
CHAPTER 1 - GENERAL INFORMATION

Table of Contents

1-1.00 INTRODUCTION	1-2
1-1.1 Purpose of the Traffic Engineering Manual	1-2
1-1.2 Scope of the Manual	1-2
1-1.2.1 Relationship to the Minnesota Manual on Uniform Traffic Control Devices.....	1-2
1-1.2.2 Relationship to MnDOT Policies.....	1-2
1-1.2.3 Relationship to Other MnDOT Manuals.....	1-2
1-1.2.4 Complementary References.....	1-3
1-1.3 Organization of the Manual	1-3
1-1.4 Revisions.....	1-4
1-2.00 OFFICE OF TRAFFIC ENGINEERING (OTE) FUNCTIONS	1-4
1-2.1 MnDOT Organization	1-4
1-2.2 OTE Organization	1-4
1-2.3 OTE Functions and Responsibilities	1-5
1-2.4 Delegation of Authority	1-8
1-3.00 DISTRICT TRAFFIC ENGINEERING (DTE) FUNCTIONS	1-8
1-3.1 General Functions of the District Traffic Engineering Staff.....	1-8
1-3.2 Specific Functions	1-9

1-1.00 INTRODUCTION

1-1.1 Purpose of the Traffic Engineering Manual

The Traffic Engineering Manual (TEM) is issued and updated by the Minnesota Department of Transportation (MnDOT) Office of Traffic Engineering (OTE). The purpose of the TEM is to establish uniform guidelines and procedures, primarily for use by MnDOT personnel. Counties, cities, and local units of government will also find this manual useful when striving for uniformity in traffic engineering throughout the state of Minnesota. Uniform application of guidelines and procedures aids the road user in recognizing and understanding the various traffic control devices used throughout the United States.

The guidelines and criteria in this manual are largely adapted from the Minnesota Manual on Uniform Traffic Control Devices ([MN MUTCD](#)) which is the statewide standard for the planning, design, and application of traffic control devices on all roads open to public travel. This manual presents engineering information typically required in the design and application of traffic control devices for trunk highways. The information must be combined with engineering judgment and balanced with social, economic, environmental, and political factors in order to yield appropriate traffic engineering solutions. This manual is not intended as a legal standard.

1-1.2 Scope of the Manual

1-1.2.1 Relationship to the Minnesota Manual on Uniform Traffic Control Devices.

The Minnesota Manual on Uniform Traffic Control Devices ([MN MUTCD](#)) is established through [Minn. Stat. Sec. 169.06](#). The MN MUTCD is based on the Federal Highway Administration's (FHWA) "[Manual of Uniform Traffic Control Devices](#)" established under Title 23, United States Code, Section 109(d) and Title 23, [Code of Federal Regulations \(CFR\) Part 655.603](#). Each state is required to adopt this manual or create a manual that is accepted by the FHWA as being in substantial conformance with the federal manual.

The MN MUTCD sets forth the basic principles, and presents state and federal laws which govern the design and usage of traffic control devices on all streets and highways in Minnesota. The TEM complements, but does not duplicate, the MN MUTCD. The TEM merely references the appropriate section of the MN MUTCD. Where the MN MUTCD does not specify warrants or applications, the TEM clarifies the accepted MnDOT practice. The TEM also details MnDOT traffic engineering guidelines and procedures not included in the MN MUTCD.

1-1.2.2 Relationship to MnDOT Policies

The TEM does not include MnDOT business policies per se, although sections of the manual reflect existing MnDOT policies related to traffic engineering. Formal MnDOT policies can be found at www.dot.state.mn.us/policy.

1-1.2.3 Relationship to Other MnDOT Manuals

The TEM is one of many manuals which describe guidelines, procedures, specifications, and references for the activities of MnDOT. The TEM is intended primarily for use by MnDOT's traffic engineering personnel working in the Central Office and the District Offices. It is not a textbook or a design and construction manual, and is not all-inclusive. It establishes guidelines and standards for traffic engineers to use in fulfilling their daily duties. Accordingly, where appropriate, references are made to other MnDOT manuals which may be useful to the traffic engineering function.

