

1                   **SECTION 760 – ROADWAY AND SIGN LIGHTING SYSTEMS**  
2   **MATERIALS**

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5   **760.01 Light Poles.** Light poles shall be made of aluminum or wood, conforming  
6 to requirements of AASHTO publication *Standard Specifications for Structural*  
7 *Supports for Highway Signs, Luminaires, and Traffic Signals*, and this subsection.  
8 Drawings for proposed poles shall be submitted in accordance with Subsection  
9 622.03(A) - Equipment List and Drawings.

10  
11       **(A) Aluminum Poles.** Aluminum poles shall be spun tapered from  
12 seamless aluminum tubing, alloy 6063-T6, conforming to ASTM B 221, with  
13 minimum thickness of 0.250 inch. Circumferential or longitudinal welds will  
14 be allowed only at lower end of pole where pole is joined to anchor base.  
15

16               Poles shall have anchor base consisting of permanent mold cast  
17 aluminum, alloy 356.0, conforming to ASTM B 108. Anchor bolts shall be  
18 stainless steel conforming to Subsection 718.01 - Standard Fasteners, and  
19 shall be of quantity and grade indicated in the contract documents. Poles  
20 mounted on walls and structures shall have anchor bases and side entry  
21 handholes. Poles mounted on bridge structures shall be equipped with  
22 vibration damper recommended by pole manufacturer and accepted by the  
23 Engineer.  
24

25               Grounding nut or screw on inner portion of pole shall be placed  
26 opposite handhole.  
27

28               Each pole shall be furnished complete with mast arm, base,  
29 ornamental pole top, base cover, and anchor bolts. Unless otherwise  
30 indicated in the contract documents, aluminum poles shall have polished  
31 natural aluminum finish and stainless steel hardware.  
32

33               Aluminum poles shall be protected during shipment with protective  
34 paper.  
35

36       **(B) Wood poles.** Wood poles shall be Southern Yellow Pine or Douglas  
37 Fir of length and class number as indicated in the contract documents. Wood  
38 poles shall have less than 180 degrees twist in grain over full length, and  
39 sweep shall be less than 4 inches. Tops of wood poles shall be beveled.  
40

41               After fabrication, wood poles shall be pressure treated in accordance  
42 with AWWA Use Category System UC4B, Commodity Specification D.  
43

**760.02**

43 **760.02 Luminaire Mast Arms.** Mast arms shall be made of seamless aluminum  
44 tubing conforming to ASTM B 221, and shall be of type, size, length, and rise, as  
45 indicated in the contract documents. Mast arms 8 feet long or shorter shall be  
46 tapered elliptical, self-supporting mast arms. Mast arms greater than 8 feet long  
47 shall be truss-type mast arms. Ends of mast arms shall be completed in two-inch  
48 slipfitter with inner-wired-type pole plates.

49  
50 **760.03 Luminaires for Roadway, Underpass, Sign, and Pedestrian Stairways**  
51 **Lighting.**

52  
53 **(A) Luminaires for Roadway Lighting.** Luminaires for roadway lighting  
54 shall be high-pressure sodium lamps, UL listed for wet locations.

55  
56 **(1) Housing.** Housing shall be rear-entry, cast aluminum, with  
57 two-inch slipfitter for inner wiring, polished aluminum reflector of  
58 snap-in design, and pressed glass refractor optical assembly.

59  
60 **(2) Ballast.** Ballast shall conform to the following:

61  
62 **(a)** Start and operate high-pressure sodium lamp from  
63 120/240-volt or 240/480-volt, single-phase; or 208/120-volt or  
64 480/277-volt, three-phase, 60-Hz power source.

65  
66 **(b)** Protect itself against normal lamp failure modes.

67  
68 **(c)** Provide reliable lamp starting and operation in ambient  
69 temperatures down to minus 22 degrees F for rated life of  
70 lamp. Ballast primary current during starting shall not exceed  
71 normal operating current.

72  
73 **(d)** Operate continuously at ambient air temperatures from  
74 minus 5 degrees F to 77 degrees F, without reduction in ballast  
75 life.

76  
77 **(e)** Have design life of not less than 100,000 hours.

78  
79 **(f)** Operate for at least six months, with lamp circuit in an  
80 open or short-circuited condition and without measurable  
81 reduction in operating requirements.

