807-T-193 LUMINAIRES

(Revised 02-19-15)

The Standard Specifications are revised as follows:

SECTION 807, BEGIN LINE 41, INSERT AS FOLLOWS:

807.03 Working Drawings

Working drawings shall be submitted in accordance with 105.02 for lighting-standard assemblies, luminaires, and external drive assemblies.

Working drawings for each luminaire model submitted shall include:

(a) Luminaire specifications and data sheets.
(b) Test report verifying UL 1598 compliance.
(c) Test report indicating compliance with ANSI C136.31, 2G or 3G requirements.
(d) Test reports indicating the IP rating specified in 920.01(d)2 are met in accordance with ANSI/IEC, International Electrotechnical Committee, standard 60529.
(e) Report of testing performed in accordance with ANSI C82.77 for electronic power drivers, or ANSI C82.6 for mechanical ballast indicating that the Total Harmonic Distortion does not exceed the limit specified in 920.01(d)2 and the Power Factor meets or exceeds the minimum specified in 920.01(d)1.

For luminaires utilizing solid state power drivers, the working drawings shall also include:

(a) IESNA LM - 79 test report.
(b) Test report indicating surge protection device survival in accordance with ANSI/IEEE C62.41.2.
(c) UL 1449 certification.
(d) Test report indicating Title 47 CFR Part 15, Class A compliance.
(e) Mean Time to Failure prediction for the power driver in accordance with Telcordia SR 332, issue 3 or MIL-HDBK-217F
(f) Power Driver Lifetime Report.

For luminaires utilizing an LED light source, the IESNA LM - 80 test shall be submitted. For plasma luminaires the emitter manufacturer's life test report indicating lumen maintenance at 50,000 hrs shall also be submitted. For post top mounted and underpass luminaires, the working drawings shall also include a report for a salt spray test in accordance with ASTM B117, 2,000 hrs time horizon.

Certifications and test reports shall be issued by a laboratory that is either listed as a National Recognized Testing Laboratory on the U.S. Department of Labor's website or is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). Additionally, LM-79 and LM-80 testing shall be performed by a laboratory that is accredited by the U.S. Department of Energy's CALIPER program.

Working drawings for luminaires shall also include the Illumination Engineering Society of North America, IESNA, photometric distribution file if the file number varies from what is indicated on the plans. The IESNA photometric distribution file shall be in either Visual, developed by Acuity Brands Lighting, or AGi32 from Lighting Analysis, Inc.

SECTION 807, BEGIN LINE 525, DELETE AND INSERT AS FOLLOWS:

807.13 Luminaire ~~Installation~~

(a) Installation

Luminaire installation shall consist of the physical placing of the luminaire. Each installation shall include the furnishing and placing of the ~~lamp~~*light source* as designated. *Luminaires shall be compatible with other lighting materials as specified in 920.01*.

~~(a)~~*1*. Roadway Luminaires

Each luminaire shall be leveled in both directions in the horizontal plane after the light standard has been erected and adjusted. Rotary adjustment of the mast arm and vertical adjustment of roadway luminaires to obtain an installed level position in both directions shall be accomplished by means of the bolted saddle arrangement used to attach the luminaires to the mast arm. Lamp socket positions may be shown on the plans by type of Illuminating Engineering Society of North American, IES, light pattern. The specified lamp socket position*, or comparable arrangement of LEDs* shall be used to obtain the desired light pattern delivery. Proper connections shall be made to provide ~~ballast~~ operation at the voltage being supplied. Replacements needed because of faulty or incorrect voltage connections shall be made with no additional payment. *All roadway luminaires provided for an intersection, interchange, or contiguous highway segment shall be the same model.*

~~(b)~~ *2*. Sign Luminaires

Connections in which plain and galvanized steel are in contact shall be protected such that aluminum surfaces shall receive one coat of zinc chromate primer. Steel surfaces shall be prepared in accordance with 619.08(a), 619.08(b) and 619.08(d) and painted with a structural steel system in accordance with 619.09(a). All paint shall be allowed to cure before assembly. Conduit fittings, if required, shall be watertight. Required conduit shall be either rigid or flexible as necessary. Conduit shall not be clamped to a sign panel.

Sign luminaires shall be mounted on overhead sign structures on two metal channels located at the extremity of the sign walkway support brackets. The distance between lighting unit support channels shall be 7 in. These channels shall be located in such a manner that they readily receive the mounting bolts from the rear of the sign luminaire. The installation of the sign luminaire shall consist of the physical placement of the luminaire on the channels.