1-1.2.4 Complementary References

Traffic engineers at MnDOT should have ready access to the latest editions of the following documents to complement the material presented in the TEM. Additional references, which may also be useful, are listed in each of the individual chapters of this Manual.

1. Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways (MN MUTCD). The MN MUTCD establishes the standards for traffic control devices on all public roads. www.dot.state.mn.us/trafficeng/publ/mutcd/index.html.
2. Traffic Control Devices Handbook - Institute of Transportation Engineers (ITE). This Handbook is meant as a guidance to assist in determining the appropriate traffic control device(s) for a specific condition based on judgment and/or study. <http://ecommerce.ite.org/IMIS/ItemDetail?iProductCode=IR-112A>
3. Minnesota Standard Signs and Markings Manual. This Manual establishes details and specifications for signs and pavement markings, including dimensions, colors, and other requirements. www.dot.state.mn.us/trafficeng/publ/signsmanual/index.html
4. Highway Capacity Manual - Transportation Research Board (TRB). This Manual contains concepts, guidelines, and computational procedures for computing the capacity and level of service of various highway facilities. <http://hcm.trb.org/?qr=1>
5. A Policy on Geometric Design of Highways and Streets - American Association of State Highway and Transportation Officials (AASHTO). This document contains current design research and practices for highway and street geometric design. https://bookstore.transportation.org/collection_detail.aspx?ID=110
6. Roadside Design Guide - AASHTO. This Guide presents a synthesis of current information and operating practices related to roadside safety. https://bookstore.transportation.org/item_details.aspx?id=1802
7. Minnesota Motor Vehicle and Traffic Laws. <https://www.revisor.mn.gov/statutes/?id=169>
8. Traffic Engineering Handbook - ITE. This Handbook provides a comprehensive description of all basic traffic and transportation engineering functions. <http://ecommerce.ite.org/IMIS/ItemDetail?iProductCode=TB-010B>
9. Manual of Transportation Engineering Studies - ITE. This Manual describes basic traffic engineering studies performed by traffic engineers. <http://www.ite.org/>
10. Highway Safety Manual - AASHTO. This manual presents a variety of quantitative safety analysis methods for estimating crash frequency or severity. <http://www.highwaysafetymanual.org/Pages/About.aspx>

1-1.3 Organization of the Manual

There are 14 chapters organized around the basic functions performed by traffic engineers within MnDOT.

Chapter 1	General Information
Chapter 2	Traffic Laws
Chapter 3	Freeway Corridor Traffic Management
Chapter 4	Traffic Engineering Research
Chapter 5	Intelligent Transportation Systems
Chapter 6	Traffic Signs and Delimitation

Chapter 7	Pavement Markings
Chapter 8	Temporary Traffic Control
Chapter 9	Highway Traffic Signals
Chapter 10	Lighting of Traffic Facilities
Chapter 11	Traffic Safety
Chapter 12	Tort Claims
Chapter 13	Non-Motorized Facilities
Chapter 14	Miscellaneous Traffic Items
Chapter 15	Connected and Automated Vehicles

1-1.4 Revisions

Material in the TEM is continuously subject to revision as guidelines and procedures evolve and other information becomes available. Changes to the TEM may be preceded by MnDOT Technical Memorandums which will describe the guideline or procedure that is to be modified, added, or deleted. MnDOT's active and historical Technical Memoranda can be found at: <http://techmemos.dot.state.mn.us/>.

An electronic notification will be sent to those individuals who have subscribed to an electronic notification list for updates, changes, revisions, or training planned specific to the Traffic Engineering Manual. The online subscription form can be found at: <http://www.dot.state.mn.us/trafficeng/publ/updates.html>.

1-2.00 OFFICE OF TRAFFIC ENGINEERING (OTE) FUNCTIONS

1-2.1 MnDOT Organization

MnDOT is organized as shown in the [MnDOT Organizational Chart](#). The Office of Traffic Engineering (OTE) is part of the Operations Division and is led by the State Traffic Engineer. Each MnDOT transportation district office has a traffic engineering section led by a District Traffic Engineer. These offices work cooperatively to provide engineering and operational services to transportation users.