82  
83 **(g)** Fully comply with requirements of fixture manufacturers  
84 and lamp manufacturers. Submit certificate of compliance in  
85 accordance with Subsection 106.07 - Certificate of Compliance  
86 for ballast to be furnished.

87  
88 There shall be individual, easily accessible, in-line fuses in  
89 each phase leg for each luminaire.

90

91 For nominal line voltage and lamp voltage, ballast design  
92 center shall vary less than 5 percent from rated lamp wattage.

93  
94 Lamp wattage regulation spread at lamp voltage shall not  
95 exceed 8 percent for  $\pm 10$  percent line voltage variation at any lamp  
96 voltage from nominal through life.

97  
98 Ballast electrical data and lamp operating volt-watt traces shall  
99 be submitted for nominal and  $\pm 10$  percent rated line voltage to verify  
100 ballast performance and compliance with lamp specifications for rated  
101 life of lamp.

102  
103 Lamp current crest factor shall not exceed 1.8 for  $\pm 10$  percent  
104 nominal line voltage variation at any lamp voltage from nominal  
105 through life.

106  
107 Ballast design shall be such that normal manufacturing  
108 tolerance for capacitors of  $\pm 6$  percent will not cause more than a  $\pm 5$   
109 percent variation in regulation throughout rated lamp life for nominal  
110 line voltage.

111  
112 **(3) Lamp.** High-pressure sodium lamp shall be clear and shall  
113 have mogul base. Lamp wattage shall be as indicated in the contract  
114 documents.

115  
116 **(4) Illumination.** Luminaires shall provide roadway with minimum  
117 average maintained illumination value in accordance with  
118 manufacturer's specifications and IES light distribution type indicated  
119 in the contract documents. Photometric data with certification of  
120 conformance shall be submitted.

121  
122 **(5) Glare Shield.** Internal or external glare shield shall eliminate  
123 stray light above 90-degree nadir line for luminaires, as indicated in  
124 the contract documents. External shield shall be made of aluminum  
125 or zinc-coated steel.

126  
127 **(6) Photoelectric Control Receptacle.** Luminaires shall be  
128 furnished with or without photoelectric control receptacles, as  
129 indicated in the contract documents. When photoelectric control  
130 receptacle is included, rain tight shorting cap shall be installed.

131  
132 **(B) Luminaires for Underpass Lighting.** Luminaires for underpass  
133 lighting shall be high-pressure sodium lamps, UL listed for wet locations.

134  
135 **(1) Housing.** Die-cast housing shall enclose ballast, lamp socket,  
136 specular aluminum reflector, and refractor of molded, prismatic  
137 thermal, shock-resistant glass with polycarbonate vandal shield. Lens  
138 assembly shall be fastened by concealed hinges and single-point,

## 760.03

139 positive-acting latch. Fittings shall be non-ferrous. Unit shall be of  
140 size and IES light distribution type indicated in the contract  
141 documents.

142

143 **(2) Ballast.** Ballast shall be regulator-type,  $\pm 10$  percent of nominal  
144 source voltage, 60 Hz, for multiple circuits and high-pressure sodium  
145 lamps. Individual, easily accessible, in-line fuses shall be furnished in  
146 each phase leg for each luminaire.

147

148 **(3) Lamp.** High-pressure sodium lamp shall be clear and shall  
149 have mogul base. Lamp wattage and IES-type light distribution shall  
150 be as indicated in the contract documents.

151

152 **(C) Luminaires for Sign Lighting.** Luminaires for sign lighting shall be  
153 metal halide lamps, UL listed for wet locations.

154

155 **(1) Housing.** Aluminum, alzac reflector housing shall have high-  
156 impact-resistant glass cover with hinge and latch, and shall be of  
157 watertight construction. Bracket raceway shall be furnished with  
158 luminaire.

159

160 **(2) Ballast.** Metal halide lamp ballast shall be self-regulating at  
161 specified nominal voltage  $\pm 13$  percent, single phase, 60 Hz. Ballast  
162 shall be waterproof and mounted integral to the unit. Individual, easily  
163 accessible, in-line fuses shall be furnished in each phase leg for each  
164 luminaire.