Sign luminaires shall be connected to a phase conductor and a neutral conductor. The luminaires shall be alternately connected to opposite phase conductors to balance the load. The connections in the base of the sign structure shall be in accordance with 807.06. Conductor splicing shall be in junction boxes, in-ground handholes, inside handholes of

sign structures, and circuit breaker enclosures. *All sign luminaires provided for an interchange or contiguous highway segment shall be the same model.*

~~(c)~~*3.* Underpass Luminaires

Underpass luminaires shall be mounted on the vertical side surfaces of bridge bent structures or suspended by means of pendants supported by angle-iron struts or clips fastened to the structural beam members of the bridge. All parts of the pendent pipe assembly shall be hot-dipped galvanized after threads are cut. Silicone caulking compound shall be applied to the threads during assembly of the pendent. Underpass luminaires may require separately mounted ballasts which shall be installed in close proximity to the luminaires.

Underpass luminaires shall be connected to a phase conductor and a neutral conductor. The luminaires shall be alternately connected to opposite phase conductors to balance the load. Conductor splicing will only be allowed in junction boxes, in-ground handholes, and circuit breaker enclosures. *All underpass luminaires provided for an interchange shall be the same model.*

~~(d)~~ *4.* High Mast Luminaires

The aiming of the luminaires shall be as shown on the plans. When the aiming process is being done the luminaire shall be oriented to conform to its raised position and the ring properly tethered to prevent rotation during the aiming adjustment. The long axis of the luminaire shall be parallel to the aiming direction indicated on the plans. *All high mast luminaires provided for an interchange shall be the same make and model.*

(b) Warranty

A non-prorated manufacturer's written warranty, against loss of performance, defects in materials and defects in workmanship, shall be provided to and in favor of INDOT. The warranty shall cover a period of five years from the date of installation of the luminaire. The warranty shall cover all components of the luminaire, including but not limited to ballast, driver, and light source. Loss of performance is defined to include, but is not limited to, the luminaire or any of its components falling out of compliance with specification, which includes but is not limited to the following: there is no light output from 10% or more of the LEDs, the luminaire is operating below the lumen maintenance curve, or the color temperature shifts more than 500K outside of the specified color temperature range. The warranty shall stipulate that replacement luminaires shall be shipped to the appropriate Department District Office, at no cost to the Department, within thirty days after the manufacturer's receipt of failed luminaires. Warranty documents shall include the manufacturer's name, address to which failed luminaires are to be shipped for replacement, contact person and contact person's telephone number and e-mail address. *Warranty documents shall be submitted to the Engineer with the type C certification. Warranty documents shall provide the estimated life cycle of the lamp, LEDs, plasma emitter and power driver.*

807.14 Sign, Underpass, Roadway, ~~and~~ High Mast Lighting Location, *and Luminaire* Identification

All high mast towers, roadway light standards, underpass lighting installations, and sign lighting installations shall have an identification code number as shown on the

plans. In addition, each luminaire at a sign or underpass installation shall be individually identified with a single capital letter.

The code number shall be displayed on the light standard, sign structure column, and high mast tower as shown on the plans. The underpass code number shall be displayed near the breaker box at a location as directed.

The code number for the lighting standard and sign structure column shall be applied to the pole, as specified by the manufacturer, by using individual, pressure sensitive, adhesive backed tags. The code number for the high mast tower shall be applied to an aluminum plate which is mounted with spacers away from the structure as shown on the plans.

A luminaire identification sticker shall be provided on each luminaire and on the light pole or tower that supports the luminaire. The sticker shall be titled "LUMINAIRE" and contain the following information: light source type, manufacturer, model, wattage, date of installation, and warranty period. The pole/tower sticker shall be attached underneath the light pole ID tag, shall face the roadway, and shall have 3/4 in. lettering, and be no greater than 8 in. by 8 in.

SECTION 807, BEGIN LINE 808, INSERT AS FOLLOWS:

Luminaire, High Mast, _____, _____ Watt~~s~~.....EACH
light source type

Luminaire, Roadway, _____, _____ Watt~~s~~.....EACH
light source type

Luminaire, Sign, _____, _____ Watt .....EACH
light source type

Luminaire, Underpass, _____, _____ Watt .....EACH
light source type

SECTION 807, BEGIN LINE 821, INSERT AS FOLLOWS:

The cost of lamps, *LED arrays, plasma emitters,* ballast, *drivers,* optical systems, weatherproof housings, *surge protection devices,* and electrical connections shall be included in the cost of luminaire.

