



LED Sports Lighting RFP for M&T Bank Stadium

November 9, 2018



Sports Lighting Design Statement

The ability to broadcast events with the best possible lighting will ultimately showcase these events to mass audiences around the globe. Professional athletes, broadcast cameras, game officials and spectators are all impacted in some way by the sports lighting during an event. Consequently, many complex considerations and decisions are involved in creating a design of the lighting system to ensure the objectives are met.

ME Engineers has developed this design criteria to fulfill the lighting requirements for NFL games. The proposed criteria has been developed based upon established guidelines in addition to ME Engineers experience of successful sports lighting design at other world class venues around the world.

The design has been progress to point that the new light fixtures are generally located in the same locations as the existing light racks. The lighting fixtures shall be positioned to provide a high quality of illumination and uniformity. The manufacturer proposed lighting solution shall meet the criteria stated herein including the needs for UHD and HDTV with current super slow-motion, flicker free replay as well as the needs of 4K and 8KTV.

In regards to illumination levels there are two main criteria, horizontal and vertical. Horizontal illuminance is a measure of light reaching a horizontal plane, 3 feet above the playing surface. A grid across each playing field shall be used as a basis for collecting these measurements and calculating maximum/minimum/average illumination on each field of play. (Refer to Appendix A for Audit Grids)

Vertical lighting at field level is the amount of illumination reaching the vertical surface of the players. This illumination helps to show close-up details of players, particularly their faces, at critical moments during the game. These images are captured by (both hand-held and motorized) field camera positions. Vertical illumination is important for both participation and spectators. The vertical illumination and uniformity requirements for broadcast television cameras are quite onerous, for HDTV and current super slow motion equipment.

As such, the manufacturer's proposed lighting system must take into consideration the complex requirements of the professional athlete performance by minimizing distracting glare and insufficient illumination across the field of play. In addition, the lighting system must have high visual comfort for the spectator to see the performance of the game and the ability of the broadcast camera to show the best digital picture quality for slow motion and close up shots of the performance.

1.1. Summary

The intent of this document is to solicit a proposal for LED sports lighting fixtures for M&T Bank Stadium. All proposals shall include as a minimum the information outlined in Section 1.5. The basis for this RFP document is for the sports lighting manufacturer to provide a turn-key sports lighting installation which includes all fixtures, lamps, light racks, mounting brackets/hardware, steel painting, the installation of electrical wiring and equipment, crane/erection and DMX lighting controls for a complete system that meets the criteria herein.

This will be a design build project and contract. Contractor is to provide a complete project including everything required to design/engineer the system, including all materials and labor and coordinated infrastructure to turn over a completed functional project that meets the specification provided and standard of care required.



1.2. Existing Conditions

M&T Bank Stadium

The sports lighting systems is the original lighting system installed in 1997. The existing Sports Lighting system is comprised of eight banks that have six hundred and forty-eight (648) 1500W normal metal halide luminaires. A portion of the total luminaires are 1500W emergency hot re-strike metal halide light fixtures. Two banks are located above each end zone of the field, while an additional two banks are located above each sideline. The existing bank general arrangement is as follows:

Bank ID	Mounting Height	Current Fixture Quantity	Power Provided By	Normal Ampacity Panelboards@ Rack	Housekeeping Circuits @ Rack	Emergency Ampacity @ Rack
A1	179'-10"	102	DPSLA	(2) 150A	(3) 20A Branch	(3) 20A Branch
A2	179'-10"	60	DPSLA	(1) 200A	(3) 20A Branch	(3) 20A Branch
B1	179'-10"	102	DPSLB	(2) 150A	(3) 20A Branch	(3) 20A Branch
B2	179'-10"	60	DPSLA	(1) 200A	(3) 20A Branch	(3) 20A Branch
C1	179'-10"	102	DPSLC	(2) 150A	(3) 20A Branch	(3) 20A Branch
C2	179'-10"	60	DPSLD	(1) 200A	(3) 20A Branch	(3) 20A Branch
D1	179'-10"	102	DPSLD	(2) 150A	(3) 20A Branch	(3) 20A Branch
D2	179'-10"	60	DPSLD	(1) 200A	(3) 20A Branch	(3) 20A Branch





Catwalks

The existing sports lighting are mounted on a structural steel tube that are generally spaced 3feet vertically apart. The luminaires are fed from panelboards located on the light racks.



