

# CHAPTER 1

## INTRODUCTION

### 1.1 About this Manual

This manual is prepared in conjunction with the TDOT Roadway Design Guidelines to aid in the development of construction plans involving traffic signals, roadway lighting, signs, pavement markings, and minor intersection improvements. Where any conflict occurs between these manuals in the areas of project management or plans development, the TDOT Roadway Design Guidelines should be followed. Although this manual is not intended to provide the ultimate answers to all traffic engineering questions, the guidelines listed do represent the preferred procedures for developing traffic signal, roadway lighting, signing, and pavement marking construction plans.

The technical requirements of this manual should be used in the design of any traffic control devices that will be placed on a state highway, regardless of whether or not it is part of a TDOT construction project. Any devices installed on state highways by local forces or directly for a local agency shall adhere to this manual, unless otherwise noted in the construction plans.

The purpose of this manual is to present the concepts and standard practices related to the design of traffic control systems within the State of Tennessee. The following is a list of the chapters contained in this manual:

- Chapter 1: Introduction
- Chapter 2: Traffic Studies (Future Chapter)
- Chapter 3: TDOT Project Development
- Chapter 4: Justifying the Need for Traffic Signals
- Chapter 5: Traffic Signal Design – General Information
- Chapter 6: Traffic Signal Design – Cabinets and Equipment
- Chapter 7: Traffic Signal Design – Operation and Coordination
- Chapter 8: Traffic Signal Design – Detection
- Chapter 9: Traffic Signal Design – Supports and Signal Heads
- Chapter 10: Traffic Signal Design – Pull Boxes, Conduits, and Wiring
- Chapter 11: Traffic Signal Design – Miscellaneous Information
- Chapter 12: Traffic Signal Design – Post-Installation
- Chapter 13: Other Types of Traffic Signals
- Chapter 14: Signing and Pavement Markings
- Chapter 15: Roadway and Intersection Lighting

## 1.2 Standard Abbreviations

Standard abbreviations referred to within this Traffic Design Manual include, but are not limited to, the following sources:

- AADT – Annual Average Daily Traffic
- AASHTO – American Association of State Highway and Transportation Officials
- ADA – Americans with Disabilities Act
- ANSI – American National Standards Institute
- ASCT – Adaptive Signal Control Technology
- ATC – Advanced Transportation Controller
- ATSPM – Automated Traffic Signal Performance Measures
- ATSSA – American Traffic Safety Services Association
- AWG – American Wire Gauge
- BBS – Battery Backup System
- BIU – Bus Interface Unit
- C – Cutoff
- CADD – Computer-Aided Design Drafting
- CBD – Central Business District
- CFL – Continuous Freeway Lighting
- CFR – Code of Federal Regulations
- CIL – Complete Interchange Lighting
- CMB – Concrete Median Barrier
- CMU – Conflict Monitoring Unit
- COE – Corps of Engineers
- CU – Coefficient of Utilization
- EF – Equipment Factor
- FDW – Flashing Don't Walk
- FHWA – Federal Highway Administration
- HCM – Highway Capacity Manual
- HCS – Highway Capacity Software
- HDPE – High-Density Polyethylene
- HID – High-Intensity Discharge
- HPS – High Pressure Sodium
- ID – Identification

- IES – Illuminating Engineering Society
- IMSA – International Municipal Signal Association
- ITE – Institute of Transportation Engineers
- ITS – Intelligent Transportation Systems
- LDDF – Luminaire Dirt Depreciation Factor
- LED – Light Emitting Diode
- LLDF – Lamp Lumen Depreciation Factor
- LLF – Light Loss Factor
- LOS – Level of Service
- LPS – Low Pressure Sodium
- LRT – Light Rail Transit
- LRTP – Long Range Transportation Plan
- MH – Metal Halide
- MMU – Malfunction Management Unit
- MOE – Measures of Effectiveness
- MOA – Memorandum of Agreement
- MOU – Memorandum of Understanding
- MUTCD – Manual on Uniform Traffic Control Devices
- MV – Mercury Vapor
- N/A – Not Applicable
- NC – Non-Cutoff
- NCHRP – National Cooperative Highway Research Program
- NEC – National Electrical Code
- NEMA – National Electrical Manufacturers Association
- NESC – National Electrical Safety Code
- NFPA – National Fire Protection Association
- PDF – Portable Document Format
- P.E. – Professional Engineer
- PIL – Partial Interchange Lighting
- PTOE – Professional Traffic Operations Engineer
- PVC – Polyvinyl Chloride
- RGS – Rigid Galvanized Steel
- RTOR – Right Turns On Red

- SC – Semi-Cutoff
- SEA – Systems Engineering Analysis
- SOP – Standard Operating Procedure
- STV – Small-Target-Visibility
- TAS – Traffic Access Study
- TCA – Tennessee Code Annotated
- TDEC – Tennessee Department of Environment and Conservation
- TDOT – Tennessee Department of Transportation
- TIP – Transportation Improvement Program
- TIS – Traffic Impact Study
- TMP – Transportation Management Plan
- TOD – Time-of-Day
- TRB – Transportation Research Board
- TRPS – Traffic Responsive Plan Selection
- TSP – Transit Signal Priority
- TVA – Tennessee Valley Authority
- TWRA – Tennessee Wildlife Resources Agency
- UPS – Uninterruptible Power Supply