1-2.2 OTE Organization

The primary duties of OTE include setting standards, policies, and guidelines and providing training, technical support, and traffic related research.

1. The OTE is divided into three sections - [OTE Organizational Chart](#).
 - a. Intelligent Transportation Systems ([ITS](#))
 - b. Administrative Support and Training
 - c. Traffic Signals and Lighting
 - d. ITS Program Management and Research
2. Traffic Engineering ([TE](#))
 - a. Signing
 - b. Pavement Markings, Work Zones, and Product Evaluation
 - c. Tort Claims **and** Traffic Standards ~~and Pedestrian and Bicycle~~
 - d. Traffic Safety **and Pedestrian and Bicycle Safety**
3. Minnesota Toward Zero Deaths ([TZD](#))

1-2.3 OTE Functions and Responsibilities

The OTE provides leadership, expertise, and education in traffic design, operations, and safety programs, and in the development, use, and maintenance of traffic control devices in order to create a safe and efficient highway system. All OTE units act as liaisons between MnDOT Districts, MnDOT functional offices, and the Federal Highway Administration. The OTE units also provide traffic engineering technical expertise to MnDOT Districts, MnDOT functional offices, local units of government, and external safety partners. The units and their functions are as follows:

Intelligent Transportation Systems (ITS)

1. Administrative Support and Training
 - a. Provide a full range of administrative services to all OTE staff and the Traffic Engineering Organization.
 - b. Administer the TEO Education/Training Committee.
2. Traffic [Signals](#) and [Lighting](#)
 - a. Provide technical expertise and training for traffic signal and roadway lighting design, operation, construction, and the contract process.
 - b. Develop and maintain standards, guidelines, concepts, and applications for lights and signals.
 - c. Provide quality assurance for plan preparation and specifications.
 - d. Research new traffic equipment and software technology for lighting and signal systems and design.
 - e. Ensure that signal and lighting projects conform to MnDOT policy, the TEM, the MN MUTCD, and other applicable standards.
 - f. Administer the TEO [Signals](#) and [Lighting](#) Committees.
3. ITS Program Management and Research
 - a. Provide technical expertise regarding ITS.
 - b. Manage, plan, and administer funding for ITS research, development, and operational test projects.
 - c. Administer the TEO Intelligent Transportation Systems Committee.
 - d. Develop and maintain ITS standards, guidelines, concepts, and applications.
 - e. Assist OTE sections and the Department in developing traffic and safety research program need statements and implement appropriate research projects.
4. Electrical Services Section (ESS)
 - a. Provide electrical maintenance for traffic signals (statewide), lighting (statewide), and ITS devices (greater MN).
 - a. Provide dispatch for locating MnDOT underground facilities as part of the Gopher State One Call system.
 - b. Perform locates of MnDOT underground facilities within the Metro District.

Traffic Engineering (TE)

1. [Signing](#)
 - a. Provide technical expertise for highway signing and quality assurance for plan preparation, specifications, and estimates.

