



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

October 30, 2017

SUBJECT: FAI Route 57 (I-57)
Project NHPP-WR9Z(018)
Section (46-3)HBR
Kankakee County
Contract No. 66885
Item No. 49, November 17, 2017 Letting
Addendum B

NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Revised page iii of the Table of Contents to the Special Provisions
2. Added pages 94-103 to the Special Provisions
3. Revised sheet 2 of the Plans

Prime contractors must utilize the enclosed material when preparing their bid and must include any changes to the Schedule of Prices in their bid.

Very truly yours,

Maureen M. Addis, P.E.
Engineer of Design and Environment

A handwritten signature in black ink, appearing to read "Ted B. Walschleger" followed by a small "P.E." monogram.

By: Ted B. Walschleger, P. E.
Engineer of Project Management

cc: Kevin Marchek, Region 2, District 3; Tim Kell; D. Carl Puzey; Estimates

JW/ck

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LUMINAIRE, LED, HORIZONTAL MOUNT, OF THE WATTAGE SPECIFIED

Description: This work consists of furnishing all materials, equipment, and labor necessary to install Light-Emitting Diode (LED) luminaires as shown on the plans, in accordance with the applicable requirements of Section 821 of the Standard Specifications for Road and Bridge Construction, and as specified herein.

General: The luminaire shall be assembled in the continental U.S.A. and shall be assembled by and manufactured by the same Manufacturer. Quick connect/disconnect plugs shall be supplied between the discrete electrical components within the luminaire such as the driver, surge protection device, and optical assembly for easy removal. The quick connect/disconnect plugs shall be operable without the use of tools and while wearing insulated gloves. The luminaire shall be in compliance with ANSI C136.37. LED light source(s) and driver(s) shall comply with the material requirements of the Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU.

Manufacturer Experience. The luminaire shall be designed to be incorporated into a lighting system with an expected 30-year lifetime. The luminaire Manufacturer shall have a minimum of 30 years' experience manufacturing High Intensity Discharge (HID) roadway luminaires and shall have a minimum of 5 years' experience manufacturing LED roadway luminaires. The Manufacturer shall have a minimum of 5,000 total LED roadway luminaires installed on a minimum of 30 separate installations, all within the continental U.S.A.

Housing: The housing shall be designed to ensure maximum heat dissipation and to prevent the accumulation of water, ice, dirt and debris. A passive cooling method with no moving or rotating parts shall be employed for heat management. The effective projected area of the luminaire shall not exceed 1.4 sq. ft. The total weight of the luminaire(s) and accessories shall not exceed 75 pounds. Wiring within the electrical enclosure shall be rated at 600 V, 221 °F (105 °C) or higher.

Finish. Painted or finished luminaire surfaces exposed to the environment, shall exceed a rating of six according to ASTM D1654 after 1000 hours of ASTM B117 testing. The coating shall exhibit no greater than 30 % reduction of gloss according to ASTM D523, after 500 hours of ASTM G154 Cycle 6 QUV® accelerated weathering testing.

Attachment. The luminaire shall slip-fit on a mounting arm with a 2 in (5 cm) diameter tenon (2.375 in (6 cm) outer diameter), and shall have a barrier to limit the amount of insertion. The luminaire shall be provided with a leveling surface and shall be capable of being tilted ± 5 degrees from the axis of attachment in not more than 2.5 degree increments and rotated to any degree with respect to the supporting arm.

Receptacle. The luminaire shall include a fully prewired, 7-pin twist lock ANSI C136.41 compliant receptacle. Unused pins shall be connected as directed by the Manufacturer and as approved by the Engineer. A shorting cap shall be provided with the luminaire.

Added 10.30.17

Vibration Characteristics. All luminaires shall pass ANSI C136.31 requirements. Roadway luminaires mounted on a bridge and high mast luminaires shall be rated for "3G" peak acceleration. Vibration testing shall be run using the same luminaire in all three axes.

Labels and Decals. All luminaires shall have external labels in compliance with the latest version of ANSI C136.15 and internal labels in compliance with the latest version of ANSI C136.22.

The luminaire shall be listed for wet locations by a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA and shall be in compliance with UL 8750 and UL 1598. It shall be identified as such by the holographic UL tag/sticker on the inside of the luminaire.

Hardware. All external fasteners shall be stainless steel. All hardware shall have corrosion resistance.

