



Traffic Engineering, Operations & Safety Manual

Chapter 1 General

Section 1 Introduction

1-1-1 Purpose

June 2005

GENERAL

This Manual contains policy, guidelines and procedures related to traffic engineering and related functions as practiced within the Wisconsin Department of Transportation, more specifically the region field and bureau office forces of the Division of Transportation Systems Development, the staff of the Bureau of Traffic Operations, and other agencies of the Department which *may* be involved in traffic engineering at some point. Traffic engineering functions include the installation and maintenance of traffic control devices, highway lighting facilities, traffic regulations, safety analyses, and support for the improvement program.

APPLICATION

The content of the Manual is applicable only to the state trunk highway system. Good practices contained herein *may* by implication be desirable on other systems of highways. However any requirements for other systems are beyond the scope of the Manual, and are appropriately addressed in the Manual on Uniform Traffic Control Devices and the Wisconsin Supplement to the MUTCD, together called the Wisconsin Manual on Uniform Traffic Control Devices.

Conscientious usage and adherence to the manual *should* provide several benefits, chief among which would be:

- Uniformity of treatment of traffic control devices on the state trunk highway system;
- Readily available and adoptable methods and procedures;
- Source of information for interpretations of policies.

DEFINITION OF GUIDELINES

When used in this Manual, the text headings **shall** be defined as follows:

1. A statement of policy is required, mandatory, or specifically prohibitive practice regarding a traffic control device. The verb **shall** is typically used and in bold type.
2. A statement of guidance is recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. The verb *should* is typically used and italicized.
3. A statement of optional practice is a permissive condition and carries no requirement or recommendation. The verb *may* is typically used and italicized.

RESPONSIBILITY FOR TGM

Policies, guidelines and procedures are most frequently developed by the Traffic Engineering standing committees and approved by the Director of BTO. BTO posts and distributes updates and new issuances) and maintains a distribution list.

Currently a hard copy of the manual costs \$110 to cover necessary printing, postage and administrative costs. An electronic copy of the Manual is available at no cost and can be found on the [Traffic Operations Manual Library](#).

Contributions of ideas, suggestions for changes, new concepts, and entire drafts of subjects, etc, are welcome and *should* be addressed to the BTO Program Leads or Supervisors and routed to the appropriate statewide Standing Committee.

Updates to the manual are normally issued quarterly or when there is a sufficient amount or content of policies that need to be published.



Traffic Engineering, Operations & Safety Manual

Chapter 1 General

Section 5 Manual Organization

1-5-1 Subject Numbering System

June 2005

DEFINITIONS

Chapter: A main divisional unit of this manual, addressing one of the major functions of traffic engineering or supporting functions.

Section: A grouping of related subjects within a chapter.

Subject: A specific guideline, policy or procedure.

SUBJECT NUMBERING

The manual is divided into topical chapters with each chapter having one or more sections that are divided into specific treatments of material, called subjects.

Chapters, sections and subjects are all numbered.

Chapter numbers are numbered consecutively, generally without gaps. Sections and subjects are numbered consecutively or sometimes with gaps--5, 10, 15, 20--to allow for future insertions of material at the most appropriate locations within the chapter or to follow the MUTCD numbering system.

Chapters 2 through 10 are allotted to subjects related to traffic control devices covered in the corresponding Parts 2 through 10 of the MUTCD.

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Traffic Engineering, Operations & Safety Manual

Chapter 1 General

Section 10 Documents

1-10-5 MUTCD and Wisconsin Supplement Approval Dates

July 2002

Wisconsin State Statutes 84.02(4)(e) require that standards for traffic control devices be prescribed by the Wisconsin Department of Transportation. The Department, in fulfilling this requirement, has for many years adopted the latest edition of the Federal Highway Administration's publication "Manual on Uniform Traffic Control Devices", and has added a Supplement to make the standards applicable to Wisconsin.

The December 2000 edition of the MUTCD along with the April 4, 2002 Supplement was made effective April 4, 2002 by the Director of the Bureau of Traffic Operations on behalf of the Department.

The latest edition of the MUTCD can be found on the website mutcd.fhwa.dot.gov and can also be obtained in hard copy from several sources noted. The Wisconsin Supplement is available on the [DOT website](#) and a limited amount of hard copies will be provided free of charge to individuals without Internet access. Periodic revisions will be made to the Supplement as changes are made in the MUTCD. For this reason, you are encouraged to obtain the Supplement from the DOT website.

There are several changes as a result of the MUTCD that have extended compliance dates. These extended compliance dates can also be found on the MUTCD website. It is important to note that these extended compliance dates are effective with the original publication date of the MUTCD, which is January 17, 2001. For other changes in the MUTCD that do not have extended compliance dates, the compliance date is set at January 17, 2003.