- b. Develop and maintain standards, guidelines, concepts, and applications for signs.
 - c. Evaluate materials, equipment, and methods to be incorporated into signing projects.
 - d. Support statewide sign design and sign management software.
 - e. Analyze the relationships between geometrics, driver expectancy, traffic flow, standardization, and operations to ensure the proper sign message and placement.
 - f. Develop and implement statewide signing training.
 - g. Ensure that signing projects conform to the MN MUTCD, the TEM, and other applicable standards.
 - h. Administer the Traffic Engineering Organization (TEO) Signing Committee.
 - i. Administer the External Sign Variance Committee.
2. [Pavement Markings](#), [Work Zones](#) and [Product Evaluation](#)
- a. Provide leadership and technical expertise for temporary traffic controls, pavement markings, crashworthiness of traffic control devices, and provide quality assurance for plan preparation, specifications, and estimates.
 - b. Develop and maintain standards, specifications, special provisions, typical plans, guidelines, concepts, applications, and training for temporary traffic controls and pavement markings.
 - c. Conduct research regarding temporary traffic control and pavement marking methods, products, and procedures.
 - d. Maintain and ensure Department adherence to the Minnesota Work Zone Safety and Mobility Policy.
 - e. Perform temporary traffic control reviews and feedback sessions with the Districts.
 - f. Conduct annual crash studies of work zones.
 - g. Ensure that pavement marking installations conform to the MN MUTCD, the TEM, and other MnDOT guidelines.
 - h. Manage a statewide pavement marking database and performance measures, and support the central striping business.
 - i. Establish and maintain models for pavement marking life cycles.
 - j. Evaluate materials, equipment, and methods to be incorporated into pavement marking projects.
 - k. Manage MnDOT's [Approved Products List \(APL\) for Traffic Control Devices](#).
 - l. Coordinate traffic control device evaluations.
 - m. Coordinate new products with traffic engineering research efforts, evaluation, and approvals.
 - n. Administer the [Statewide Work Zone Safety Committee](#) and TEO [Temporary Traffic Control Committee](#).
 - o. Administer the TEO [Pavement Marking Committee](#).
3. [Tort Claims](#) and Traffic Standards
- a. Provide technical expertise to the Districts for reducing risk and liability on MnDOT projects.
 - b. Direct and coordinate state and MnDOT traffic engineering policy.
 - c. Coordinate and administer the [Minnesota Committee on Uniform Traffic Control Devices](#).
 - d. Prepare, coordinate, and administer traffic engineering standards and technical memoranda.

- e. Arrange for publication and distribution of various traffic engineering manuals and provide expertise on their interpretation.
 - f. Represent MnDOT interests in the defense against tort claims and lawsuits.
 - g. Evaluate tort claims, negotiate and approve settlements, and develop MnDOT policies and practices regarding tort liability settlement decisions.
4. [Traffic Safety](#)
- a. Provide leadership and technical expertise on traffic safety issues.
 - b. Develop safety plans, provide crash data, evaluate effectiveness, highlight research reports, and identify implementation opportunities to support the [Toward Zero Deaths \(TZD\)](#) program.
 - c. Administer the [Highway Safety Improvement Program](#).
 - d. Coordinate and administer [speed authorizations](#) and the [Speed Monitoring Program](#) in accordance with [Minn. Stat. Sec. 169.14](#).
 - e. Manage the Transportation Information System (TIS) [crash data](#), and conduct training on use of the data for the Districts and local agencies.
 - f. Conduct [Road Safety Audits](#) as required.
 - g. Develop and implement [Minnesota's Strategic Highway Safety Plan](#), working closely with the Department of Public Safety, Minnesota State Patrol, and other safety partners.
 - h. Propose needed [Traffic Safety Research](#) projects and act as the technical liaison to these projects.
 - i. Interact with other states and research groups in order to exchange information and assist in practical safety research.
 - j. Administer the TEO Safety Committee.
 - k. Provide technical expertise for bike and pedestrian safety features and provide quality assurance for plan preparation.
 - l. Develop and maintain standards, guidelines, concepts, and applications for bike and pedestrian safety features such as crosswalks and bike lanes.
 - m. Ensure that standards are available to MnDOT personnel so road design projects conform to MnDOT policy, the MN MUTCD, the TEM, and other applicable standards as they pertain to bike and pedestrian safety.

Minnesota Toward Zero Deaths Program ([TZD](#))

Minnesota TZD is the state's cornerstone traffic safety program, employing an interdisciplinary approach to reducing traffic crashes, injuries, and deaths on Minnesota roads. The TZD program works in partnership with other state agencies, local units of government, non-profit safety groups, community and corridor groups to improve traffic safety across all Minnesota roadways. TZD provides technical assistance, materials, and guidance to local groups that are committed to reducing crashes and the fatalities and severe injuries that result from them. The Director of MnDOT's Office of Traffic Engineering serves as co-chair of the TZD program along with the Director of the Office of Traffic Safety, Department of Public Safety.