Optical Assembly: The LED optical assembly, consisting of LED packages, shall have a minimum Ingress Protection rating of IP66 according to ANSI C136.25-2013. Circuiting shall be designed to minimize the impact of individual LED failures on the operation of the other LEDs.

The optical assembly shall utilize high brightness, long life, minimum 70 color rendering index (CRI), 4,000 K color temperature (+/-300 K) LEDs binned according to ANSI C78.377. Lenses shall be UV-stabilized acrylic or glass. Provisions for house-side shielding shall be provided when specified.

Lumen depreciation at 50,000 hours of operation shall not exceed 15% of initial lumen output at the specified LED drive current and an ambient temperature of 77 °F (25 °C).

The assembly shall have individual serial numbers or other means for Manufacturer tracking.

Photometric Performance: The classification of LED luminaires shall be as follows:

VLW – Wattages ≤ 100, minimum delivered lumens 5,000,
LW – Wattages 101 - 200, minimum delivered lumens 10,000,
MW – Wattages 201 - 300, minimum delivered lumens 20,000,
HW – Wattages 301 - 400, minimum delivered lumens 30,000,
VHW – Wattages ≥ 401, minimum delivered lumens 40,000.

VLW= very low watt, LW = low watt, MW = medium watt, HW = high watt, and VHW = very high watt luminaire. Luminaires with lumens below the stated minimums will not be accepted.

Testing. Luminaires shall be tested according to IES LM-79. The laboratory performing this test shall hold accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) under NIST. Submitted reports shall have a backlight, uplight, and glare (BUG) rating according to IESNA TM-15 including a luminaire classification system graph with both the recorded lumen value and percent lumens by zone.

Lumen maintenance shall be measured for the LEDs according to LM-80, or when available for the luminaires according to LM-84. The LM-80 report shall be based on a minimum of 6,000 hours, yet 10,000 hour reports shall be provided for luminaires where those tests have been completed.

Thermal testing shall be provided according to UL 1598. The luminaire shall start and operate in the ambient temperature range specified. The maximum rated case temperature of the driver, LEDs, and other internal components shall not be exceeded when the luminaire is operated in the ambient temperature range specified.

Mechanical design of protruding external surfaces such as heat sink fins shall facilitate hose-down cleaning and discourage debris accumulation. Testing shall be submitted when available to show the maximum rated case temperature of the driver, LEDs, and other internal components are not exceeded when the luminaire is operated with the heat sink filled with debris.

Calculations. Complete point-by-point luminance and veiling luminance calculations as well as listings of all indicated averages and ratios as applicable shall be provided according to IES RP-8 recommendations. Lighting calculations shall be performed using AGI32 software with calculations performed to two decimal places (i.e. x.xx cd/m²). Calculation results shall demonstrate that the submitted luminaire meets the lighting metrics specified in the project Luminaire Performance Tables (see exhibit B). Scotopic or mesopic factors will not be allowed.

Lumen Maintenance Projection. The LEDs shall have long term lumen maintenance documented according to IESNA TM-21, or when available for the luminaires according to IESNA TM-28. The submitted calculations shall incorporate an in situ temperature measurement test (ISTMT) and LM-80 data with TM-21 inputs and reports according to the TM-21 calculator, or when available ISTMT and LM-84 data with TM-28 inputs and reports according to the TM-28 calculator. Ambient temperature shall be 77 °F (25 °C).

Driver: The driver for the luminaire shall be integral to the unit. It shall be mounted in the rear of the luminaire on the inside of a removable door or on a removable mounting pad. The removable door or pad shall be secure when fastened in place and all individual components shall be secured upon the removable element. Each component shall be readily removable from the removable door or pad for replacement.

Circuit Protection. Shall tolerate indefinitely open and short circuit output conditions without damage.

Ingress Protection. IP66 rating.

Input Voltage. Shall be suitable for operation over a range of 120 to 277 volts or 347 to 480 volts as required by the system operating voltage.

Operating Temperature. Operating ambient temperature range of -40 to 104 °F (-40 to 40 °C).

Added 10.30.17

Driver Life. Life time of 100,000 hours at 77 °F (25 °C) ambient.

Safety/UL. Listed under UL 1310 or UL 1012.

Power Factor. Shall maintain a power factor of 0.9 or higher and total harmonic distortion of less than 20 % at 50% load across the full supply voltage range.

