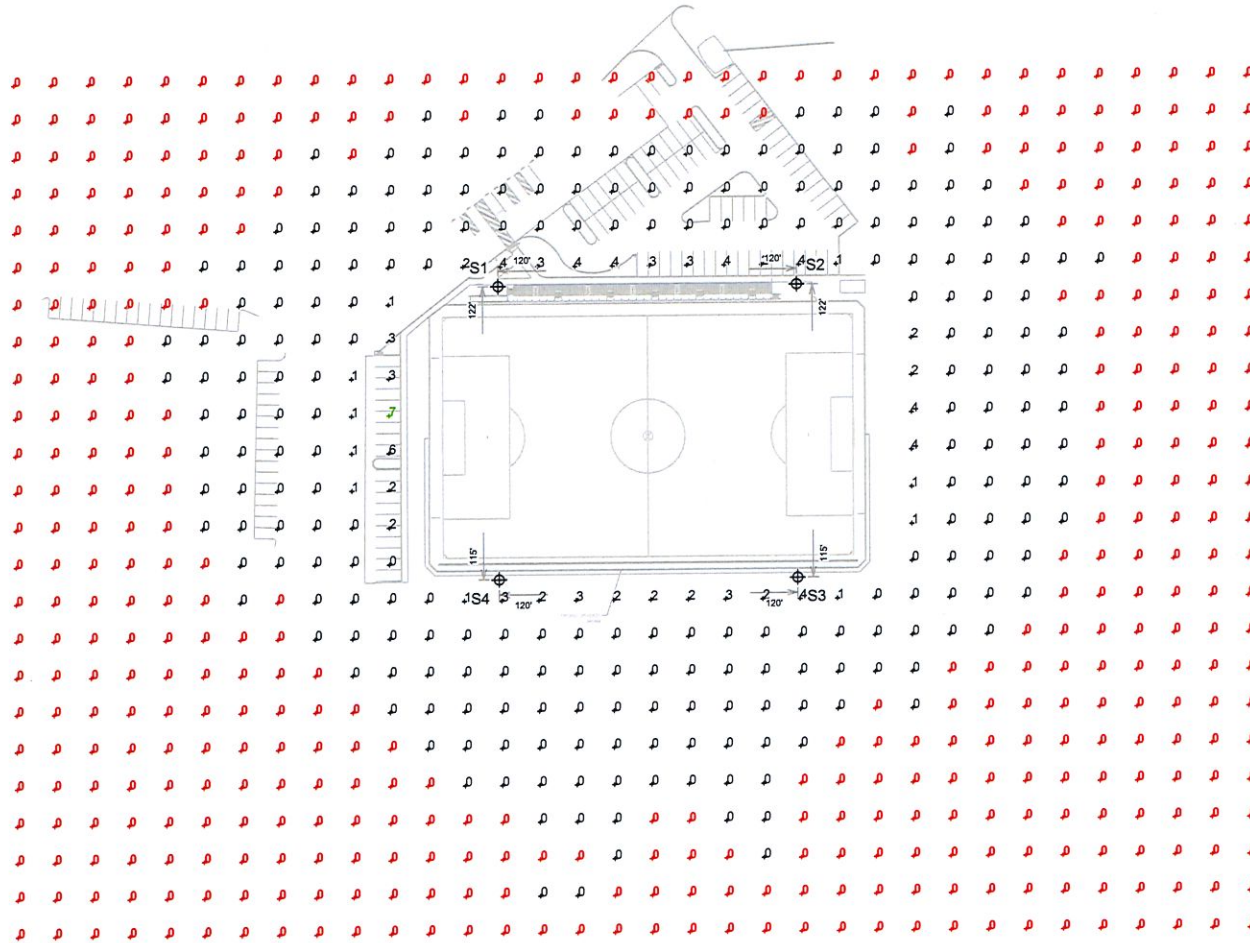
We Make It Happen.