1.3. Sports Lighting Design Criteria

The proposed sports lighting system for M&T Bank Stadium shall consist of an array of LED fixtures mounted to the existing structural systems. The new lighting fixtures shall be pre-assembled on steel racks which can be hoisted and structurally secured in place. The manufacturer may also propose a mounting solution which does not add mounting racks and whereby each individual luminaire is individually mounted. Under no circumstances shall any new steel block any access to repair and maintain fixtures or existing equipment on the catwalks.

The new lighting system shall be carefully aimed and positioned to provide a high quality of illumination. The manufacturer's lighting solution shall meet the specified lighting criteria requirements herein. The lighting system shall also meet the needs for UHD and HDTV with super slow-motion and flicker free replay.

The venue operators may also choose to hold other types of events such as concerts and soccer. The lighting design must accommodate these events and provide illumination for egress and maintenance lighting within the seating bowl.

The following is the lighting design criteria requirements:

	Horizontal illuminance			Vertical illuminance		Properties of lamps		Glare Rating
	Eh ave	Unifo	ormity	Ev cam ave	Uniformity	Color Temperature	Color Rendering	
Calculation towards	FC	Max:Min	Avg:Min	FC	Max: Min	Tk	Ra	GR
Fixed cameras including field level sideline cameras	ed cameras luding field level eline cameras 250 1.25 : 1 1.2 : 1		200	1.35:1	5000 - 5700	≥ 80	≤ 40	
End Zone Field Camera (goal line)				150	1.5:1			

NFL Lighting Criteria



	Vertical illuminance			Horizontal illuminance			Properties of lamps	
FIFA Class V	Ev cam ave	Uniformity		Eh ave	Uniformity		Color Temperature	Color Rendering
Calculation towards	Lux	U1	U2	Lux	U1	U2	Tk	Ra
Fixed cameras	>2000	0.6	0.7	2500	0.7	0.8	4000-6500K	≥ 90
Field camera (at pitch level)	>1800	0.6	0.7		-			
Orthogonal Vertical	N/A	0.5	0.7					

FIFA Football (Soccer) Class V Lighting Criteria – Alternate No. A1

Maintenance & Concert Lighting System:

Provide a complete maintenance and concert lighting system for the entire field and seating bowl. This shall include fixtures on the front side of the light racks that illuminate the entire seating bowl to 15 to 20FC average with a 3:1 uniformity. These fixtures shall be dimmable to be used in concert mode. These fixtures may also be used for egress lighting and have dedicated raceways and wiring from the light fixtures to the panelboards.

Bowl Egress Lighting System:

Provide a complete bowl egress lighting system the is UL listed for emergency lighting and UL924 compliant. This shall include fixtures on the front side of the light racks that illuminate the entire seating bowl to 3FC average and a minimum of 1 FC. These fixtures shall be dimmable to be used in concert mode. These fixtures shall also be on the emergency generator and have dedicated raceways and wiring from the light fixtures to the emergency panelboards on the upper concourse.

Football Camera Positions for Calculation:



Stadium Section:



General Illumination Design Criteria

The venue operators may also choose to hold other types of events such as concerts and soccer. The lighting design must accommodate these events and provide illumination for egress and maintenance lighting within the seating bowl. The following is the lighting design criteria for each of the events.

	Horizontal Illuminance			
Event	Eh ave	Uniformity		
Concert Floor/Field	5-10 fc	N/A		
Concert Seating	2-5 fc	N/A		
Egress Lighting	3 fc (1 fc min)	Per Code		
Maintenance	15-20 fc	3:1		

Note: Dimming of all fixtures to achieve event design requirements will not be acceptable. Manufacturer to use limited quantity of fixtures to achieve the desired light levels.