Driver efficiency. Minimum efficiency of 90% at maximum load and a minimum efficiency of 85% for the driver operating at 50% power with driver efficiency defined as output power divided by input power.

Electrical Interference. Shall meet the Electromagnetic Compatibility (EMC) requirements for Class A digital devices included in the FCC Rules and Regulations, Title 47, Part 15.

Thermal Fold Back. The driver shall reduce the current to the LED module if the driver is overheating due to abnormal conditions.

Dimming. 0-10 V dimming capability.

Leakage current. Compliance with safety standards according to IEC 61347-1 and UL 1012.

Surge Protection Device: SPD shall be labeled as Type 4 in accordance to UL 1449 and be an integral part of the luminaire. It shall provide a minimum system protection level of 10 kV, 10 kA. To protect for a 10 kV, 10 kA surge the required clamping voltage of the external Metal Oxide Varistor (MOV) or other SPD shall be lower than 1 kV at 8 kA $\{(10 \text{ kV}-2 \text{ kV})/1 \text{ ohm}=8 \text{ kA}\}$.

The SPD shall comply with the following standards:

- 1) IEEE C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits,
- 2) IEEE C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits,
- 3) IEEE C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits, and
- 4) ANSI C136.2, American National Standard for Roadway and Area Lighting Equipment – Luminaire Voltage Classification.

The SPD and performance parameters shall be posted at www.UL.com under Category Code: VZCA2.

Warranty: The entire luminaire and all of its component parts shall be covered by a 10 year warranty. Failure is when one or more of the following occur:

- 1) Negligible light output from more than 10 percent of the LED packages
- 2) Condensed moisture inside the optical assembly
- 3) driver that continues to operate at a reduced output below 15% of the rated nominal output

Added 10.30.17

The warranty period shall begin on the date of final acceptance of the lighting work as documented in the Resident Engineer's project notes.

Submittal Requirements: The Contractor shall submit, for approval, an electronic version of all associated luminaire IES files, AGi32 files and the TM-21 calculator spreadsheet with inputs and reports associated with the project luminaires. The Contractor shall also provide an electronic version of each of the following Manufacturer's product data for each type of luminaire.

- 1) Descriptive literature and catalogue cuts for luminaire, LED package, driver, and surge protection device.
- 2) LED drive current, total luminaire input wattage and total luminaire current at the system operating voltage or voltage range and ambient temperature of 77 °F (25 °C).
- 3) Luminaire efficacy expressed in lumens per watt (lpw) per luminaire.
- 4) Initial delivered lumens at the specified color temperature, drive current and ambient temperature.
- 5) Computer photometric calculation reports.
- 6) TM-15 BUG rating report.
- 7) Documentation of Manufacturers experience and certification that luminaires were assembled in the U.S.A.
- 8) Supporting documentation of compliance with ANSI standards as well as listing requirements.
- 9) Supporting documentation of laboratory accreditations and certifications for specified testing.
- 10) Thermal testing documents.
- 11) IES LM-79, LM-80 (or LM-84) and TM-21 (or TM-28) reports.
- 12) Salt spray (fog) test reports and certification.
- 13) Vibration characteristics test reports and certification.
- 14) IP test reports.
- 15) Manufacturer written warranty.
- 16) Luminaire installation, maintenance, and washing instructions.

Luminaire Testing: When a contract has 30 or more luminaires of the same type, wattage and distribution, that luminaire shall be tested. The quantity of luminaires requiring testing shall be one luminaire for the first 30 plus one additional luminaire for each additional 50 luminaires of that type, wattage, and distribution. Testing is not required for temporary lighting luminaires. The Contractor shall coordinate the luminaire testing, propose a properly accredited laboratory and an independent witness, submit their qualifications for approval prior to any testing, and pay all associated costs including travel expenses for the independent witness. Delays caused by the luminaire testing process shall not be grounds for additional compensation or extension of time.

The independent witness shall be present when tests are performed by the luminaire manufacturer. A laboratory independent of the luminaire manufacturer, distributor, and Contractor may self-certify the test results, in which case the independent witness need not be present during the testing.

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After all qualifications have been approved, the independent witness shall select from the project luminaires at the manufacturer's facility the luminaires for testing. In all cases, the selection of luminaires shall be a random selection from the entire completed lot of luminaires required for the contract. Selections from partial lots will not be allowed. The independent witness shall mark each sample luminaire's shipping carton with the IDOT contract number and a unique sample identifier.