1-10-25 Federal Aid Policy Guide

June 2005

Refer to the Federal-Aid Policy Guide located at <http://www.fhwa.dot.gov/legsregs/directives/cfr23toc.htm> 23CFR 25 "Design Standards for Highways" for material related to traffic operations matters. Topics include design speed, design exceptions; vertical clearance, and accessibility standards. Also, Section 23 CFR 655 "Traffic Operations" for FHWA policy on uniformity of traffic control devices (including requirements for MUTCD).



INTRODUCTION

Historically the Secretary's Office has designated the State Traffic Engineer to approve assignments of highway numbers on the State Trunk Highway system with input from the Regions and locals. This does not include approval of the beginning and end and alignment of the highway, but merely the approval of the number itself. In some cases the State Traffic Engineer *may* be asked to select a number, or a rearrangement of numbers. Since the State Traffic Engineer's authority transcends region lines, all proposals for additions, deletions, or revisions to the state's route marking system **shall** be submitted to the State Traffic Engineer in the Bureau of Traffic Operations.

To allow sufficient lead time to establish or modify route numbering for new or reconstructed highways, the evaluation for the route assignment *should* begin during the highway planning stage. The State Traffic Engineer will inform and coordinate with the Division of Transportation Investment Management Bureau of Planning and other Divisions to determine appropriate highway route numbering. Any impacts to the National Highway System (NHS) if reconstructed **shall** be addressed with FHWA at the beginning of the numbering process to address NHS continuity.

NHS is a federal designation for funding eligibility, by changing the number on an NHS route the NHS designation is not changed. This would be an issue if, for example, a new bypass is built and now the NHS designation moves to the bypass. It does not move just because a bypass is given the state route number. Refer to [FDM 4-1-20](#), Federal Aid System, for more information on the National Highway System route designation.

The official information on numbering, beginnings and terminations, as well as connecting highway limits is contained in the booklet, Official State Trunk Highway System Maps, which can be found on the WisDOT website.

STATE NUMBERED HIGHWAY NUMBERING PROCESS

Proposal to change a state highway designation is initiated by the Region, typically the Planning Section. This could constitute adding a STH route, dropping a portion of a STH route or changing the route name. It is unnecessary to submit an application for changes of a state highway to AASHTO. The following steps *should* be considered when changing a State Trunk Highway Number (this process can also be used to determine US Highway route numbering for submittal to AASHTO):

1. Proposed changes to the State Highway numbering system *should* be discussed with local government agencies representing the communities through which the proposed route change traverses prior to implementation. Others affected *should* also have their comments considered, such as trucking and farm implement operators. The Regional Traffic Engineer *should* canvass local government jurisdictions to determine their reaction, views and comments to the proposed numbering changes. However, this is strictly a courtesy procedure and final authority for making the ultimate decision still remains with the Department (i.e., local government does not have veto power over route establishment on the State Highway System). For most significant changes to the SHS, there *should* be public involvement in the decision process. This includes any implications due to mile marker and exit number changes. Often a public informational meeting or hearing at which the proposed changes are discussed and the public is allowed to comment on them is valuable.
 - a. It is necessary, however, to have approval by the county board of each county in which part of the proposed change is situated when the change is more than 2 ½ miles of the system, according to Wisconsin State Statute 84.02 (3).
2. Any impacts to the National Highway System (NHS) if reconstructed **shall** be addressed with FHWA at this time to address NHS continuity.
3. If a new STH route is being proposed, the Region *should* propose a number to discuss with BTO Traffic. Some guidelines to consider when requesting a new number:
 - a. Number cannot be used elsewhere on the STH (includes STH and USH) system unless it is an extension of an existing route.

- b. Typically, the route number chosen is the next consecutive highway number unless the number is already used or a sufficient "tied" number can be used.
- c. "Tied" numbers *should* be considered to relate to the main route (ex. Highway 251 connects back to Highway 51).
 - i. Tied "300" series routes *should* be used if the route connects to a state route on **one** end (spur route). Additional routes *should* use the next odd numbered series (ex. 500, 700, etc.)
 - ii. Tied "200" series *should* be used if the route connects back to the STH on **both** ends of the same route making a loop. Additional routes *should* use the next even numbered series (ex. 400, 600, etc.)
4. The State Traffic Engineer *should* seek consensus with the Region on the route number that makes the most sense, based on the reasoning above.
5. The Region prepares a formal letter explaining the reason why the route change is needed, the benefits of a route change and the timetable when it will take effect.
6. The Region submits a formal letter along with map locations to the State Traffic Engineer for approval.
7. Upon the State Traffic Engineer's approval, notification is made by Central Office Traffic to the following units:
 - a. Central Office DTIM Bureau of State Highway Programs Highway Data Management Section.
 - b. Central Office DTSD Surveying and Mapping Section. In addition to updating the State Highway Map, the Surveying and Mapping Section will also notify private sector mapping and atlas companies like MapQuest, DeLorme, etc.
 - c. Central Office DTSD Highway Development for updating the official state trunk highway list.
 - d. Regional Office(s) affected by the route numbering change.
8. The Region **shall** make the public aware of the changes and the time period for the changes. This includes:
 - a. Fire, EMS, State Patrol and Local Police.
 - b. Businesses along the route (individual mailings)
 - c. Media (TV, radio, newspapers)
 - d. Chamber of Commerce
 - e. Elected Officials and government officials
9. Once a number is established, the State Traffic Engineer will also coordinate with the Office of General Counsel in order for them to make the appropriate changes on official truck operator routing lists and maps (i.e., Trans 276).
10. Utilize PCMS as the changes take place for at least the first month.
11. Installation of independent Type II reassurance marker signs that state "Formerly" on the cardinal header. It has been WisDOT practice to keep these signs installed for two years, then removed.