- Lumen Package Maximum of 120,000 delivered lumens per fixture.
- Glare rating \leq 40 GR at all calculation points on the field and all fixed camera positions.
- Maintenance Factor shall be 0.88.
- The use of multi-zoned aiming strategies is required.
- The design must fully comply with local authority light spill requirements.
- Final luminaire count dependent upon individual manufacturer meeting the performance lighting design criteria.
- All Drivers shall be electronic with less than 2% flicker.
- All fixtures in the endzone (Racks A2, B2, C2, D2) shall have additional glare mitigations shields.

1.4. Light Fixture Criteria

The following is the acceptable manufacturer qualified to bid on the sports lighting:

- Carolina High Mast Lighting
- Ephesus Lighting
- GigaTera Lighting
- Musco Lighting



The sports light fixtures shall be LED and shall operate at a supply voltage of 277volt.

All fixtures shall conform to LM-79 and LM-80 published standards. They shall have a color temperature binning that does not exceed +/-200K. LED Lamp life shall be rated at 70% of initial lumens remaining. LED drivers shall be used at 100% output for lumen output rating and not be under-driven or over-driven.

Initial delivered lumens – thermal losses should be less than 10% when operated at a steady state at an average ambient operating temperature of 25°C, and optical losses should be less than 15%.

Average Delivered Lumens – Average delivered lumens over 50,000 hours should be minimum of 85% of initial delivered lumens. Each LED shall have a reflector to control light and limit glare. The fixture and design shall also meet all local jurisdiction lighting and glare restrictions including night sky limitation and off-site glare.

Warranty (parts and labor):

- LED boards, drivers and associated components shall have a minimum Warranty of 15 years on the LEDs, 15 years on the driver, 15 years on the paint finish. Warranty shall include components, equipment, shipping, labor, etc.
- Color characteristics, balance and uniformity including CRI and TLCI shall be warrantied to not deviate more than 10% of the design values for a minimum period of 15 years.
- The specified light levels shall be warrantied for a minimum of 15 years.
- Manufacturer shall replace any non-functional module prior to the beginning of each new season for a minimum of 15 years.
- Fixture replacement any time the light levels dip 10% below the design criteria.
- Manufacturer shall include 24-hour response time for all warranty related issues.
- The manufacturer shall furnish an attic stock of ten (10) sports light fixtures and drivers to MSA. Attic stock fixtures and parts shall be the latest version of the lights.



Drivers:

- Driver shall be capable of dimming the LED array from 10% to 100% with a efficiency of 95%
- Driver shall have DMX input capable of dimming and controlling each fixture.
- Driver casing shall be constructed from aluminum.
- Driver shall have universal voltage input of 277volt to 480volt.
- All drivers shall comply with IEC 61347-2-13.
- If integral with luminaire, identify in the proposal the maintenance cost to access if failure occurs on drivers.

The fixture shall not exceed a weight of 100lbs each and be mounted on existing structure not to exceed structural capacity. The fixture shall be securely fasten to the structure and have mounting brackets and a safety cable that is attached to both the fixture and structure. The LED light source will have a color temperature as specified in the criteria for each stadium and accurately depict the all team colors color. All of the sports light fixture shall be connected and controlled by a dedicated sports lighting control system provided by the Luminaire provider. The proposal shall include all final structural connections and shall be stamped and signed by a registered professional engineer in the State of Maryland.