At the time of random selection, the independent witness shall inspect the luminaire(s) for compliance with all physical, mechanical, and labeling requirements for luminaires according to Sections 821 and 1067 and as stated herein. If deficiencies are found during the physical inspection, the Contractor shall have all luminaires of that type, wattage, and distribution inspected for the identified deficiencies and shall correct the problem(s) where found. Random luminaire selection and physical inspection must then be repeated. When the physical inspection is successfully completed, the independent witness shall mark the project number and sample identifier on the interior housing and ballast of the luminaires and have them shipped to the laboratory.

The testing performed by the laboratory shall include photometric, colorimetric, and electrical testing. Colorimetric values shall be determined from total spectral radiant flux measurements using a spectroradiometer. Photometric testing shall be according to IES recommendations and as a minimum, shall yield an isofootcandle chart, with max candela point and half candela trace indicated, an isocandela diagram, maximum plane and maximum cone plots of candela, a candlepower table (house and street side), a coefficient of utilization chart, a luminous flux distribution table, BUG rating report, and complete calculations based on specified requirements and test results. All testing shall cover the full spherical light output at a maximum of 5 degree intervals on both the vertical planes and the cones. Tests that "mirror" results from one hemisphere or quadrant to another are not acceptable.

The results for each photometric and colorimetric test performed shall be presented in a standard LM-79 report that includes the IDOT contract number, sample identifier, and the outputs listed above. The calculated results for each sample luminaire shall meet or exceed the contract specified levels in the luminaire performance table(s). The laboratory shall mark its test identification number on the interior of each sample luminaire.

Electrical testing shall be in accordance with LM-79.

The summary test report shall consist of a narrative documenting the test process, highlight any deficiencies and corrective actions, and clearly state which luminaires have met or exceeded all test requirements and may be released for delivery to the jobsite. Photographs shall also be used as applicable to document luminaire deficiencies and shall be included in the test report. The summary test report shall include the Luminaire Physical Inspection Checklist (see exhibit A), photometric and electrical test reports, and point-by-point photometric calculations performed in AGi32 sorted by luminaire type, wattage, and distribution. All test reports shall be certified by the independent test laboratory's authorized representative or the independent witness, as applicable, by a dated signature on the first page of each report. The summary test reports shall be delivered to the Engineer and the Contractor as an electronic submittal. Hard copy reports shall be delivered to the Engineer for record retention.

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Should any of the tested luminaires fail to satisfy the specifications and perform according to approved submittal information, all luminaires of that type, wattage, and distribution shall be deemed unacceptable and shall be replaced by alternate equipment meeting the specifications. The submittal and testing process shall then be repeated in its entirety. The Contractor may request in writing that unacceptable luminaires be corrected in lieu of replacement. The request shall identify the corrections to be made and upon approval of the request, the Contractor shall apply the corrections to the entire lot of unacceptable luminaires. Once the corrections are completed, the testing process shall be repeated, including selection of a new set of sample luminaires. The number of luminaires to be tested shall be the same quantity as originally tested.

The process of retesting corrected or replacement luminaires shall be repeated until luminaires for each type, wattage, and distribution are approved for the project. Corrections and re-testing shall not be grounds for additional compensation or extension of time. No luminaires shall be shipped from the manufacturer to the jobsite until all luminaire testing is completed and approved in writing.

Submittal information shall include a statement of intent to provide the testing as well as a request for approval of the chosen independent witness laboratory. All summary test reports, written reports, and the qualifications of the independent witness and laboratory shall be submitted for approval to the Bureau of Design and Environment in Springfield.

Construction: Examine all luminaires delivered to the jobsite prior to installation to ensure all specification requirements and Shop Drawing comments have been incorporated by the Manufacturer. Deficient luminaires shall not be installed and the Engineer shall be notified immediately.

Luminaires shall be adjusted with the use of a level placed along the fixture housing or other means approved by the manufacturer to make sure they are installed with their optics set to deliver optimum designed light levels on the roadway. Any dirt or film on LEDs and/or the optical assembly shall be thoroughly removed using cleaning methods approved by the manufacturer.