If needed, the Department *may* request a legal opinion and/or interpretation from Office of General Counsel on legal matters concerning the proposed State Highway Numbering System revision.

US NUMBERED HIGHWAY NUMBERING PROCESS

Any proposed alteration of the US Numbered System *should* be extremely meritorious and thoroughly, though concisely, explained in order that the Special Committee on US Route Numbering and the Standing Committee on Highways of the American Association of State Highway and Transportation Officials (AASHTO) *may* give prompt and proper consideration to each and every request made by a member department. The application for US Route Number, Interstate and Bicycle Routes can be found at www.aashto.org. Refer to [TEOpS 1-11-5](#), U.S. Route Renumbering Process for further instructions regarding the application process and responsible parties.

Bureau of Traffic Operations, Bureau of Planning and the Regional office(s) affected **shall** be involved in the route numbering process prior to being submitted to AASHTO.

According to the AASHTO Transportation Policy Book, January 2000, Establishment and Development of United States Numbered Highways:

1. *The Standing Committee on Highways of the American Association of State Highway and Transportation Officials **shall** have full authority to review the U.S. numbered road system and the numbering and marking thereof, to make additions, changes, extensions, revisions or reductions in said road system and to revise the numbering or marking thereof.*
2. *Before approving any addition, change, extension, revision or reduction in the U.S. numbered road system or the numbering or marking of any U.S. numbered road, the Standing Committee on Highways **shall** consult the State Highway Department of the State or States through or within which such addition, change, extension, revision or reduction is located.*

INTERSTATE HIGHWAY NUMBERING PROCESS

Any proposed route alteration or additional route of an Interstate Highway requires the Department to work closely with FHWA to determine an appropriate route number and submission of the US Route Number, Interstate and Bicycle Routes application to the AASHTO Special Committee on US Route Numbering. The State Numbered Highway Numbering Process can be followed for the preliminary steps of the Interstate Highway Numbering Process. However, the Department **shall** coordinate with FHWA at the beginning of the process. Refer to "Federal-Aid Policy Guide Subchapter E, Part 470" for information on the policy for the signing and numbering of future Interstate corridors. The State Traffic Engineer **shall** coordinate with the Division Administrator and the Secretary's Office when proposing Interstate Highway numbers.

BUSINESS ROUTE MARKING

For information on business route markers, refer to [TEOpS 2-4-19.1](#). If a business route is proposed related to a U.S. Highway designation the route has to have the approval of AASHTO. Refer to the US Numbered Highway Numbering process stated previously.

1-11-5 US Route Renumbering Process

August 2012

BACKGROUND

The purpose of the U.S. route numbering and U.S. bicycle routes system is to facilitate travel on the main interstate lines, over the shortest routes and the best roads. To serve that purpose a system of main interstate routes was designated, and a uniform system of guide and warning signs was adopted for use in all the States, on such designated routes.

Applications are submitted twice a year to AASHTO Special Committee on US Route Numbering at the AASHTO Spring Meeting and the AASHTO Annual Meeting on the day before the Subcommittee on Highways (SCOH) Business Meetings. Application request is an open solicitation but states are asked to submit their applications twice a year. BTO Traffic Engineering Section leads the effort in coordinating responses for the entire Department.

The following steps in the process of U.S. Route Numbering applications must be completed in order for new changes become official.

1. The committee reviews applications and makes recommendations to approve or disapprove the request.
2. The committee **shall** report all recommendations and decisions to the Standing Committee on Highways and will ask for its approval. This will take place at SCOH's spring and annual meetings.
3. In the case of interstate route requests, both FHWA and SCOH must approve.
4. These decisions will be presented to the AASHTO Board of Directors in the SCOH report at the Board's business meeting.

It is WisDOT's responsibility to submit all proposed changes to the Special Committee for approval and implementation on maps and the GIS network.

