

CHAPTER 8

TRAFFIC SIGNAL DESIGN – MISCELLANEOUS INFORMATION

8.1 Signal Control for Private Driveways within Signalized Intersections

Traffic signal control for a private driveway should be considered if the private driveway is located within signalized intersections. When a traffic signal is installed based on the pedestrian or school crossing warrant (Warrants 4 or 5), pedestrian signals should control the private driveway. Split-phase operation for low-volume driveways should be considered and detection should always be provided for the approach to avoid unnecessary delays on other approaches. Engineering judgment should be used in all cases.

8.2 Utilities

The Tennessee One-Call System (also known as 811) should be contacted before work starts on any traffic signal installation. The following is relevant information regarding work with utility companies:

- Utility companies should expose/mark/relocate utilities;
- Check for any additional underground and overhead utilities;
- Check for required permits;
- Keep utility company's contact information onsite for any emergencies;
- Keep authorization documents (eg. ticket number) at the worksite;
- Notify utility companies before starting to dig;
- When in doubt, hand dig or Hydro Vacuum should be utilized;
- Uniform color-coding is used to identify underground utilities, such as:
 - White: Proposed Excavation
 - Pink: Temporary Survey Markings
 - Red: Electric Power Lines, Cables, Conduit and Lighting Labels
 - Yellow: Gas, Oil, Steam, Petroleum, and Gaseous Materials
 - Orange: Communication, Alarm or Signal Lines, Cables or Conduits
 - Blue: Potable Water
 - Purple: Reclaimed Water, Irrigation and Slurry Lines
 - Green: Sewers and Drain Lines
- For overhead utilities, proper insulation should be placed on signal poles and utility wires.

8.3 Street Lighting on Traffic Signal Supports at Intersections

See Traffic Design Manual Module 2 (Lighting Design Manual) for lighting design information. More specifically, street lighting may be justified at signalized intersections as follows:

- **Urban Locations:** In urban areas where street lighting already exists along the highway;
- **Rural Locations:** In rural locations where street lighting at the intersection would have a positive effect on the nighttime safety.

8.3.1 Street Light Support Design

Where used on mast arms or strain poles, the design of the street light support must be integrated with the traffic signal support. The pole manufacturer must provide an acceptable design for review by TDOT.

8.3.2 Luminaire Mounting Height

The luminaire for the street lighting is typically mounted a minimum of 30 feet above the roadway. The actual mounting height shall be determined by the luminaire photometrics.

8.3.3 Wiring Requirements

The following requirements should be observed:

- **Circuit Breaker:** A disconnect and fuse shall be located at the power pole location;
- **Wire Type:** 1-2 conductor, #6 AWG;
- **Conduit Size:** One inch diameter RGS;
- **Isolation:** Street light conductors shall not be routed through the controller cabinet and shall have separate conduits and pull boxes;
- **Pull Boxes:** Pull boxes used in lighting applications should be a maximum of 300 feet apart.

8.4 Traffic Signal Installation Inspection Guidelines

The primary goal of this section is to assist TDOT with the inspection guidelines of traffic signal installations by ensuring that construction is performed in accordance with the plans, specifications, and related contract provisions. Inspectors should be properly trained and be familiar with all the typical traffic signal construction activities.

8.4.1 Responsibilities of the Inspector

Some of the responsibilities of the inspectors are:

- Work with the contractor to make sure that construction of the traffic signal installation is completed safely with proper protection of the contractor's employees, the traveling public, and pedestrians in or adjacent to the work area;
- Verify that the items of work are done in accordance with the special provisions, the plans, Standard Drawings and in conformance with industry standards;
- Know the scheduling and status of construction activities, including the coordination of utility work that may affect the progress of construction;
- Coordinate with project engineer any necessary changes in the original project. Document any changes;
- Maintain a project diary, documenting construction activity, equipment test results, pay item measurements, etc. Taking pictures is recommended. These records will be the basis for final inspection and approval;
- Verify that materials installed are approved by the traffic signal owner's agency;
- Prior to turn-on, check traffic signal system in conjunction with project engineer that all components are operating properly according to the design plans;
- Follow traffic signal activation procedures in Section 8.5.

8.4.2 Preconstruction Activities

A preconstruction conference with the contractor and other interested parties (e.g. utilities, etc.) is normally conducted on traffic signal installations. The project engineer and inspector(s) should thoroughly review the plans and specifications and visit the project site, making special note of any potential conflicts or items that might require clarification or field modification. During the conference, the responsibilities of each party are determined as well as the establishment of safety procedures to be adopted throughout the construction process.