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ILLUMINATION SUMMARY

Exhibit A

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2	S1-S2	70'	-	70'	TLC-LED-1150	9	9
2	S3-S4	70'	-	70'	TLC-LED-1150	8	8
TOTALS						34	34



The Prout School Wakefield, RI

GRID SUMMARY	
Name:	Zero Grid
Size:	330' x 195'
Spacing:	30.0' x 30.0'
Height:	3.0' above grade

ILLUMINATION SUMMARY			
MAINTAINED HORIZONTAL FOOTCANDLES			
Entire Grid			
Scan Average:	0.2		
Maximum:	7		
Minimum:	0		
Avg / Min:	-		
Max / Min:	-		
UG (adjacent pts):	800.58		
CU:	0.02		
No. of Points:	712		
LUMINAIRE INFORMATION			
Color / CRI:	5700K - 75 CRI		
Luminaire Output:	121,000 lumens		
No. of Luminaires:	34		
Total Load:	39.1 kW		
Lumen Maintenance			
Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1150	>81,000	>81,000	>81,000

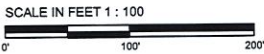
Reported per TM-21-11. See luminaire datasheet for details.

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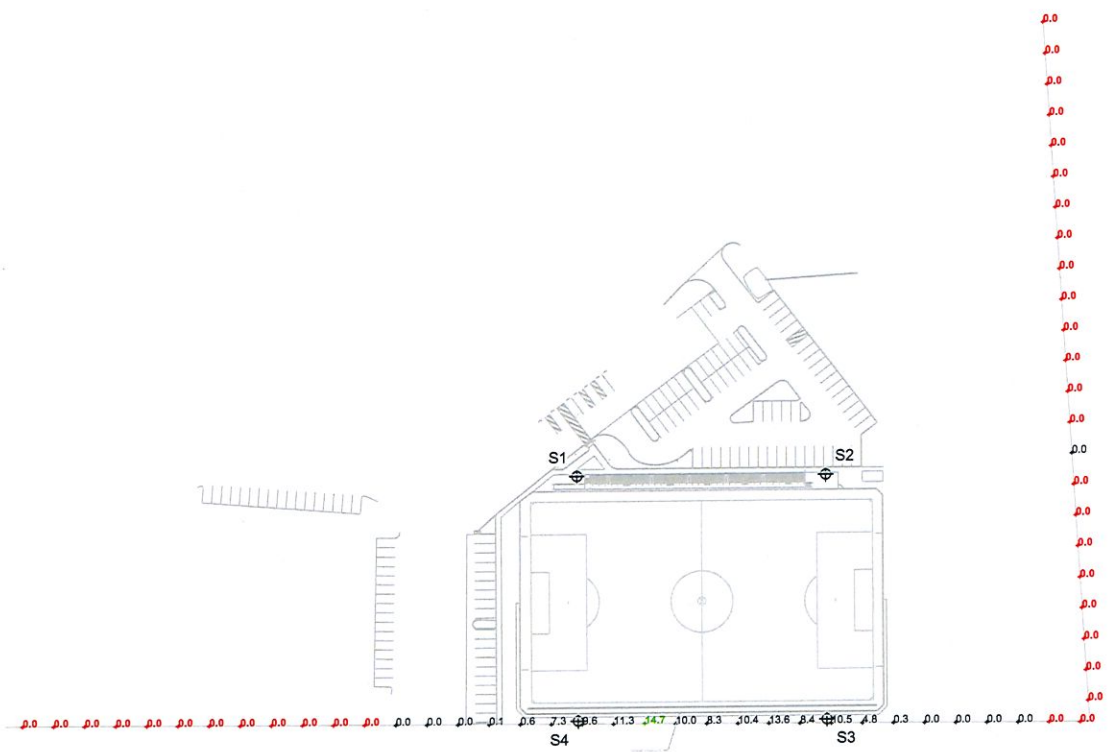
Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗



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Exhibit A

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Pole			Luminaires				
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2	S1-S2	70'	-	70'	TLC-LED-1150	9	9
2	S3-S4	70'	-	70'	TLC-LED-1150	8	8
TOTALS						34	34



The Prout School Wakefield, RI

GRID SUMMARY	
Name:	Property Line
Spacing:	30.0'
Height:	3.0' above grade

ILLUMINATION SUMMARY			
MAINTAINED HORIZONTAL FOOTCANDLES			
Entire Grid			
Scan Average:	1.894		
Maximum:	14.69		
Minimum:	0.00		
No. of Points:	58		
LUMINAIRE INFORMATION			
Color / CRI:	5700K - 75 CRI		
Luminaire Output:	121,000 lumens		
No. of Luminaires:	34		
Total Load:	39.1 kW		
Lumen Maintenance			
Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1150	>81,000	>81,000	>81,000
Reported per TM-21-11. See luminaire datasheet for details.			

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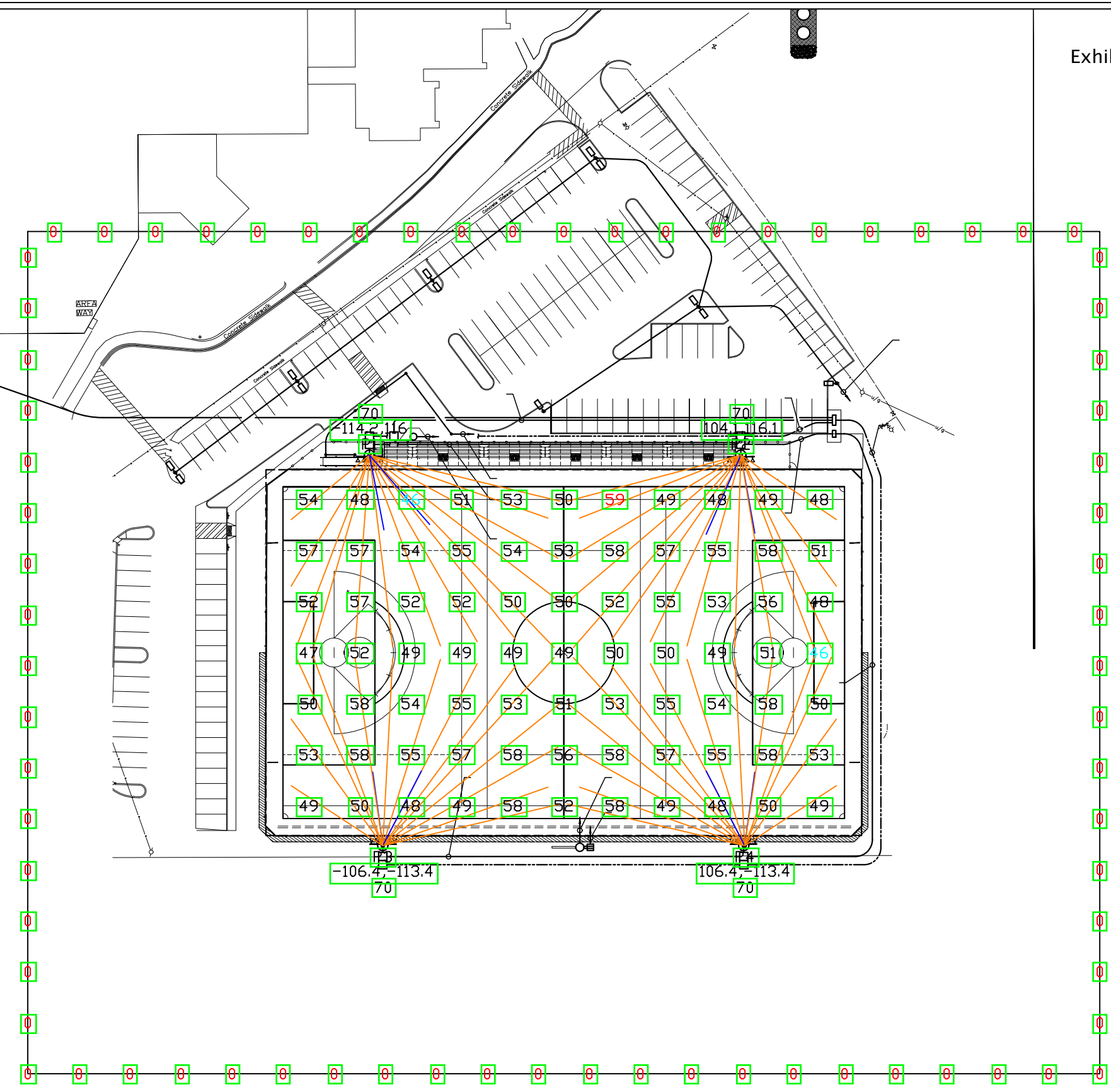


Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗



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Exhibit B



Pole	x-loc	y-loc	height	M	EW	Total	kw
P1	-114.2	116	70ft	14	2	16	10.3
P2	104.1	116.1	70ft	14	2	16	10.3
P3	-106.4	-113.4	70ft	14	2	16	10.3
P4	106.4	-113.4	70ft	14	2	16	10.3
Total				56	8	64	41.3

Soccer 330'X195'
 77 points at z=3, sp 30ft by 30ft
 HORIZONTAL FOOTCANDLES
 Average 53
 Maximum 59
 Minimum 46
 Avg:Min 1.14
 Max:Min 1.28
 Coef_Var 0.07
 UnifGrad 1.20

EW
 CLIR 630 EV EW
 Light Loss Factor = 0.950
 watts per luminaire = 646
 Number luminaires used = 8
 kw these luminaires = 5.2

Spill 150'
 75 points at z=0, sp 15ft by 15ft
 HORIZONTAL FOOTCANDLES
 Average 0
 Maximum 0
 Minimum 0
 Avg:Min N/A
 Max:Min N/A
 Coef_Var 0.00
 UnifGrad 7070.36

M
 CLIR 630 EV M
 Light Loss Factor = 0.950
 watts per luminaire = 646
 Number luminaires used = 56
 kw these luminaires = 36.2



PROUT SCHOOL
 WAKEFIELD, RI
 SOCCER

1. THIS LIGHTING DESIGN IS BASED ON INFORMATION SUPPLIED BY OTHERS. SITE DETAILS PROVIDED HEREON ARE REPRODUCED ONLY AS A VISUALIZATION AID. FIELD DEVIATIONS MAY SIGNIFICANTLY AFFECT PREDICTED PERFORMANCE. PRIOR TO INSTALLATION, CRITICAL SITE INFORMATION (POLE LOCATIONS, ORIENTATION, MOUNTING HEIGHT, ETC.) SHOULD BE COORDINATED WITH THE CONTRACTOR AND/OR SPECIFIER RESPONSIBLE FOR THE PROJECT.
 2. LUMINAIRE DATA IS TESTED TO INDUSTRY STANDARDS UNDER LABORATORY CONDITIONS. OPERATING VOLTAGE AND NORMAL MANUFACTURING TOLERANCES OF LAMP, BALLAST, AND LUMINAIRE MAY AFFECT FIELD RESULTS.
 3. CONFORMANCE TO FACILITY CODE AND OTHER LOCAL REQUIREMENTS IS THE RESPONSIBILITY OF THE OWNER AND/OR THE OWNER'S REPRESENTATIVE.
 4. CALCULATIONS DO NOT TAKE INTO CONSIDERATION ANY OBSTRUCTIONS OR LIGHTING POLLUTION CAUSED BY NEIGHBORING LIGHT SOURCES.

DRAWN BY:KBER
 Date:3/24/2022
 SCALE:NTS
 Page:1 of 1
 Dwg #:21-3330