PROCESS

The process for reporting route number changes to AASHTO is shown below:

1. Secretary's Office receives a letter twice a year from AASHTO to add or make changes to existing routes

2. Secretary's Office send request to DTSD Administrator Office for response
3. DTSD Administrator Office sends to BTO Director
4. BTO Director sends to State Traffic Engineer
5. State Traffic Engineer sends to BTO Traffic Operations Engineer for response
6. BTO Traffic Operations Engineer sends out request to Planning Chiefs and Operations Chiefs two months prior to AASHTO's meeting to collect changes to US Routes needed in Wisconsin. All requests are sent to BTO Traffic Operations Engineer for compilation. Note: If route numbering changes come up throughout the year, the Regions can submit applications to BTO at anytime.
7. BTO Traffic Operations Engineer sends out same request to DTIM Bike/Pedestrian Coordinator for changes needed to the US Bicycle Route numbering. All requests are sent to BTO Traffic Operations Engineer for compilation
8. BTO Traffic Operations Engineer reviews all submittals for accuracy and compliance and sends along with a letter to AASHTO from the DTSD Administrators Office to Secretary's Office, then to AASHTO. The BTO Traffic Operations Engineer is identified as the main contact person for WisDOT. The AASHTO Special Committee needs 30 days to review each application and vote.

EXAMPLE SUBMITTAL



Division of Transportation System Development
Southwest Region
3550 Mormon Coulee Road
La Crosse, WI 54601

Scott Walker, Governor
Mark Gottlieb, P.E., Secretary
Internet: www.dot.wisconsin.gov

Telephone: 608-785-9022
Facsimile (FAX): 608-785-9969
E-mail: lacrosse.dtd@dot.state.wi.us

April 17, 2012

ATTN
COMPANY NAME
STREET ADDRESS
PO BOX
CITY, STATE 9-DIGIT ZIP CODE

Salutation

— Enclosed we have an AASHTO Application for a Relocation of a U.S. Route on USH 18 in Prairie du Chien for your approval.

Sincerely

John Corbin
Bureau of Traffic Operations



American Association of State Highway and Transportation Officials

Please save and send as a word file. You can attach a map in PDF or JPG with the application to

usroutes@ashto.org (M.Vitale)

An Application from the State Highway or Transportation Department of Wisconsin for:

- Elimination of a U.S. (Interstate) Route
- Establishment of a U.S. (Interstate) Route
- Extension of a U.S. (Interstate) Route
- Relocation of a U.S. (Interstate) Route USH 18
- Establishment of a U.S. Alternate Route
- Establishment of a Temporary U.S. Route
- **Recognition of a Business Route on U.S. (Interstate) Route
- **Recognition of a By-Pass Route on U.S. Route

AASHTO Use Only

Date received:

Date to Special Committee on U.S. Route Number:

Date Presented to Standing Committee on Highways (SCOH):

Action taken by SCOH:

Member Department Notified:

Between Wisconsin Street and La Pointe Street

The following states or states are involved:

City of Prairie du Chien

State of Wisconsin

- ***Recognition of... A local vicinity map needed on page 3. On page 6 a short statement to the effect that there are no deficiencies on proposed routing, if true, will suffice.
- If there are deficiencies, they should be indicated in accordance with page 5 instructions.
- All applications requesting Interstate establishment or changes are subject to concurrence and approval by the FHWA

DATE SUBMITTED: February 24, 2011

SUBMIT APPLICATION ELECTRONICALLY TO usroutes@ashto.org

*U.S. Bicycle Route System: this form is not applicable for US Bicycle Route System see new form.

The purpose of the **United States (U.S.) Numbered Highway System** is to facilitate travel on the main interstate highways, over the shortest routes and the best available roads. A route should form continuity of available facilities through two or more states that accommodate the most important and heaviest motor traffic flow in the area.

The routes comprising the **National System of Interstate and Defense Highways** will be marked with its own distinctive route marker shield and will have a numbering system that is separate and apart from the U.S. Numbered Highway System. For the convenience of the motorist, there must be continuity and a uniform pattern of marking and numbering these Interstate routes without regard to state lines.

The U.S. Numbered System was established in 1926 and the Interstate Numbered System was established in 1956. Both have reached the period of review, revision, and consolidation. They now need perfecting rather than expansion. Therefore, any proposed alteration in the established systems should be extremely meritorious and thoroughly, though concisely, explained in order that the Special Committee on U.S. Route Numbering and the Standing Committee on Highways of the Association may give prompt and proper consideration to each and every request made by a member department.

Explanation and Reasons for the Request (US and Interstates Only): (Keep concise and pertinent.) USH 18 is designated as part of the National Highway System and is also a State designated Long Truck Route. The existing and projected traffic volumes on the roadway are causing and will continue to cause traffic congestion and unsafe traveling conditions. Access points have decreased the mobility and efficiency of the roadway. Re-routing USH 18 from Main Street to La Pointe Street will improve safety and mobility in the area.

