

## SECTION 16526

### SPORTS FIELD LIGHTING

#### PART 1 – GENERAL

##### 1.1 SUMMARY

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of these specifications is to define the performance and design standards for Athalie Range Park. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth by the criteria set forth in these specifications.
- C. The sports lighting will be for the following fields:
  - 1. Football
  - 2. Softball / Baseball
- D. The primary goals of this sports lighting project are:
  - 1. Life Cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated, and the field(s) should be proactively monitored to detect fixture outages over a 25 year life cycle. To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system.
  - 2. Environmental Light Control: It is the primary goal of this project to minimize spill light and glare.
  - 3. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore the lighting system shall be designed such that the light levels are guaranteed for a period of 25 years.
- E. All lighting designs shall comply with all Miami-Dade County ordinances.

##### 1.2 LIGHTING PERFORMANCE

- A. Performance Requirements: Playing surfaces shall be lit to an average constant light level and uniformity as specified in the chart below. Light levels shall be held constant for 25 years. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Measured average illumination level shall be +/- 10% of predicted mean in accordance with IESNA RP-6-01, and measured at the first 100 hours of operation.

Area of Lighting	Average Constant Light Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Football	50 Footcandles	2.0:1.0	72	30' x 30'
SB/ Baseball Infield	50 Footcandles	2.0:1.0	25	20' x 20'
SB/ Baseball Outfield	30 Footcandles	2.5:1.0	103	20' x 20'

##### 1.3 ENVIRONMENTAL LIGHT CONTROL

- A. Spill Light Control: Average horizontal Footcandles at the property line from the perimeter of the field shall not exceed .5 FC. Footcandle readings shall be taken at 30' intervals along the specified line. Measured average illumination level shall allow a 10% variance of predicted mean in accordance with IESNA RP-6-01, and be measured at the first 100 hours of operation.

1.4 LIFE CYCLE COSTS

- A. Energy Consumption: The average kWh consumption for the field lighting system shall be 121 kWh or less.
- B. Complete Lamp Replacement: Manufacturer shall include all group lamp replacements required to provide 25 years of operation based upon 610 usage hours per year.
- C. Preventative and Spot Maintenance: Manufacturer shall provide all preventative and spot maintenance, including parts and labor for 25 years from the date of equipment shipment. Individual lamp outages shall be repaired when the usage of any field is materially impacted. Owner agrees to check fuses in the event of a luminaire outage.
- D. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the owner of outages within 24 hours, or the next business day. The controller shall determine switch position (Manual or Auto) and contactor status (open or closed).
- E. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields, to only having permission to execute "early off" commands by phone.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

- F. Management Tools: Manufacturer shall provide a web-based database of actual field usage and provide reports by facility and user group.
- G. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for a period of 25 years.
- H. 25-Year Life Cycle Cost: Manufacturer shall submit 25-year life cycle cost calculations as follows. Equipment price and total life cycle cost shall be entered separately on bid form.

a.	<b>Luminaire energy consumption</b> # Luminaires x __kW demand per luminaire x \$.16 kW rate x 610 annual usage hours x 25 years	+	
b.	<b>Cost for spot relamping and maintenance over 25 years</b> Assume 7.5 repairs at \$750.00 each if not included	+	
c.	<b>Cost to relamp all luminaires during 25 years</b> 610 annual usage hours x 25 years / <u>lamp replacement hours</u> x \$125 lamp & labor x # fixtures	+	

d.	<b>Extra energy used without base bid automated control system</b> \$ Energy consumption in item a. x 15%.	+	
	<b>TOTAL 25-Year Life Cycle Operating Cost</b>	=	

1.5 WARRANTY AND GUARANTEE

- A. 25-Year Warranty: Manufacturer shall supply a signed warranty covering the entire system for 25 years. Warranty shall guarantee light levels; lamp replacements; system energy consumption; monitoring, maintenance and control services, spill light control, and structural integrity. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations.

1.6 DELIVERY TIMING

- A. Equipment On-Site: The equipment must be on-site 4-6 weeks from receipt of approved submittals and receipt of complete order information.

1.7 SUBMITTAL REQUIREMENTS

- A. Design Approval: The owner / engineer will review shop drawings from the manufacturer to ensure compliance to the specification.
- B. Design Submittal Data Checklist and Certification shall be submitted to owner

1.8 ALTERNATE SYSTEM REQUIREMENTS

- A. Compliance to Specifications: Acceptance of a bid alternate does not negate the contractor and lighting manufacturer's responsibility to comply fully with the requirements of these specifications.
- B. Light Level Requirements: Manufacturer shall provide computer models guaranteeing light levels on the field over 25 years. If a constant light level cannot be provided, a maximum Recoverable Light Loss Factor of 0.70 shall be applied to the initial light level design to achieve the maintained light levels of 50 FC for Football & 50/30 FC for SB / Baseball. For alternate systems, scans for both initial and maintained light levels shall be submitted.
- C. Revised Electrical Distribution: Manufacturer shall provide revised electrical distribution plans to include changes to service entrance, panel and wire sizing.

