



# Traffic Engineering, Operations & Safety Manual

Chapter 11 Lighting/Electrical/Electronic Systems

Section 6 Roadway Lighting Plan Production

## 11-6-1 Plan Production

April 2024

### POLICY

Biddable plans for construction **shall** be prepared as set forth by the guidelines in previous TEOpS chapters. The plans and specifications **shall** define the work as complete and accurate as possible, and they **shall** be stamped and signed by the engineer of record. The plans and specifications *should not* leave ambiguity as to bid items used to account for indicated work.

### REFERENCE TO STANDARDS

The plan production of roadway lighting **shall** conform to applicable provisions of [Chapter 15, Section 1 of the WisDOT Facilities Development Manual \(FDM\)](#). In addition, the roadway lighting plans **shall** comply with the latest edition of the following:

- [WisDOT Standard Specifications](#)
- [WisDOT Standard Detail Drawings](#)
- [WisDOT Standard Bid Items](#)
- [WisDOT Creating Special Provisions Manual](#)
- [WisDOT's Electrical Qualified Products List \(i.e., Approved Products List\)](#)

## 11-6-2 Plan Production – Roadway Lighting

April 2024

### GENERAL

Roadway lighting plans **shall** be stamped by a registered professional engineer in the State of Wisconsin on the title page of the plan or on the first page of the roadway lighting plans with an indication of how many pages were designed.

Each sheet in the set **shall** have the appropriate title block correctly indicating the project information.

WisDOT has prepared standard detail drawings (SDD's) which are available to the designer. The designer **shall** carefully review and apply standard details whenever possible to ensure consistent installation. The designer **shall** create and provide any additional construction details as required for a complete installation that are not covered by the SDD's.

Provide "General Notes" to clearly indicate the responsibilities of the installer to minimize questions during the bidding and installation process. Provide any additional notes required for removal, temporary, and final roadway lighting installations. Notes that apply to all sheets *should* be consolidated to a "Notes and Legend" section in the plan set to reduce redundancies. Notes that apply only to a specific sheet *should* be placed on that respective sheet.

A legend and list of abbreviations used **shall** be provided correctly indicating all symbols used on the project.

Plans **shall** indicate the right-of-way boundaries and include any walkways and bike paths.

All roadways **shall** be labeled and include station alignment identification.

All plan sheets **shall** include a scale for reference. A scale of 1:40 is appropriate for urban roadways and intersections. A scale of 1:100 is appropriate for rural and freeway applications and *should* be considered the maximum scale. One scale *should* be used for all sheets in one plan set.

Plan sheets and details **shall** include all critical dimensions.

A sample roadway lighting plan sheet is located in [FDM 15-1-20.11](#) attachment for reference.

### ROADWAY LIGHTING REMOVAL PLANS

Plans **shall** detail all required electrical infrastructure to be removed or abandoned and indicate if any infrastructure **shall** be discarded, salvaged, or relocated.

All plan sheets **shall** accurately indicate the existing electrical infrastructure to remain.

Removals *may* be combined with permanent roadway lighting plan for basic systems. More complex roadway lighting systems *should* have separate removal sheets.

**TEMPORARY ROADWAY LIGHTING PLANS**

If required, plans **shall** detail temporary roadway lighting including fixture types and locations, installation requirements, and temporary power wiring. Temporary roadway lighting plans *should* indicate work zone locations/stages and show any temporary connections to existing roadway lighting infrastructure and controls. Temporary roadway lighting plans **shall** detail any non-standard bid items used with the design.

Temporary roadway lighting plans *may* be combined with permanent roadway lighting plans for basic systems. More complex roadway lighting systems *should* have separate temporary roadway lighting sheets.

**PERMANENT ROADWAY LIGHTING PLANS**

Plans **shall** identify the electrical service location, including voltage, phase, and size. Special requirements and notes needed for a complete installation **shall** be included.

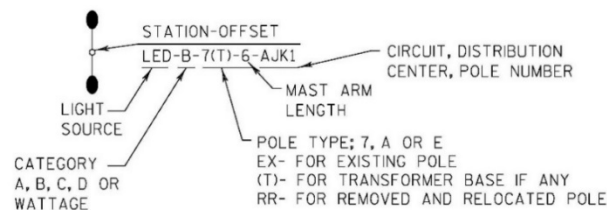
All existing utilities which could pose a conflict with the installation for the proposed roadway lighting **shall** be identified.