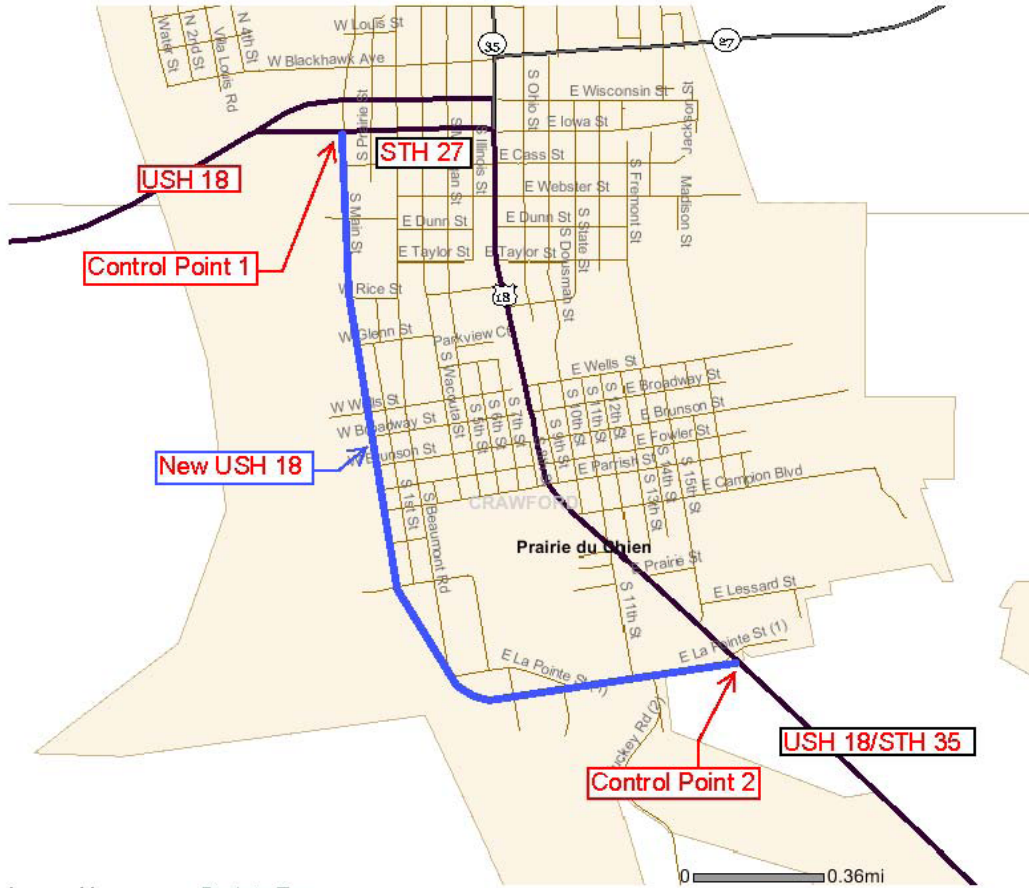
Date facility available to traffic: 08/2011

Does the petition propose a new routing over a portion of an existing U.S. Route? No
If so, where?

Does the petition propose a new routing over a portion of an existing Interstate Route? No
If so, where?

Map of state, or portion thereof, indicating proposed addition or change in the (This includes US and Interstates) U.S. Numbered or Interstate Numbered System:

There are two ways to do this follow the instructions below or convert your map in PDF format and submit as a separate document along with this application to usroutes@aaashto.org. It is your preference, however all files are converted to PDF once received by AASHTO.



Control Point 1: Intersection with State Highway 27
 Control Point 2: Intersection with State Highway 35

The State agrees and pledges its good faith that it will not erect, remove, or change any U.S. or Interstate Route Markers on any road without the authorization, consent, or approval of the Standing Committee on Highways of the American Association of State Highway and Transportation Officials, notwithstanding the fact that the changes proposed are entirely within this State.



The weighted average daily traffic volume along the proposed route, as shown on the map on page 3, is 7,300 as compared to 9000 for the year 2009 for all other U.S. Numbered Routes in the State.



The Purpose and Policy in the Establishment and Development of the United States Numbered Highways, as Retained from October 3, 1991 or the Purpose and Policy in the Establishment of a Marking System of the Routes Comprising the National System of Interstate and Defense Highways as Retained from August 10, 1973 has been read and is accepted.

In our opinion, this petition complies with the above applicable policy.

(Signature Required – see note below)

Chief Executive Officer

(Member Department)

This petition is authorized by official action of

under date of _____ as follows: (Copy excerpt from minutes.)

(This includes US, Interstates)

A **letter** from your Chief Executive Officer with the **CEO's signature** is sufficient when submitting your application, if you choose not to include the signature on this form.