SECTION 920, BEGIN LINE 499, DELETE AND INSERT AS FOLLOWS:

(d) Luminaires

1. General Requirements

~~Lamps~~*Light sources* supplied for luminaires shall be electrically compatible with the luminaires. Luminaires shall include the lamp ballast *or power driver*. The ballast *or power driver* shall be integrally built in. ~~and~~*Ballasts shall* of the constant wattage regulator type of sufficient size to operate the designated lamp at the required voltage. The ~~ballast shall provide satisfactory lamp performance to 20°F~~*luminaire shall operate satisfactorily in temperatures from - 40°F to 122°F* with an input voltage variation of ± 10% of the rated operating voltage specified. *Luminaires shall be a single, self contained device, not requiring on-site assembly for installation. Power consumption, wattage, shall not exceed that which is indicated on the plans. The luminaire power factor shall be 0.9 or greater.*

Underpass and post top mounted luminaires shall be protected against salt spray and conform to ASTM B117, 2,000 hrs time horizon.

Luminaires shall include vandal shields when installed on an underpass or signs on bridge brackets and when otherwise specified. The vandal shield shall be made of a tough durable plastic, such as Lexan, mounted in a rugged galvanized steel or aluminum frame, and shall withstand severe impact without being damaged or allowing the refractor to be damaged. It shall be fastened securely to the luminaire so it cannot be removed from the outside and shall not interfere with the light distribution pattern. It shall protect the face of the refractor and if ventilation is necessary, the ventilating apertures shall be arranged so that they do not admit a probe of a diameter greater than 1/4 in.

2. Roadway Lighting Luminaires

~~Roadway lighting luminaires shall have a precision-cast aluminum housing and refractor holder with weatherproof finish. They shall have a strong, easily operated, positive latch on the street side of the refractor holder and a hinge with a safety catch that prevents accidental unhinging on the house side of the refractor holder. They shall include a slipfitter capable of adapting to a 2 in. mounting bracket; an easily detachable highly specular aluminum reflector; and an easily adjustable socket in both horizontal and vertical directions capable of producing lighting patterns to meet all the requirements of the American Standard Practice for Roadway Lighting as sponsored by the Illumination Engineering Society and as shown on the They shall have a high impact, heat-resistant, glass, prismatic refractor; and include gasketing that will completely seal out dust, moisture, and insects from the interior of the optical assembly and retard the formation of an undesirable film from gaseous vapors on the interior of the optical assembly.~~ *Roadway lighting luminaires shall have a precision-cast aluminum housing with weatherproof finish. They shall have a strong, easily operated, positive latch on the street side of the housing with a hinge and a safety catch that prevents accidental unhinging on the house side of the refractor or lens holder. They shall include a four bolt slipfitter capable of adapting to a 2 in. mounting bracket that is adjustable ± 5° for levelin.*

Luminaires shall include gasketing that will completely seal out dust, moisture, and insects from the interior of the optical assembly and retard the formation of an undesirable film from gaseous vapors on the interior of the optical assembly. The optical assembly shall be rated at IP 66 or better in accordance with ANSI/IEC 60529 while ballasts, power drivers and surge protection devices shall be rated at IP 65 or better.

All internal components shall be adequately supported to withstand mechanical shock and vibration. Luminaires shall be tested in accordance with ANSI C136.31, 2G loading or ANSI C136.31, 3G loading for luminaires on bridges. Testing about all axes shall be accomplished with a single luminaire.

Total Harmonic Distortion, THD, of the ballast or power driver shall not exceed 20% as verified by ANSI C82.6 for mechanical ballasts or ANSI C82.77 for power drivers.

Luminaire weight shall not exceed 53 lbs and its projected area shall not exceed 2.4 sq ft. Luminaires shall be either High Pressure Sodium, HPS, or utilize another light source in accordance with 920.01(d)2b.

a. High Pressure Sodium Luminaires

HPS luminaires shall have a high impact, heat-resistant, glass, prismatic refractor; a precision-cast, aluminum refractor holder with weatherproof finish, a detachable highly specular aluminum reflector; and an adjustable socket in both horizontal and vertical directions capable of producing lighting patterns to meet all the requirements of the American Standard Practice for Roadway Lighting as sponsored by the IESNA and as shown on the plans.