1.5. Luminaire Provider/Manufacturer Submission

The RFP submission shall include the following:

- · General Conditions (Project Management, Design and Engineering).
- Demolition of existing lighting system.
- Itemized cost of the complete lighting system for M&T Bank Stadium including
 - o General Conditions
 - o Demolition and recycling of all fixtures and parts. Include trash/recycling dumpster in price.
 - o Luminaires, lamps, light racks, drivers, enclosures, mounting brackets and hardware.
 - o Individual Luminaire Cost
 - o Lighting Controls
 - Erection methodology and installation (i.e. Crane/Steel)
 - o Means & methods of installation and logistics (laydown, plan,etc.)
 - Electrical wiring and installation
 - Painting of entire steel catwalk tubing for light fixtures
 – MSA will provide paint color and International paint specification.
 - Commissioning Costs
 - o Insurance
 - Other Fees (permit cost, taxes, bond, etc.)
- Product data on proposed luminaires with references from similar facilities where proposed luminaire is currently installed.
- Preliminary lighting calculations identifying illumination levels (horizontal and vertical) and uniformity for each event.
- Preliminary luminaire arrangement on structure and mounting methodology.
- Quantity of Luminaires for each event and the energy consumption in kW.
- Preliminary Construction Schedule to meet the completion.

Other Bid Information:

- Site Visits The site is generally available for inspection. All site visits shall be scheduled through MSA with a few days' notice in case of previously schedule events.
- Requests for Information All requests for information shall be referred to the Maryland Stadium Authority (MSA-Phil Hutson).
- Hours All work shall be between the hours of 6am to 6pm unless otherwise agreed on.
- Police Details & Uniformed fire watch Any Police Details and Uniformed Firewatch necessary to complete the work is to be included in the General Requirements.
- Crane work & Field Protection All crane work shall be coordinated and agreed with the Maryland Stadium Authority prior to any work commencing. The contractor shall provide the physical size and total weight of the crane required. The contractor shall provide protection for all sidewalks, ramps or other surfaces.
- Staffing Provide staffing plan that includes a Project Manager and onsite Superintendent.
- Schedule & Logistics A draft narrative describing the project approach should be submitted with a schedule
 and logistics plan with the proposal. The stadium is used throughout the year and to the extent possible they
 need to accommodate tours and other events. There is very little staging and storage space in the park. Please
 define the following items in the proposed logistics plan.
 - o Shop drawings and submittals shall be due two-weeks after award date.
 - Release date to start on-site construction will be at the conclusion of the Ravens 2018 season (no later than February 4th 2019).
 - The Architect and Engineer review cycle for shop drawings and submittals shall be seven (7) working days from receipt.
 - Provide required lead time required for fixture manufacture & delivery.
 - Duration of on-site construction per tower and for all racks.
 - Duration for aiming and commissioning per rack and for all racks.
 - Expected completion date for M&T Bank Stadium is May 1st, 2019 and shall include lighting fixtures, lamps, brackets, mounting hardware, shop drawings, full installation, electrical connections, control

system and night time field aiming. Additional time considerations may be accommodated with written justification and schedule for review and approval.

1.6. Luminaire Positioning

The location and height of the luminaires is essential in order to satisfy both the horizontal and vertical illumination requirements. The proposed luminaire and light rack locations shall remain in the current structural position. It is intended that the fixtures be arranged on the light racks to create a consistent look from the field of play and shall not be located in any of the designated glare zones. The lighting arrays shall be linear, continuous and uninterrupted in appearance. The proposal shall include a description proposed layouts meeting these requirements.

The luminaire provider shall evaluate the existing lighting positions, identify and designate distinct luminaire types including various beam luminaires, calculate glare ratings to players, patrons and camera positions to satisfy the lighting criteria specified herein.