TZD has identified several major focus areas to reduce traffic injuries and fatalities as outlined in the Strategic Highway Safety Plan ([SHSP](#)). A combination of strategies from different focus areas is often most effective for solving a particular problem

1. [Education](#) - changing driver behavior.
2. [Emergency Medical and Trauma Services](#) - fast and efficient emergency response
3. [Enforcement](#) - ensuring compliance with traffic laws.
4. [Engineering](#) - careful evaluation of road characteristics
5. [Courts and Legislation](#) - passage of traffic safety legislation.

1-2.4 Delegation of Authority

In addition to the responsibilities of the State Traffic Engineer, which are carried out by the various units of the OTE, the State Traffic Engineer is delegated very specific authority and responsibility from the Commissioner of MnDOT for providing traffic control devices on the trunk highway system. In addition, some authority is further delegated to the District Traffic Engineers. The general levels of authority and responsibility are described in the following sections:

1. Orders approved by the District Traffic Engineer
 - a. For standard traffic signs and markings which are in accordance with the MN MUTCD, the District Traffic Engineer may issue a [District Traffic Work Order, Form 29187 \(Form 1.A\)](#).
 - b. Files are kept in the District Traffic Office.
2. Speed limit authorization by the Office of Traffic Engineering
 - a. The State Traffic Engineer or Assistant State Traffic Engineer authorizes speed limits in accordance with [Minn. Stat. Sec. 169.14](#) based on the engineering and traffic investigation prepared by the district traffic office.

1-3.00 DISTRICT TRAFFIC ENGINEERING (DTE) FUNCTIONS

1-3.1 General Functions of the District Traffic Engineering Staff

The functions of the District are primarily to implement guidelines, standards, policies and preferred practices, advise local governmental agencies as requested, manage day-to-day field operations, develop traffic plans, provide feedback to MnDOT Central Office on policies and practices, perform field investigations, collect data, supervise signing and striping operations, and conduct studies.

Within the MnDOT organization, many important traffic engineering functions are carried out by the District Traffic Engineer (DTE) and staff. While each District has a slightly different organization, the functions performed by the DTE's and their staffs are essentially the same. [Links to MnDOT District Websites](#).

1-3.2 Specific Functions

Specific functions performed by District Traffic Engineering Staff:

1. Design Coordination
 - a. Review preliminary and final road design plans from a traffic engineering perspective.
 - b. Obtain and administer all work authorities needed by and/or assigned to the traffic office.
 - c. Review comprehensive plans, plats, and proposed development documents.
 - d. Obtain local approvals of traffic engineering projects where needed.
 - e. Review proposed design standards and provide feedback.
 - f. Update P6 schedules for traffic activities.
 - g. Discuss staging strategies and traffic control options for completion of a Traffic Management Plan.
2. Safety Design
 - a. Develop a District Safety Improvement Program, including contract and maintenance work.
 - b. Investigate safety issues and develop safety project proposals.
 - c. Review entrance permits.
 - d. Make recommendations to designers.
 - e. Prepare design study reports for safety projects when requested.
 - f. Prepare portions of large study reports relating to crashes, traffic volume, roadway operations, etc.
 - g. Assist in the development of guardrail improvement programs.
 - h. Review and assist local safety programs.
 - i. Provide capacity analysis of roadways, intersections, etc.
 - j. Provide District support of traffic-oriented research programs.
 - k. Provide before and after evaluations of projects.
 - l. Manage the District crash database and provide crash data procurement and analysis.
3. Signal Design
 - a. Prepare traffic signal design plans.
 - b. Prepare traffic signal special provisions.
 - c. Develop, administer, and process signal agreements with local governmental agencies in conjunction with the Office of Project Management and Technical Support.
 - d. Prepare and approve [Intersection Control Evaluation \(ICE\)](#) letters and reports, which replace the signal justification report.
 - e. Assist in the determination and preparation of signal installation and operation programs.
 - f. Investigate and recommend signal system concepts on trunk highways and local roads.
4. Lighting Design
 - a. Develop, administer, and process lighting agreements and exhibits with local agencies and utility companies in conjunction with the Office of Project Management and Technical Support.