All new electrical infrastructure, symbols, conduit and wiring information, right of way lines, and text **shall** be printed in dark black. All other background information **shall** be printed in gray to easily distinguish the electrical information. Designers *should* include background linework for structures, overhead signs, underground pipes, and other pertinent project features.

Plans **shall** show all new roadway light standards, high mast towers, underpass lighting, walkway lighting, and roadway lighting controller locations. Special conduit installation requirements, i.e., installation under existing pavement, **shall** be identified on the plans.

Plans **shall** clearly label all luminaires and pull boxes. See Figure 1 below for an example of luminaire labeling.

**Figure 1. Luminaire Labeling Example**



Plans **shall** clearly indicate all conduit sizes and locations, and wiring information for each roadway lighting circuit. See Figure 2 below for examples of circuit callouts.

**Figure 2. Circuiting Callout Examples**

CIRCUIT CALLOUT LEGEND	
3 # 2 A,B,N, 1 # 8 GND, CID	PROPOSED CABLE IN DUCT WITH 3 # 2 AWG CONDUCTORS (HOT LEG A, HOT LEG B, NEUTRAL) AND 1 # 8 AWG GROUND CONDUCTOR
2" C, 3 # 6 C,D,N, 1 # 8 GND	PROPOSED 2 INCH CONDUIT WITH PROPOSED 3 # 6 AWG CONDUCTORS (HOT LEG C, HOT LEG D, NEUTRAL) AND 1 # 8 AWG GROUND CONDUCTOR
2" C EXISTING 3 # 4 A,B,N 1 # 8 GND	EXISTING CONDUIT WITH PROPOSED 3 # 4 AWG CONDUCTORS AND 1 # 8 AWG GROUND CONDUCTOR
3 # 8 G,H,N, 1 # 8 GND, CID EXISTING	EXISTING CABLE IN DUCT WITH EXISTING 3 # 8 AWG CONDUCTORS AND 1 # 8 AWG GROUND CONDUCTOR
2" C, 3 # 2 J,K,N, 1 # 8 GND (EXISTING)	EXISTING 2 INCH CONDUIT WITH EXISTING 3 # 2 AWG CONDUCTORS AND 1 # 8 AWG GROUND CONDUCTOR

**11-6-3 Special Provision Preparation – Roadway Lighting****April 2024**

WisDOT has prepared standard specifications which are available to the designer. The designer **shall** carefully review and apply the standard specifications whenever possible to ensure consistent installation. The designer **shall** create and provide any additional special provision (SPV) specifications as required for a complete installation.

Designers *may* encounter scenarios where a standard bid item needs to be modified according to the project requirements. In these instances, the designer is permitted to modify a standard specification rather than create a new SPV. Modifications to standard specifications *should* be coordinated with the Regional Lighting Engineer.

Each SPV **shall** be provided with its own unique name and number, description detailing the equipment/devices to be provided and installed, and all associated work to be performed for that specific pay item. Each pay item **shall** include the following: description of work, materials, construction, units of measurement, and basis of payment.

Specifications **shall** be clear, concise, and complete.

Each SPV name and numbering **shall** match those used in the list of quantities.

**11-6-4 Quantities and Cost Estimate Preparation – Roadway Lighting****April 2024**

Each item to be removed, modified, or installed **shall** be accounted for in a list of standard bid items and SPV item quantities to be included in the plan set.

A complete cost estimate based on the list of quantities **shall** be provided for the project. The designer **shall** use the historical data collected by WisDOT and their best engineering judgment to provide an accurate estimate.

**11-6-5 Submittal Requirements – Roadway Lighting****April 2024**

Electrical design documents **shall** be submitted for review and approval by WisDOT at the following stages: 30%, 60%, 90%, and final. The following sections detail the required materials that are typically submitted for each design development stage.

**30% PLAN SUBMITTAL**

The designer **shall** submit all appropriate request forms, preliminary permit applications, and roadway lighting investigation report as required in TEOpS [11-1](#) and [11-2](#). The designer **shall** obtain all necessary approvals prior to completing the full preliminary design.