(US and Interstates Only)**Instructions for Preparation of Page 6**

Column 1: Control Points and Mileage. Top of column is one terminus of road. Indicate control points by identical number as shown on map on page 3. Show mileage between control points in miles and tenths.

| Column 2: Pavement Type. | Code |
|---------------------------------|-----------------|
| High type, heavy duty | H |
| Intermediate type | I |
| Low type, dustless | L (show in red) |
| Not paved | N (show in red) |

| Column 3: Pavement Condition | Code |
|-------------------------------------|-----------------|
| Excellent | E |
| Good | G |
| Fair | F (show in red) |
| Poor | P (show in red) |

NOTE: In columns 2 and 3, where pavements types and conditions change, the location of the change shall be indicated by a short horizontal line at the proper place opposite the mileage log and the proper code letter (shown above) shall be entered in the respective column between the locations so indicated.

Column 4: Traffic. Indicate average daily traffic volumes in this column. Points of changes in these data to be indicated by short horizontal lines opposite the appropriate mileage point on the mileage log. Any existing main line rail crossing that is not separated shall be indicated at the appropriate mileage point by RXR - black if signalized - red if not protected by signals.

Columns 5 & 6 Pavement Width and Shoulder Width. These columns to be completed by comparing standards of highway involved with applicable AASHTO standards. Entries that fall to the right of the tolerance lines (dashed) should be shaded in red. If there are no deficiencies indicate by use of the word NONE.

Columns 7 & 8 Major Structures. Show in these columns those structures that do not meet AASHTO standards. Show by horizontal line sufficiently long to indicate percentage of deficiency. Portion on right of tolerance line shall be shown in red. Indicate length of structure in feet immediately under the line. Any sub-standard highway underpass structure shall be shown opposite the appropriate mileage point by the designation LP with the vertical clearance in feet following and shown in red. If there are no deficiencies indicate by the use of the word NONE.

Column 9: Vertical Sight Distance. Items to be shown in this column as a horizontal line, the length of which will indicate the deficiency as determined in accordance with comparisons with comparable AASHTO standards. Portions of the line past the tolerance line shall be shown in red.

Column 10: Horizontal Curvature. Curves in excess of AASHTO applicable standards to be shown in this column by a short horizontal line with degree of curve shown immediately above the line. To be shown in red.

Column 11 Percent Grades. Show by horizontal lines opposite proper mileage point on mileage log. Show percent of grade above the line and length of grade in feet immediately below. To be shown in red.

What follows is an Excel worksheet that you can open by right clicking your mouse and select "Worksheet Object" – you can then Edit, Open or Convert but you must first unlock the form as show when inserting maps.

Double click inside frame to release excel worksheet. Click outside frame to re-lock. (US and Interstates Only)

| Mileage | 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | 6 | | | | | | | | | | | | 7 | | | | | | | | | | | | 8 | | | | | | | | | | | | 9 | | | | | | | | | | | | 10 | | | | | | | | | | | |
|---------|----------------------------|---------------|--------------------|-------------|--|----|----|----|---------------------------|----|----|----|--------------------------|----|----|----|------------------------|----|----|--------|------------------------------------|--|--|--|--------------------------------|------------|--|--|---|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|--|--|
| | Control Points and Mileage | Pavement Type | Pavement Condition | Traffic ADT | Comparison to Applicable AASHTO Design Standards | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | Pavement Width Deficiency | | | | Shoulder Width Deficiency | | | | Major Structures | | | | | | | | Vertical Sight Distance Deficiency | | | | Show Where Excess of Standards | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | Percent | | | | Percent | | | | Roadway Width Deficiency | | | | H - Loading Deficiency | | | | Percent | | | | Horizontal Curvature | Percentage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 20 | 30 | 40 | 20 | 40 | 60 | 80 | 10 | 20 | 30 | 40 | 20 | 40 | 60 | 80 | 20 | 40 | 60 | 80 | Degree | Length | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | | | 7,300 | NONE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 | H | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

(Contact person regarding this application:

Name: Joseph Langeberg PE

Address: 3550 Mormon Coulee Road, La Crosse, WI 54601

Telephone Number: 608-785-9961

Fax Number: 608-246-3819

Email Address: joseph.langeberg@dot.state.wi

Description to be provided to the AASHTO Highways Special Committee on US Route Number (USRN) when they review this application:

- Where does the route begin? (Intersection or Mile Marker) Wisconsin Street
- Describe where it is going? To the west of the existing US 18
- What type of facility is it traveling over? (New alignment or over an existing pathway) Existing pathway and new alignment
- Give the direction of travel(north, east, south, and west) South and east
- Name the focal point city or cities Prairie du Chien
- Length of route in miles. 2.62
- Where does it end? (Terminal intersection or mile marker) Marquette Street