PART 2 – PRODUCT

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:  
  - Musco Sport Lighting or approved equal
  - 2107 Stewart Road
  - Muscatine, Iowa 52761

2.2 LIGHTING SYSTEM CONSTRUCTION

- A. System Description: Lighting system shall consist of the following:
  - 1. Galvanized steel poles and crossarm assembly

2. Pre-stressed concrete base embedded in concrete backfill.
  3. All luminaires shall be constructed with a die-cast aluminum housing to protect the luminaire reflector system.
  4. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum enclosures mounted approximately 10' above grade. The enclosures shall include ballast, capacitor and fusing for each luminaire. Safety disconnect per circuit for each pole structure will be located in the enclosure.
  5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
  6. Controls and Monitoring Cabinet to provide on-off control and monitoring of the lighting system, constructed of NEMA Type 4 aluminum. Communication method shall be provided by manufacturer. Cabinet shall contain custom configured contactor modules for 30, 60, and 100 amps, labeled to match field diagrams and electrical design. Manual Off-On-Auto selector switches shall be provided.
- B. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, ballast and other enclosures shall be factory assembled, aimed, wired and tested.
- C. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed steel shall be hot dip galvanized per ASTM A123. All exposed hardware and fasteners shall be stainless steel of at least 18-8 grade, passivated and polymer coated to prevent possible galvanic corrosion to adjoining metals. All exposed aluminum shall be powder coated with high performance polyester. All exterior reflective inserts shall be anodized, coated with a clear, high gloss, durable fluorocarbon, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All wiring shall be enclosed within the crossarms, pole, or electrical components enclosure.
- D. Lightning Protection: All structures shall be equipped with lightning protection meeting NFPA 780 standards. Contractor shall supply and install a ground rod of not less than 5/8" in diameter and 8' in length, with a minimum of 10' embedment. Ground rod should be connected to the structure by a copper main down conductor with a minimum size of #2 for poles with less than 75' mounting height and 2/0 for poles with more than 75' mounting height.
- E. Safety: All system components shall be UL Listed for the appropriate application.
- F. Electric Power Requirements for the Sports Lighting Equipment:
1. Electric power: 480 Volt, 3 Phase
  2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

## 2.2 STRUCTURAL PARAMETERS

- A. Support Structure Wind Load Strength: Poles and other support structures, brackets, arms, bases, anchorages and foundations shall be determined based on the latest edition of the FBC Building Code, wind speed of 146 HVHZ, exposure category C and an importance factor of 1.0. Luminaire, visor, and crossarm shall withstand 150 mph winds and maintain luminaire aiming alignment.
- B. Structural Design: The stress analysis and safety factor of the poles shall conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

- C. Soil Conditions: The design criteria for these specifications are based on soil design parameters as outlined in the geotechnical report. If a geotechnical report is not provided by the owner, the foundation design shall be based on soils that meet or exceed those of Class 5 material as defined by 2001 IBC, Table 1804.2-I-A OR 1997 UBC, Table 18-I-A.
- D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole.

## PART 3 – EXECUTION

### 3.1 FIELD QUALITY CONTROL

- A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-01, Appendix B.
- B. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles, uniformity ratios, and maximum kilowatt consumptions are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be liable to any or all of the following:
  - 1. Manufacturer shall at his expense provide and install any necessary additional fixtures to meet the minimum lighting standards. The Manufacturer shall also either replace the existing poles to meet the new wind load (EPA) requirements or verify by certification by a licensed structural engineer that the existing poles will withstand the additional wind load.
  - 2. Manufacturer shall minimize the Owner's additional long term fixture maintenance and energy consumption costs created by the additional fixtures by reimbursing the Owner the amount of \$1,000.00 (one thousand dollars) for each additional fixture required.
  - 3. Manufacturer shall remove the entire unacceptable lighting system and install a new lighting system to meet the specifications.

## Design Submittal Data Checklist and Certification

*All items listed below are mandatory, shall comply with the specification and be submitted according to submittal requirements*

Included	Tab	Item	Description
	<b>A</b>	Letter/ Checklist	Listing of all information being submitted must be included in a cover letter. List the name of the supplier's local representative and his/her phone number. Signed submittal checklist to be included.
	<b>B</b>	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by, and other pertinent data b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), or homeplate for baseball/softball fields. Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, as well as luminaire information including wattage, lumens and optics d. Height of meter above field surface e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (FC); uniformity including maximum to minimum ratio, coefficient of variance and uniformity gradient; number of luminaires, total kilowatts, average tilt factor; light loss factor. f. Alternate manufacturers shall provide both initial and maintained light scans using a maximum 0.70 Light Loss Factor to calculate maintained values.
	<b>C</b>	Off Field Lighting Design	Lighting design drawings showing spill light levels in footcandles as specified in section 1.3 A.
	<b>E</b>	Life Cycle Cost calculation	Document life cycle cost calculations as defined in the specification. Identify energy costs for operating the luminaires, maintenance cost for the system including spot lamp replacement, and group relamping costs. All costs should be based on 25 Years.
	<b>F</b>	Luminaire Aiming Summary	Document showing each luminaire's aiming angle and the poles on which the luminaires are mounted. Each aiming point shall identify the type of luminaire.
	<b>G</b>	Structural Calculation	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Florida.
	<b>H</b>	Control and Monitoring	Manufacturer shall provide written definition and schematics for automated control system to include monitoring. They will also provide examples of system reporting and access for numbers for personal contact to operate the system.
	<b>I</b>	Electrical distribution plans	If bidding an alternate system, manufacturer must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Florida.
	<b>J</b>	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed per specification for 25 years.
	<b>K</b>	Warranty	Provide written warranty information including all terms and conditions.
	<b>L</b>	Project References	Manufacturer to provide a list of project references of similar products completed within the past three years.
	<b>M</b>	Product Information	Complete set of product brochures for all components, including a complete parts list and UL Listings.
	<b>N</b>	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications.
	<b>O</b>	Compliance	Manufacturer shall sign off that all requirements of the specifications have been met at that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in item N – Non-Compliance

**Manufacturer:** \_\_\_\_\_ **Signature:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_ **Date:** \_\_\_\_/\_\_\_\_/\_\_\_\_