

February 10, 2004
TRAFFIC ENGINEERING DIRECTIVE
102-3

Supersedes TED 102-2

SUBJECT: ROADWAY LIGHTING DESIGN

Roadway lighting design is to conform to current specifications (Section 662) and the Traffic Engineering Division standard drawings (TEL'S) pertaining thereto.

Additional specifications will seldom be necessary and the lighting designer should avoid their use. Many special problem areas, such as special attachments to bridges or retaining walls, large service and control stations, toll booths and weigh stations may be covered by plan notes and/or special details. However, any additional specifications that the lighting designer deems necessary should be submitted to the Traffic Engineering Division for approval as early as possible during plan development. When working for Engineering Division, Consultants should make such submissions through that Division.

- A. In the design of roadway lighting systems the following items are to be given consideration:
1. It is recommended that the lighting designer and Traffic Engineering Representative conduct a pre-design meeting to discuss all lighting design parameters that apply other than that which was discussed at scope of work.
 2. The feasibility of steel high-mast lighting (towers) in lieu of conventional lighting shall be a design consideration unless otherwise stated in the scope of work.
 3. High pressure sodium shall be used on new installations and replacements for mercury vapor luminaires. In highly unusual cases, other types of luminaires may be proposed but must receive the approval of Traffic Engineering Division. The preferred design is 250W-240V HPS cobra head at 40.0 feet mounting height. Above 40.0 feet mounting height, consideration should be given to using 400W HPS. The preferred wallpack design is 150W-240V HPS at appropriate mounting height allowing for higher illumination levels generally not to exceed twice the level of the adjacent roadway.
 4. Electrical systems shall be 3-wire, single phase, 60 Hertz, with voltage configuration of 120/240V with ground or 240/480V with ground as shown on top portion of TEL-01. The 240V ballast is to be used if at all possible. Adjacent lights on a roadway/lighting run should be on alternate circuits. If lighting is City/Power Company maintained, check with City/Power Company for ballast voltage.

5. Service and control stations shall be placed in a location easily accessible to maintenance forces and kept out of low places which may collect water. The decision as to whether a control station is to be pole mounted or ground mounted should be referred to the Traffic Engineering Division. This decision will be based on system size, aesthetics, room, accessibility, City/Power Company desires, etc. Photo cells are to be located on conduit at minimum of 12 inches above lighting control cabinets, as a first option.
6. Lighting poles shall be steel (unless otherwise approved by Traffic Engineering Division) and shall be located after considering the safety aspects as follows:
 - a) Keep the pole out of clear zone if feasible, but if not, install an approved breakaway base (presently an Aluminum Transformer Base as shown on Standard Detail TEL-18).
 - b) Avoid locating a pole on steep slopes i.e., where the negative side slopes are steeper than 6:1 between the roadway and the luminaire support.
 - c) When locating a lighting pole behind a traffic barrier, the pole shall be a breakaway design if it is within the design deflection distance of the barrier.
 - d) Avoid mounting the pole on top of a median barrier, and any such shall be preapproved by Traffic Engineering Division.
 - e) May be located as part of parapet wall for bridges, retaining walls, etc. but try very hard to emplace such using a pilaster (blister) (secondary option is a lighting support base like that shown on TEL-17A). In any case, contact Traffic Engineering Division in these situations since anchor bolts and bolt circles are critical.

As much consistency as possible is desired within poles, e.g., anchor bolt circle, all same type (all steel or aluminum, all truss or single arm). Odd sized mounting heights and spreads shall not be used because of unavailability or high costs. The following are standard mounting heights and spreads for various types of lighting poles.

Type I-	MHS-35-40-45-50 Spreads 8-10-12-15-16-18-20-22-24
Type II-	MHS-35-40-45-50 Spreads 2-4-6-8-10
Type IV-	Wood Pole-contact Traffic Engineering Division
Type V-	MHS-35-40-45-50 Spreads 8-10-12-15-16-18-22-24

If spreads of over 22.0 feet are needed, then consideration shall be given to using pole top mounted expressway luminaires, or relocation of poles.

8. Roadway lighting and traffic signal conductors shall be placed in separate conduits and junction boxes, although in special cases the same junction boxes may be used if the wiring is properly tagged and Traffic Engineering Division approval is obtained. However, if both systems are designed to operate on the same distribution center and voltage, the two systems may be placed in the same conduit provided they are properly tagged. Traffic signal communication cable (interconnect) should be in separate raceways.
9. Navigation lighting shall be designed to operate at 120V (preferred) or 240V, and shall be separated from roadway lighting and traffic signals. For aviation (beacon) lighting, contact Traffic Engineering Division. Owner (DOH) maintained transformers are not to be called for in design of these systems.
10. Conduit sizes shall be a minimum of 2 inches for all main and feeder circuits, minimum of 1.5 inches for all navigation lighting feeder circuits, minimum of 1 inch for all navigation lighting tap circuits, and 1 inch minimum for all tap circuits to luminaire supports on structures. Conduit runs under the roadway (mainline) shall be 3 inches minimum (alternate is two separate two-inch conduits).
11. Wiring sizes shall be calculated and submitted using the 5% voltage loss rule. Both the wire size and number of conductors shall be noted on the plans. A plan note shall make the contractor responsible for sizing all wire in accordance with the load requirements (all feeder wires shall be a minimum size of No. 8 AWG, all tap wires shall be a minimum size of No. 10 AWG).

B. Lighting Plan Assembly will generally include the following:

1. Standard Title Sheet (If a separate construction contract).
2. Summary of Quantities, Lighting Notes, Legend and Tables (for large projects).
3. Photometric Data (or reference thereto).
4. Plan Sheets (sufficient scale to adequately show the following):
 - a. Control Stations and Pole locations by designation number and station number.
 - b. Pavement edges (provided on Preliminary Field Review Submission)
 - c. County lines
 - d. Urban area and/or city limits
 - e. Guardrail
 - f. Drainage
 - g. Utilities (as applicable)
 - h. Right of way and North arrows
 - i. Overhead Sign Supports
 - j. Tentative Service drop location(s) to include pole number (provided on Preliminary Field Review Submission, to coordinate with the Power company).
5. Circuit Diagram(s)
6. Special Details (as required).
 - a. Underpass/Underbridge lighting details.
 - b. Underbridge conduit details.
 - c. Special bridge details (e.g., junction boxes and pole attachments).

- d. Special foundations (e.g., towers or for median barrier).**
- e. Location of ground rods.**
- f. Grounding system for bridges and/or other large structures.**
- g. Wiring for large service and control stations.**
- h. Navigation lighting system equipment and attachments to structures.**

C. The procedure for Submissions and Distributions is to be as follows:

In general conformance with the latest copy of DD-202 for Traffic Engineering Division to receive 1 copy of construction drawings plus 2 additional copies of lighting drawings.

1. Preliminary Field Review

- a. Appropriate photometric calculations based upon the parameters agreed upon with Traffic Engineering Division.**
- b. Preliminary layout to include poles, conduits, junction boxes, control system locations, etc.**

2. Final Field Review

- a. Notes, legends and Tables**
- b. Completed plan layout sheets with Control Stations and Power Services.**
- c. Circuit (wiring) Diagrams (if necessary).**
- d. Special Details**
- e. Steel high-mast footer calculations (based on borings)**
- f. Voltage drop wiring size calculations**
- g. Transformer size calculations (if necessary).**

3. Final Office Review

The entire revised lighting portion of plans to be submitted at this review including all quantity tabulations.

Barry Warhafftig, P.E.
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