Table 1. Example of Log Data File for submittal

Log Data for USH 18

| US Route Number | State | Type | Intersection | Point to Point | Accumulated | Remarks |
|--------------------------------|--------------|-------------|---------------------|---------------------------|--------------------|-------------------------|
| 18 | Wisconsin | Regular | Milwaukee | 0 | 0 | Route begins |
| 18 | Wisconsin | Regular | Milwaukee | 1 | 1 | Crosses I-43 |
| 18 | Wisconsin | Regular | Milwaukee | 3 | 4 | Crosses U.S. 41 |
| 18 | Wisconsin | Regular | Milwaukee | 3 | 7 | Crosses U.S. 45 |
| 18 | Wisconsin | Regular | Jct. E. Waukesha | 7 | 14 | Crosses I-94 |
| 18 | Wisconsin | Regular | Jefferson | 35 | 49 | NONE |
| 18 | Wisconsin | Regular | Cambridge | 11 | 60 | Joins U.S. 12 |
| 18 | Wisconsin | Regular | Jct. E. Madison | 14 | 74 | Crosses I-90 |
| 18 | Wisconsin | Regular | Madison | 2 | 76 | Crosses U.S. 51 |
| 18 | Wisconsin | Regular | Madison | 5 | 81 | Joins U.S. 14, U.S. 151 |
| 18 | Wisconsin | Regular | Jct. S. W. Madison | 3 | 84 | Leaves U.S. 12, U.S. 14 |
| 18 | Wisconsin | Regular | Mt. Horeb | 15 | 99 | NONE |
| 18 | Wisconsin | Regular | Dodgeville | 23 | 122 | Leaves U.S. 151 |
| 18 | Wisconsin | Regular | Fennimore | 28 | 150 | Crosses U.S. 61 |
| 18 | Wisconsin | Regular | Prairie du Chien | 28 | 178 | NONE |
| 18 | Wisconsin | Regular | State Line | 2 | 180 | NONE |



INTRODUCTION

The development of guidelines, standards, policies and procedures related to traffic engineering functions in the Division has been undertaken in several ways:

- Memos and letters answering inquiries, the answers then becoming guidelines;
- Recorded decisions from discussions at meetings such as traffic conferences, coordinators meetings, traffic standing committee meetings, and special conferences;
- Assignments and activities by BTO staff;
- Formalization of the above by publication in traffic operations manual.

Standing Committees are a means of addressing needs for policy development and revisions. These groups are established so adequate time and attention *may* be given to setting policy and guidelines that meet the needs of practitioners. This attention in turn streamlines operations in the future, thereby increasing efficiency and improving the quality of products and services.

BTO relies on the active involvement of regional staff and other resources with special insights into policy issues. BTO takes the policy lead and coordinates the work of others, as outlined in the Structure and Procedures section below.

PURPOSE

The basic purpose for Traffic Engineering Standing Committees is to provide a means of concentrating additional time, experience, knowledge, and expertise on specific issues in order to offer better guidelines, policies and standards.

This results in:

- Enhancing cooperation and developing consensus,
- Providing leadership, incentive and professional growth opportunity.
- Promoting uniformity in regulations, devices, and field practices,
- Enhancing communication, information service, and technology transfer,
- Gathering advice and best practices from other agencies,
- Enhancing the decision-making process, and
- Improving the professional image of the Traffic Engineering community.

STRUCTURE AND PROCEDURES

There are seven Standing Committees for the following technical areas:

- Lighting
- Electrical Standards
- Signing & Marking
- Traffic Signals
- Work Zones
- Traffic Safety Engineering
- Traffic Incident Management (TIME)

Additional work groups *may* be established for emerging technical and program areas.

Responsibilities of the Standing Committees are to:

- Identify issues and draft a potential policy document for appropriate manual;
- Follow policy development practices of the Bureau including actively involving the Operations Managers through the BTO State Traffic Engineer in these efforts to assure buy in and alignment with Bureau direction;
- Clarify any questions and concerns on issues approved for action;
- Prepare a work plan and make assignments,
- Follow deadlines established by the Standing Committee;
- Bring the study to a conclusion and recommend final action in a policy document;

- Develop implementation plans for proposed actions when appropriate, including documentation, education or training needs, performance measures, and budget impacts.
- Make progress reports at Traffic Conferences.
- Respond to requests for information on the status of issues, especially to complete quarterly and annual reports.
- Give due consideration to traffic safety in all issues.

Each Standing Committee **shall** consist of one BTO Traffic Engineering Section member, at least two and preferably more Region members, and a management sponsor from a Region. Each Standing Committee will appoint its own membership and keep the Traffic Engineering Section informed of activities by keeping meeting minutes and providing updates at Section meetings. Each Standing Committee meeting *should* be scheduled as a Microsoft Outlook appointment including the BTO Unit Supervisor and the State Traffic Engineer as optional attendees.