D1 A1 24 2 2 -0 D2 A2 3 **≌** 5 **≌** 6 *** C2** 20 ***** 1 C1 **B**1

Stadium Light Racks (linear light locations on all racks):



1.7. Proposed Sports Lighting Fixtures

Туре	Lamp	Luminaire Description	Location	Manufacturer and Catalogue
Type SL1 – Field Lighting Luminaire	LED	LED Sports lighting luminaire with high power LEDs. Individual lensing for glare controlled optics. Heavy duty cast aluminum housing, cast aluminum driver housing, flicker free control gear, high power factor, energy conserving, stainless steel hardware, trunion mount with protractor base-plate, vertical adjustment aiming, safety cable, beam spreads and aiming as determined by the engineer's computer study of the stadium geometry for uniform lighting. Full DMX enabled and controlled for dynamic effects.	Racks	Musco Lighting– LED TLC 1400 except in endzone use LED TLC 900 Ephesus – Stadium Pro 1000. Provide internal black glare shield on all fixtures. GigaTera (KMW) – SUFA-A 800. Provide black internal optic louvers on all endzone fixtures. Carolina High Mast – UltaSpotLED R900 series. Provide black internal optic louvers on all endzone fixtures
Type SL2 – Upper Seating Luminaire	LED	LED Upper seating lighting luminaire with high power LEDs. Individual lensing for glare controlled optics. Heavy duty cast aluminum housing, cast aluminum driver housing, flicker free control gear, high power factor, energy conserving, stainless steel hardware, trunion mount with protractor base- plate, vertical adjustment aiming, safety cable, beam spreads and aiming as determined by the engineer's computer study of the stadium geometry for uniform lighting. Full DMX enabled and controlled for dynamic effects.	Rack	Musco Lighting TLC LED 600 Ephesus – AllField with eyelid Glare shields GigaTera (KMW) – SUFA 400 Carolina High Mast – UltaSpot R600 LED

1.8. Lighting Control System

The existing lighting control system is to be replaced. Provide a complete and stand-alone DMX addressable system for the sports lighting and seating bowl lighting system for the stadium. This contractor/manufacturer shall provide a new 'Sports Lighting Control' system that will run independently of the existing building control system but have the ability to receive scene signals from the MircoLite building control system as well as input commands from the Scoreboard control dashboard. It is envisioned that this system would send 'ON' and 'OFF' triggers to the sports lighting show controller for specific scene recalls. The control system shall have a minimum of 20 graphic screens that can be field programmable. The new 'Sports Lighting

Control' system shall operate and control all of the new LED sports light fixtures specified herein including the sports lights, egress/concert, and infill/work lights. All of the new light fixture drivers shall be connected via DMX XLR cable or Category 5E control wiring in conduit. Fiber cable and conduit may be used to connect the network/gateway control boxes. The control system shall have an ETC Mosaic Show Controller, web server (remote access), and Rio music adaptor. The system shall also provide two 18" LCD or touch screen control location that is the interface and control of the new LED lighting. The control location shall be in the existing Scoreboard Control Room and Engineering Office (Service Level – Quad C) and should have network access over the Stadium IT network for authorized users. The use of a "Lighting Control Integrator (LCI)" for final programming shall be included. The LCI is an important component to the success of project and having full integration of the current theatrical software during games.

As part of the commissioning procedures, the manufacturer shall train the owner's representatives in the operation of the system. The manufacturer shall attend all training sessions in person. A minimum of 40 hours of on-site training shall be provided. The manufacturer shall attend and provide technical support for the first of each type of event.

Technical Support: The manufacturer shall supply telephone support at no additional cost to the owner for the duration of the warranty period.

Replacement components and response period: The manufacturer shall be able to ship replacement parts within 24 hours for any component that fails during the warranty period.

Lighting Control Scenes - At a minimum the following new scenes will be included in the cost of the system:

- Football
- Football 30%
- Football 50%
- Full Lighting
- Introduction
- Intermission
- Concert Infill 180-degree stage
- Concert Infill 360-degree stage
- Concert infill Half House
- Maintenance Full
- Maintenance Lower
- Maintenance Upper
- Blackout
- Chasing Lights
- Random Flashing Lights
- Flashing Lights
- Five spare zones to be determined in the future with the MSA and the Ravens

In addition, the new Sports Lighting Control system shall have a DMX loss detection kit and UL924 emergency bypass detection kit for the emergency powered luminaires and data bus. Refer to 'Typical Luminaire Wiring Diagram' below for more information. Provide new contactors with H-O-A keyed selector switch to override sports lighting system to bypass DMX control for manual control. The location of the H-O-A switches shall be confirmed with the owner. The existing control to the contactors at shall be replaced with new relays which are compatible with the new lighting control system and connected to the H-O-A selector switch.