-
- b. Prepare and process exhibits for lighting systems.
 - c. Prepare lighting design plans.
 - d. Prepare lighting special provisions.
 - e. Prepare lighting study reports.
 - f. Review lighting permits submitted by local municipalities and utility companies.
 - g. Determine the source of power obtained from the utility company.
5. Signal and Lighting Construction
- a. Supervise contracts and provide inspection for assigned signal and lighting projects as directed by the District Engineer.
 - b. Assist in the inspection of signal and lighting contracts assigned to others.
 - c. Originate traffic engineering requests for state furnished equipment.
 - d. Update the Automated Facilities Management System (AFMS).
 - e. Provide Turn-On Reports for signal and lighting installations.
6. Signal and Lighting Operations
- a. Investigate and respond to questions regarding signal and lighting operations.
 - b. Supervise lighting procedures.
 - c. Time all MnDOT signals, and develop and maintain a systematic review of the operation of all signal systems, including railroad emergency preemption.
 - d. Meet annually with Railroad signal personnel diagnostic team to review Railroad and signal preemption timing.
 - e. Coordinate activities with the appropriate Electrical Services Unit (ESU).
 - f. Provide inventory of signal and lighting equipment in the field for maintenance by the appropriate ESU.
 - g. Assist in minor troubleshooting of signals as requested by the appropriate ESU.
 - h. Provide liaison with electric utility companies for repairs when MnDOT provides lane closures.
 - i. Locate underground facilities in response to requests from Gopher State One Call.
 - j. Prepare a signal and lighting agreement checklist for agreement preparation.
 - k. Perform general maintenance to signal and lighting systems such as changing filters, dusting, updating plans, maintaining log books, and checking operations and hardware.
7. Signing Design and Operations
- a. Investigate and reply to complaints relative to signing.
 - b. Investigate and prepare District Traffic Work Orders for needed signs.
 - c. Administer special signing projects such as signing for resorts, campgrounds, corporate limits, specific service signs, etc.
 - d. Prepare layouts for routine sign maintenance programs.
-

- e. Assist in the formulation of signing standards and policies.
 - f. Design and/or review designs of layouts and plans.
8. Construction Coordination
- a. Prepare Traffic Control Orders which cover traffic control devices used for maintenance operations.
 - b. Coordinate MnDOT sign crew activities in the field.
 - c. In conjunction with the Project Engineer, determine construction staging required and prepare the Traffic Control Plan for a construction project.
 - d. Ensure the development of and assist in the preparation of Transportation Management Plans.
 - e. Conduct or assist in periodic reviews of construction projects to assure the adequacy of the temporary traffic control plan.
 - f. Obtain and keep a record of crashes within work zones.
 - g. Assist in the preparation of time and traffic provisions.
 - h. Assist in the layout and installation of contract signing.
 - i. Assist in the preparation of public information for construction projects.
9. Speed Zoning and Special Studies
- a. Prepare speed limit studies and manage the District speed limit authorization process.
 - b. Investigate complaints and systematically review all speed zoning on the trunk highway system.
 - c. Collect data for determining speed trends and influences.
 - d. Conduct investigations and provide reports for school safety programs.
 - e. Conduct investigations and provide reports for railroad crossing programs.
10. Special Studies
- a. Conduct sight distance studies.
 - b. Gather turning movement counts.
 - c. Perform no-passing zone studies and maintain database.
 - d. Administer the annual ADT tube counting program.
 - e. Perform and/or coordinate modeling for capacity and level-of-service analysis.
 - f. Perform signal warrant analysis.
11. Pavement Marking Operations
- a. Maintain appropriate pavement markings on all highways and interstates.
 - b. Oversee construction and maintenance activities related to pavement markings.
 - c. Collect and report handheld retroreflectometer readings to the pavement marking unit to be added to the inventory data base.
 - d. Provide daily work planning and supervision for pavement markings.

12. Oversee the design, construction, maintenance, and operation of District ITS systems which may include cameras, electronic signs, vehicle detection, and communications networks.
13. Assist in the issuance of permits for parades and events.
14. Respond to numerous public and legislative concerns and requests.
15. Facilitate District tort claim responses.