### **1.3 Standard References**

Standards, specifications, and references referred to within this Traffic Design Manual include, but are not limited to, the following sources (latest edition unless otherwise noted):

- TDOT – Roadway Design Guidelines
- TDOT – Intelligent Transportation Systems Design Guidelines
- TDOT – Standard Traffic Operations, Roadway, and Structures Drawings
- TDOT – Standard Specifications for Road and Bridge Construction
- TDOT – Tennessee Supplement to the Standard Highway Signs
- TDOT – Special Provisions
- TDOT – Survey Manual
- FHWA – Manual on Uniform Traffic Control Devices, 2009 Edition
- FHWA – Standard Highway Signs
- FHWA – Traffic Signal Timing Manual

- FHWA – Traffic Detector Handbook, Volumes 1 and 2
- FHWA – Performance Measurement Fundamentals
- FHWA – Lighting Handbook
- ITE – Traffic Control Devices Handbook
- ITE – Traffic Engineering Handbook
- ITE – Manual of Traffic Signal Design
- ITE – Traffic Signal Installation and Maintenance Manual
- ITE, IMSA – Traffic Signal Maintenance Handbook
- TRB – Highway Capacity Manual, 2010 Edition
- US Access Board – Proposed Right-of-Way Accessibility Guidelines (PROWAG)
- ITS America – Transit Signal Priority Handbook
- AASHTO – LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals
- AASHTO – A Policy on Geometric Design of Highways and Streets (i.e. Green Book), 2012 Edition
- AASHTO – An Informational Guide for Roadway Lighting, 2005 Edition
- AASHTO – Roadway Lighting Design Guide
- AASHTO, ITE, NEMA – Advanced Transportation Controller Standards
- NEC, NESC – Electrical Codes
- NEMA – Standards

## 1.4 Traffic Control Devices

Traffic control devices are defined by the MUTCD as all traffic signals, signs, pavement markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, private road open to public travel, pedestrian facility, or shared-use path by authority of a public agency or official having jurisdiction, or, in the case of a private road open to public travel, by authority of the private owner or private official having jurisdiction. Shared-use path is defined as a bikeway outside the traveled way and physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent alignment. Shared-use paths are also used by pedestrians (including skaters, users of manual and motorized wheelchairs, and joggers) and other authorized motorized and non-motorized users. The purpose of traffic control devices, as well as the principles for their use, is to promote highway safety and efficiency by providing for the orderly movement of all road users on streets and highways. Traffic control devices notify road users of regulations and provide warning and guidance needed for the safe, uniform, and efficient operation of all elements of the traffic stream.

## 1.5 Design of Traffic Control Devices

The design of traffic control devices must be carefully prepared by a qualified individual in the traffic engineering profession whose specialty is in traffic engineering. The qualified individual who is responsible for the traffic engineering construction plans of the project shall be a registered professional engineer in Tennessee and in good standing. The TDOT Traffic Engineering Office also recognizes the certification of a PTOE. The proper design and use of traffic control devices can result in an efficient and safe transportation system. However, improper or inadequate design can result in system inefficiency, decreased safety and potential liability. In addition to this TDOT Traffic Design Manual, other TDOT design information is available on TDOT's web site at [www.tn.gov/tdot](http://www.tn.gov/tdot).

## 1.6 TDOT Traffic Operations Division, Traffic Engineering Office

The TDOT Traffic Operations Division, Traffic Engineering Office is responsible for the development of traffic signal, signing (overhead and street name signs), and roadway lighting construction plans, either as stand-alone projects or in support of larger roadway design projects administered by TDOT.

### 1.7 Governing Laws, Rules and Regulations

State laws, which govern the process of determining the need for and the installation of traffic control devices on all streets and highways in Tennessee, include:

➤ **T.C.A. 54-5-108. Cooperation by department with federal government in designating roads, and in erection of danger signals and safety devices;**

.... (b) The department has full power, and it is made its duty, acting through its commissioner, to formulate and adopt a manual for the design and location of signs, signals, markings, and for posting of traffic regulations on or along all streets and highways in Tennessee, and no signs, signals, markings or postings of traffic regulations shall be located on any street or highway in Tennessee regardless of type or class of the governmental agency having jurisdiction thereof except in conformity with the provisions contained in said manual.

➤ **T.C.A. 54-5-601. Maintenance of signal light on state highway without commissioner's approval - Misdemeanor.**

Any person who installs or maintains a signal light on a state highway without having secured prior written approval of the commissioner commits a Class C misdemeanor.

➤ **T. C.A. 54-5-602. Signal light declared public nuisance.**

In addition, a signal light installed and maintained on a state highway without the authority of the commissioner is hereby declared a public nuisance which may be abated by the employees of the department at the direction of the commissioner or, upon the commissioner's request, by any peace officer, or by civil actions or suits brought in the circuit or chancery courts as provided by the general law.

➤ **T C.A. 54-5-603. Inapplicable within boundaries of municipal corporation.**

*This part does not apply within the boundaries of municipal corporations.*

Under the Uniform Administrative Procedures Act, the Manual on Uniform Traffic Control Devices (MUTCD) and subsequent revisions are part of the Rules and Regulations of the State of Tennessee, Department of Transportation as certified by the Secretary of State (Tennessee Rule 1680-03-01). The MUTCD shall serve as the basis for the choice and installation of all traffic control devices installed in State of Tennessee, Department of Transportation roadway projects.

*[This page intentionally left blank.]*