Provide DMX loss detection kit and UL924 emergency bypass detection kit for denoted emergency luminaires. Provide H-O-A keyed selector switch located in the upper concourse electrical rooms to override sports lighting system to bypass DMX control for manual control.

Typical Luminaire Wiring Diagram



1.9. Installation of System

The luminaire provider shall provide a complete turn-key installation of the field sports lighting system. This shall include as a minimum the following:

- Demolition of existing sports lighting system
- Fixture Erection and Installation of Fixtures on the Catwalk
- Bowl Emergency and Maintenance Lighting
- Electrical Conductors & Raceways to Panelboard
- Installation & Programming of the Lighting Control System
- Commissioning of the Sports Lighting to Meet the Criteria outline herein.
- Installation Meeting Local and State Codes
- Permit Requirements (no city building permits required but all others will be required such as street closures for cranes, etc.)

The Luminaire provider shall provide a turnkey solution that includes the structural light racks, structural connections and complete electrical installation as described herein. All raceway conduits to be of size and be installed according to NEC. The minimum conduit size for branch circuits is ³/₄" and 1" for feeders. Rigid conduit, intermediate metal conduit or electrical metallic tubing as permitted by NEC. Flexible metal conduit to be used only for final connection to equipment with maximum length 6 feet.

Panel Locations

M&T Bank Stadium - The main switchgear distributes 13,200V to substations located throughout the stadium. These distributed substations reduce the voltage from 13,200V to 480V/277Y. At four quadrant located substation locations an 800A distribution panel is tapped off the secondary side of the substation transformer. The distribution to the rack mounted panels is as follows:

• Quadrant A distribution panel DPSLA located on Press Level has (2) 150A breakers and (2) 200A breakers which serve the (2) 150A panels in Rack A1, the (1) 200A panel in Rack A2, and the (1) 200A panel in Rack B2 respectively.



- Quadrant B distribution panel DPSLB located on Press Level has (2) 150A breakers which serve the (2) 150A panels in Rack B1.
- Quadrant C distribution panel DPSLC located on Press Level has (2) 150A breakers which serve the (2) 150A panels in Rack C1.
- Quadrant D distribution panel DPSLD located on Press Level has (2) 150A breakers and (2) 200A breakers which serve the (2) 150A panels in Rack D1, the (1) 200A panel in Rack D2, and the (1) 200A panel in Rack C2 respectively.
- Contactors and By-pass switch for panelboards are located on Upper Concourse for sideline light racks and Upper Suite Level for endzone light racks. See below for more information.

It is anticipated that the luminaire provider can re-use all existing panelboards, however, new branch breakers shall be provided for the new LED lighting system. Any modifications or changes shall be note within your submitted proposal.

Plan Drawing of Panel Locations:



Upper Suite Level, Normal and Emergency



Upper Concourse Level, Normal and Emergency



Appendix A – Audit Grids

M&T Bank Stadium





Pricing Schedule

Item	Description	Cost (\$) M&T
		Bank Stadium *
а	General Conditions	
b	Demolition of existing lighting system	
C	Sports Lighting Material - Luminaires, lamps, light racks, drivers, enclosures, mounting brackets and hardware. *	
d	Sports Lighting Installation - Luminaires, lamps, light racks, drivers, enclosures, mounting brackets and hardware.	
е	Lighting Controls	
f	Erection costs (i.e. Crane/Steel)	
g	Electrical wiring, equipment and installation	
h	Painting	
i	Commissioning	
j	Insurance	
k	Maintenance and warranty coverage for 15 years	
	Totals	
A1	FIFA Class V Lighting	
A2	Increase warranty to 20years	

* Proposal shall include individual unit cost for each luminaire type.