165

166 **(3) Lamp.** Lamp shall be metal halide with lamp wattage and IES-  
167 type light distribution as indicated in the contract documents.

168

169 **(D) Luminaires for Pedestrian Stairways.** Luminaires for pedestrian  
170 stairways shall include cast aluminum, recessed box, with wire glass and cast  
171 aluminum louver cover, tamper proof screws, and medium porcelain socket.  
172 Luminaire dimensions and type shall be as indicated in the contract  
173 documents. Luminaires shall be UL listed for wet locations.

174

## 175 760.04 Cables and Wires for Roadway Lighting System.

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177 **(A) Cables and Wires.**

178

179 **(1) Circuit Cable.** Cable for 120/240 volt or 240/480 volt roadway  
180 lighting circuits shall conform to the following requirements: single  
181 conductor, 600 volt, AWG sizes as indicated in the contract  
182 documents; stranded copper, Type XHHW suitable for use at 167  
183 degrees F, with 2/32-inch-thick rubber insulation, and 3/64-inch-thick  
184 neoprene jacket. Rubber insulation and neoprene jacket shall  
185 conform to NEC, RHW/USE standards, and ICEA S-105-692  
186 standard.

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**(2) Pole Fixture Cable.** Connection of circuit cables from base of light pole or pull box to each luminaire shall conform to the following requirements: single conductor, 600 volt, No. 10 AWG, stranded copper, and Type XHHW or RHW. Unless otherwise indicated in the contract documents, ground conductors shall conform to the following requirements: single conductor, 600 volt, No. 6 AWG, stranded copper, Type XHHW or RHW. Ground conductors shall be installed in conduits.

**(3) Aerial Cable.** Unless otherwise indicated in the contract documents, aerial cable shall conform to the following requirements: No. 1/0 AWG copper, pre-assembled, RINJ-insulation, including copper-clad messenger.

**(B) Luminaire and Cable and Wire Identification.** Tags of rigid, non-ferrous material shall be affixed, with machine embossed legend on two sides with non-ferrous wire to feeder, branch feeders, and sub-branch cables and wires in pullboxes and light standard bases. Legend with 1/4-inch-high letters shall indicate feeder designation.

#### **760.05 Disconnect and Protective Devices.**

**(A) General.** Splices and taps shall be limited to minimum number. Conductor-to-conductor connections shall be made with hydraulically indented lugs.

**(B) Taps.** Taps from feeders to highway lighting luminaires shall be made at lighting standards, with standard connector kits that provide quick-disconnect, fused branch connection to feeder conductors. Waterproof taps shall have dielectric value equal to that of the insulation of conductors joined. Fuses shall be standard midget, ferrule-type, with ampere ratings as indicated in the contract documents.

**(C) Splicing.** Feeders shall be spliced with standard splicing kits of type recommended by cable manufacturer. Splices shall be waterproof and shall have dielectric value equal to that of the insulation of conductors joined.

**760.06 Waterproof Connectors for Roadway Lighting.** Where indicated in the contract documents, connector kits shall be of waterproof, molded rubber. Connectors shall be 600-volt, quick disconnect, in-line connectors, fused for ungrounded conductor and non-fused for neutral at each pole. Opening in line conductor connectors shall be suitable for cables furnished. Lubrication and taping shall be as recommended by manufacturer of connectors. Fused connectors shall accommodate standard midget, ferrule-type fuses with ampere rating as indicated in the contract documents.

## 760.07

235 **760.07 Photoelectric Control.** Photoelectric control unit shall have inrush  
236 current rating of 120 amperes. Photoelectric control shall withstand surge current  
237 up to 1,000 amperes. Chassis shall withstand hi-pot test of 5,000 volts.  
238 Cadmium-sulfide cells shall have 300 to 500 milliwatts maximum dissipation  
239 operating voltage range between 105 volts to 285 volts, and mounting features that  
240 conform to EEL Publication No. 148, NEMA Publication No. SH18-1959.  
241 Photoelectric control unit shall be UL listed for wet locations.

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243 Light level setting shall be adjustable from 0.5 to 3.0 foot-candles with time  
244 delay of up to three minutes. Light level setting shall be adjusted for turn on at  $0.7 \pm$   
245 0.2 foot-candles.

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248

**END OF SECTION 760**