Preliminary roadway lighting plans *may not* be required at this stage, but designers *should* develop a preliminary estimate of costs. High mast lighting and plans that will incorporate roadway lighting poles mounted on structure or median barriers *should* be considered at this stage.

Designers *should* submit any roadway lighting alternatives analysis to the Regional Lighting Engineer by the 30% submittal.

**60% PLAN SUBMITTAL**

Plans **shall** be prepared and include the correct title block, appropriate legends, and preliminary notes. Plans **shall** address any comments made during the 30% review process. The plans **shall** incorporate as much detail as possible.

Temporary roadway lighting requirements **shall** be addressed as part of the Transportation Management Plan (TMP), and preliminary layout included if required.

Plans **shall** be coordinated with underground and overhead utilities in the vicinity of each luminaire to ensure there is no conflict. Provide location(s) for roadway lighting control cabinet(s).

The roadway lighting **plans shall** include luminaire station labels, along with circuit and conduit labeling.

The designer **shall** submit the completed illumination design output to the Regional Lighting Engineer for review and approval. The illumination design **shall** include:

- A copy of the approved illumination form (signals and roundabouts).
- The preliminary design layout showing illumination contours (when appropriate).
- Photometric calculations with summary information showing compliance with illumination and uniformity

criteria.

- Transition roadway lighting calculations (as applicable).
- Verification of luminaire cut sheets and .IES files to be used in the design.

The designer **shall** provide a preliminary list of special provisions, pay items, and an updated construction cost estimate.

### **UTILITY (DT1078) PLAN SUBMITTAL**

Plans **shall** address any pertinent comments made during the 60% review process and at a minimum include locations of all light poles, control cabinets, pull boxes, conduit, and other infrastructure necessary to evaluate utility conflicts.

Electrical service coordination *should* begin during this submittal phase. All potential conflicts with utilities *should* be reviewed, identified, and coordinated.

### **90% DRAFT PLAN SUBMITTAL**

Plans **shall** address any additional comments made during the 60% review process, as well as utility conflicts identified from the DT1078 review.

The designer **shall** submit any final permit applications as required in TEOpS [11-1](#) and [11-2](#).

Permit applications *should* be approved prior to completing the 90% plan submittal.

Coordination *should* be done with local agencies for cost sharing when applicable.

Temporary roadway lighting (when applicable) **shall** have been coordinated with the construction staging and maintenance of traffic plan.

The plans **shall** include all plan sheets (removal, temporary, and permanent), miscellaneous quantities, SPVs, construction cost estimate, a list of applicable standard detail drawings, and any unique installation construction details.

Voltage drop calculations as required in [TEOpS 11-5](#) **shall** be submitted for review.

### **FINAL PLAN SUBMITTAL**

All final bidding documents **shall** address any comments made during the 90% review process.

Final plans, miscellaneous quantities, and special provisions **shall** be complete and accurate for the intent of bidding and construction.

The plans **shall** include all plan sheets (removal, temporary, and permanent), miscellaneous quantities, SPVs, final construction cost estimate, list of applicable standard detail drawings, and any unique installation construction details.

### **AS-BUILT DRAWINGS**

As-Built record drawings **shall** be submitted by the installation contractor upon final completion of all electrical installations as required on the plans and specifications prior to final payment. The installation contractor **shall** provide a plan redlining any deviations from construction plans made in the field and provide the GIS coordinate information for the final lighting equipment locations for WisDOT use. Final plans *should* be updated to reflect the red-lined changes and be clean and free of revision clouds and triangles.

### **SHOP DRAWINGS**

Shop drawings **shall** be submitted by the installation contractor and reviewed by the construction oversight engineer in accordance with the guidelines described in the [WisDOT Construction and Materials Manual \(CMM\)](#).

### **CONSTRUCTION CHECKLISTS**

Refer to [Figure 655-2](#) of the [Construction and Materials Manual \(CMM\)](#) for the Lighting Installation Checklist which is to be used to inspect system lighting installations in the field. The contractor is required to perform tests and demonstrate that the completed lighting is acceptable.