Basis of Payment: This work will be paid for at the contract unit price per each for Luminaire, LED, Horizontal Mount, of the wattage specified which shall be payment in full for all labor, equipment and material necessary to perform the work specified herein.

Added 10.30.17

EXHIBIT A

Illinois Department of Transportation
 Luminaire Physical Inspection Checklist

IDOT Contract No: _____ Date: _____ Inspector: _____
 Luminaire Type: _____ Wattage: _____ Distribution: _____
 Packaging: _____

Inspection Item	Sample:	Sample:	Sample:	Sample:
Shipping carton properly labeled				
Packaging adequately secures and protects luminaire				

Luminaire Housing

Inspection Item	Sample:	Sample:	Sample:	Sample:
Paint and coatings even and reasonably unblemished				
Correct 7-pin receptacle in place and adequately sealed				
No dents, cracks, or other malformations present				
Correct seal of the housing and individual LEDs				
Internal and external labels correct				
Pole or bracket mounting hardware correct				

Light Source Compartment

Inspection Item	Sample:	Sample:	Sample:	Sample:
Lens properly secured to each LED or door or housing				
Lenses not cracked or scratched				
Correct number of LEDs and LED array assemblies				
LEDs correctly installed and oriented				
All fasteners are stainless steel				
Surfaces are smooth to prevent dirt accumulation				

Electrical Compartment

Inspection Item	Sample:	Sample:	Sample:	Sample:
Driver(s) is held securely in place				
Wiring is undamaged, protected from sharp edges, and neatly routed				
Terminations for incoming power wiring are clearly marked and correct for 10 AWG cables				
Driver has quick-disconnect plugs for power and lamp connections which cannot be mis-connected				
Photocell socket is securely mounted				
Photocell receptacle operates correctly				
All fasteners are stainless steel and captive				
Electrical components securely mounted on removable tray with quick-disconnect plugs for ease of maintenance				

Describe any deficiencies found:

Added 10.30.17

LUMINAIRE PERFORMANCE TABLE

**ILLINOIS DEPARTMENT OF TRANSPORTATION
 LUMINAIRE PERFORMANCE TABLE**
 Collector / Low Pedestrian Conflict

GIVEN CONDITIONS		
ROADWAY DATA	Lane Width	12 ft
	Number of Lanes (in each direction)	2
	Median Width	0 ft
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	45 ft
	Mast Arm Length	12 ft
	Pole Set-Back From Edge of Pavement	12 ft
LUMINAIRE DATA	Luminaire Type	LED
	Initial Lumens	20,000
	I.E.S. Vertical Distribution	Medium
	BUG Rating	U = 0
	I.E.S. Lateral Distribution	Type III
	Lumen Depreciation	0.90
	Dirt Depreciation	0.80
	Equipment Factor	0.95
	Total Light Loss Factor	0.684
LAYOUT DATA	Spacing	400 ft To nearest 5 ft
	Configuration	Staggered

- NOTES:**
1. Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.
 2. A Lumen Depreciation value greater than 0.90 for LED light sources shall be based upon I.E.S. LM-80 or I.E.S. LM-84 and I.E.S. TM-21 test reports.

Added 10.30.17

PERFORMANCE REQUIREMENTS

NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ROADWAY LUMINANCE	Average Luminance, L_{AVE}	<u>0.4 Cd/m²</u>
	Uniformity Ratio, L_{AVE}/L_{MIN}	<u>4.0:1</u>
	Uniformity Ratio, L_{MAX}/L_{MIN}	<u>8.0:1</u>
	Max. Veiling Luminance Ratio, L_V/L_{AVE}	<u>0.4:1</u>
ROADWAY ILLUMINANCE	Average Illuminance, E_{AVE}	<u>0.6 fc</u>
	Uniformity Ratio, E_{AVE}/E_{MIN}	<u>4.0:1</u>
INTERSECTION ILLUMINANCE	Average Illuminance, E_{AVE}	<u>1.0 fc</u>
	Uniformity Ratio, E_{AVE}/E_{MIN}	<u>4.0:1</u>
BIKE PATH ILLUMINANCE HORIZONTAL	Average Illuminance, E_{AVE}	<u>0.3 fc</u>
	Uniformity Ratio, E_{AVE}/E_{MIN}	<u>6.0:1</u>
VERTICAL	Average Illuminance, E_{AVE}	<u>0.08 fc</u>

Added 10.30.17