8.4.3 Sampling and Testing of Materials

Before construction, the contractor should submit a detailed list of suppliers and anticipated delivery dates for all materials to be used on the job. This list is commonly supplied and discussed at the preconstruction conference. Typically, the following materials require approval before installation:

- Traffic signal structural support;
- Traffic signal controllers;
- Flasher units;
- Signal heads (vehicular and pedestrian);
- Detection systems and detection amplifiers;
- Pedestrian pushbuttons and accessible pedestrian signals (APS) (if applicable);
- Preemption systems (if applicable);
- Wiring.

It is good practice to maintain documentation accepting the materials used in the project.

8.4.4 General Principles

The inspector should maintain a cooperative and positive attitude with the contractor while closely adhering to the contract documents. The inspector should work with the contractor and project engineer to resolve any issues that arise during the project. Nevertheless, the inspector does not work for the contractor, and should not direct any of the contractor's personnel in any facet of the construction activity. Providing direction or instruction assumes responsibility for the actions of the contractor and the outcome of the project. The inspector should maintain professional separation from the contractor and focus on documentation and reporting.

8.4.5 Inspection Activities

It is recommended for the inspector to regularly visit the project site to assure that all steps of the traffic signal installation have been closely monitored. The lack of regular inspection can lead to an agency experiencing operational problems soon after the work is completed and accepted. A high quality installation should provide years of reliable service. Moreover, proper documentation of inspection activities constitutes an essential part of the project records and may be subject to review during an audit, investigation, or litigation proceedings. Proper documentation should include project diaries, inspection and test reports, change orders, meeting notes, etc. There are several steps of the traffic signal installation process that cannot be simply visually inspected during a final inspection of the signal system. For example, placement, depth, slope and bonding of conduits, foundation excavation depth and type of steel

reinforcement bars, number of turns of a loop detection wire, etc. Basically, the inspector should check and document all steps of the traffic signal installation, including the construction of underground facilities, according to the project design and standard specifications. Before the traffic signal system can be turned on, a final and thorough inspection of the installation should be performed. The use of the following checklist(s) is recommended for the inspection of traffic signal installations in the State of Tennessee:

- **Preliminary Hardware Inspection:** It is recommended that the inspector carefully complete this preliminary report before the traffic signal activation date. A representative of the contractor should be available for any necessary clarifications;
- **Activation Day Inspection:** It is recommended that the inspector and the project/traffic engineer complete this report to check for proper operation of the traffic signal system. The contractor should give a one week notice before requesting for signal activation assistance. A representative of the contractor should be available for any necessary clarifications.

The checklists may be tailored according to agency needs. Each item on the list should be checked with the plans provided. Consideration should be given to overall workmanship and quality of equipment installation. Notes should be specific, dated, and initialed. Appendix C provides additional guidelines and forms on inspection activities.

8.4.6 Final Acceptance and Notification

Upon satisfactory completion of the inspection activities, the contractor should be formally notified of final acceptance in writing.

8.5 Traffic Signal Activation Procedures

Activation of a new traffic signal is a critical part of the signal installation process. The traffic signal designer should consider the possible consequences of a change in traffic control and add any notes and items which may improve the safety of the transition period. When signalization is introduced at locations where a multi-way stop, flashing beacon operation exists, special measures may be required.

The following steps are recommended for the activation of a new traffic signal:

- **Advance Flash Period:** To make motorists aware of its presence, a new traffic signal installation should be put on flash operation for a minimum of seven calendar days up to a maximum of 14 calendar days prior to the activation of normal traffic signal operation. Other flash operation time periods can be considered upon written approval from the Regional Traffic Engineer;
- **Publicity:** The date and time of the activation of stop and go operation should be advertised in the local newspaper and on local radio stations both, prior to and on the date of activation;
- **Activation:** The actual activation of normal stop and go operation should be made during an off-peak traffic period (not on Fridays or before holidays);
- **Technical Support:** The contractor shall be on-hand for all new traffic signal activations to immediately troubleshoot or fix any problems that arise;
- **Signing Adjustments:** Once the traffic signal is turned on normal traffic signal operation, remove the stop signs that the traffic signal replaces;
- **Police Assistance:** Police assistance should be requested and be on site at the time of traffic signal activation to provide emergency traffic control in case of a malfunction and to help emphasize the new traffic control change to the motorists;
- **School Crossing:** Should the intersection include a school crossing with a crossing guard, the crossing guard should be familiarized with the operation of the new traffic signal;
- **Fine-Tuning:** Shortly after the traffic signal is turned on, the engineer should observe the signal's operation during both peak and off-peak periods (AM and PM) to assure the adequacy of the signal's timing parameters. Late night operation should also be checked.

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