b. Other Light Source Types

Luminaires that utilize technologies other than HPS shall be compatible with the lighting materials specified in this section and in the plans. Luminaires, including primary fuse protection, surge protection devices, power drivers, and other major components, shall be rated for a minimum operational life of 50,000 hours at 77°F. Power drivers shall maintain constant current and have a minimum Mean Time to Failure of 2,000,000 hrs as determined by Telcordia SR 332, issue 3 or MIL-HDBK-217F methodology Luminaires shall be adjustable in the horizontal and vertical directions to meet the specified IESNA light distribution pattern. Refractors or lenses shall be scratch resistant and made from high impact, heat-resistant, glass or UV inhibited, high impact plastic. If utilized, reflectors shall be detachable and made of highly specular aluminum. Power supply drivers, surge protection devices, LED arrays, and plasma emitters shall be replaceable without replacing the entire luminaire. Luminaires shall have five or seven wire photocontrol receptacle in accordance with ANSI C136.41 with shorting cap for adaptive lighting control.

LEDs shall be connected so that the loss of one LED will not result in the loss of the entire luminaire. LED circuitry shall prevent flickering to the unaided eye at the voltage specified on the plans and the range indicated herein. LED junction temperature shall not exceed 158°F.

Metal halide luminaires shall utilize a power driver; external capacitors or igniters shall not be used.

Solid state and plasma luminaires shall meet these additional requirements:

(1) Wattage. The wattage shall be verified by the IESNA LM-79 test.

(2) Lumen Output. The total lumen output shall meet or exceed the amount specified on the plans and shall be verified by the IESNA LM-79 test. LEDs shall deliver a minimum of 85% of the initial rated lumens after 50,000 hours of operation at 130°F ambient temperature as indicated by LM-80 lumen maintenance test of the light source as calculated by IESNA TM-21 (L85 >

50,000 hrs). Plasma emitters shall deliver a minimum of 70% of the initial lumens after 50,000 hrs of operation.

(3) Chromaticity. Luminaires shall exhibit a color temperature in the range of 4000K to 5000K per ANSI C78.377 and a minimum Color Rendering Index of 70 as verified by the IESNA LM-79 test

(4) Surge Protection. Solid State luminaires shall include a Surge Protection Device, SPD, to protect the luminaire from damage and failure for transient voltage and currents. The SPD shall conform to UL 1449 and shall be tested in accordance with, and survive, the procedure in ANSI/IEEE C62.41.2 definitions for standard and optional waveform for location category C-High. Once the surge current has subsided, the SPD shall automatically restore normal operation and reset to a state ready to receive the next surge.

(5) Electromagnetic Interference. Luminaires shall comply with Title 47 CFR Part 15, Class A on unlicensed transmissions in a business, commercial, or industrial environment.

(6) Heat Dissipation. A passive thermal management system to dissipate the heat generated by operation shall be provided. Fans or other mechanical cooling systems shall not be used.

3. Sign Luminaires

Luminaires shall be 250W metal halide unless otherwise specified. Sign luminaires shall have the same requirements as roadway luminaires plus a shield that blocks the view of the refractor from an approaching motorist. This shall be accomplished by the design of the housing or by a shield fabricated from sheet aluminum, approximately 0.05 in. thick, and of sufficient size to be fastened onto the horizontal edge of the refractor holder with self tapping screws and placed between the refractor and approaching traffic.

Aluminum and steel structural members for luminaire supports shall include aluminum conduit, conduit clamps, fittings, and stainless steel screws.

4. Underpass Luminaires

Underpass luminaires shall have the same requirements as roadway luminaires except they shall have vandal shields and the ballast shall meet the same requirements except it may be mounted separately near the luminaire as shown on the plans.

5. High Mast Luminaires

The luminaires shall be in accordance with the American Standard Practice for Roadway Lighting by the Illumination Engineering Society and shall produce lighting patterns as shown on the plans. The ~~lamp in the~~ high mast luminaire *lamp or light source* shall be supported at both ends with mechanical spring grips or other means to hold the

lamp secure against vibration. The sockets shall be mogul sized and porcelain enclosed. The luminaire housing shall be an enclosed aluminum unit with a ~~reflector and~~ borosilicate glass refractor *or lens*. It shall include gasketing that will completely seal out dust, moisture, and insects from the interior of the optical assembly and retard the formation of an undesirable film from gaseous vapors on the optical assembly. *High pressure sodium luminaires shall have an aluminum reflector. High mast luminaires utilizing light sources other than HPS shall meet the requirements of 920.01(d)1 and 920.01(d)2.*