Each Standing Committee *may* elect its own Chairperson. Alternatively, the State Traffic Engineer *may* at their discretion designate the Chairperson. The BTO representative *may* serve as Chairperson, although it is suggested that he/she be more in the role of facilitator and resource person. The chairperson *should* maintain close contact with the committee management representative to discuss policy proposals.

Each Standing Committee will have one regional management representative assigned to the committee. The roles of the management representative are as follows:

- Provide the regional management viewpoint and guidance to the Standing Committee.
- Serve as communication link between Highway Operations Managers, Operations Supervisors and the Standing Committee.
- Inform other regional managers and supervisors of major policy initiatives being discussed or proposed that *may* have resource impacts.
- Attend Standing Committee meetings when major policy changes are being proposed. If not able to attend meetings regularly, the management representative *should* provide regional management perspective to the Standing Committee Chairperson prior to the Standing Committee meeting.
- Coordinate with Standing Committee Chairperson to brief BTO Director when a policy has other impacts on other bureaus, and as necessary, assist BTO Director in relaying information to other bureaus and DTSD management.

Each Standing Committee *may* establish ad hoc and/or sub-committees for efficiently and effectively conducting certain tasks.

The Director of the Bureau of Traffic Operations has the authority to:

- Establish Standing Committees
- Generally oversee and guide activities as necessary
- Assign issues for action
- Suggest methods of study, alternatives, modifications, resources, etc.
- Assign priorities and deadlines
- Review recommendations from the Standing Committees,
- Give final approval to each recommendation although he *may* elect to defer approval to an administrative level on specific issues.

The Standing Committee Chairperson will provide a briefing on any proposed policy being presented to the Executive Group. The executive group will provide a consensus recommendation to the BTO Director. Any policy action needed between quarterly meetings will be considered interim policy.

POLICY COMMUNICATIONS PROTOCOL

Any Regional policy inquiries requiring BTO involvement, as well as legislative and sensitive media contacts, **shall** involve the relevant Regional and BTO Traffic Engineering Supervisors. It *should* be noted that legislative and sensitive media contacts also require the completion of a Public Communications Record (PCR).

POLICY AND GUIDELINE DEVELOPMENT PROCESS

The Policy and Guideline Development Process *should* be followed whenever a policy for this manual is being developed.

1. Department staff identifies need for policy
2. BTO develops proposed concepts of the policy or guideline. \
3. Preliminary policy concepts are shared with regional staff via Standing Committee.
4. BTO collects comments and drafts policy for review by Traffic Supervisors.

5. Preliminary review and comment period of 2-4 weeks by Regional Traffic staff via email along with a copy to Operations Chiefs and FHWA.
6. If creating a new policy or making major changes to a policy, it may be necessary for the Standing committee to review the policy for the second time and make necessary changes to document upon receipt of comments.
 - a. If making minor changes to a policy, BTO can make the necessary changes after reviewed by the Regions.
 - b. An overview of the final draft should be reviewed by the Operations Managers, especially when policies have political or resource impacts.
7. Once issues have been resolved BTO makes final changes to the document presented to the Director of the Bureau of Traffic Operations for final review and approval. When policies have political or resource impacts, it *may* be necessary to present the issues to the DTSD management or other Bureaus that *may* be impacted for input.
8. Post and distribute new document in next transmittal unless prompt distribution is necessary. The document is then effective statewide.

INTERIM GUIDANCE PROCESS

In special or urgent circumstances when a policy needs to be implemented quickly, interim guidance *may* be appropriate.

1. Initial drafting of the interim policy or guideline by BTO with assistance from Standing Committee or Traffic Supervisors and possibly OGC.
2. Operations Chiefs review interim guidance and present the issues to their Regional staff. Subject to the urgency of the topic, this task can be completed by email (informational copy to FHWA) or presented at Operations Managers meetings.
3. Operations Chiefs report back to the BTO once the Region has concurred.
4. Bureau Director reviews and approves the interim guidance.
5. BTO posts and/or distributes the interim guidance to the key stakeholders for implementation.
6. Post and distribute new document in next transmittal unless prompt distribution is necessary. The document is then effective statewide.

INFORMATION MANAGEMENT RESPONSIBILITIES

BTO **shall** perform support services for the Standing Committees including:

- Suggest, define and transmit candidate issues as needed.
- Set priorities and deadlines if requested.
- Perform background or resource work for the Standing Committees as necessary.
- Prepare and distribute quarterly and annual reports.
- Provide updates at traffic conferences.
- Receive Standing Committee recommendations and provide the initial screening.
- Circulate Standing Committee recommendations to any other Office for review if desirable.
- Submit final recommendation to Bureau director and act on results.
- Follow up on any further business involving issues.
- Monitor implementation of approved/adopted actions, when appropriate.
- Edit, publish and distribute all issues that become part of the TGM.
- Keep full and updated records of all transactions, available upon request.

1-16-2 FHWA Approvals

September 2008

INTRODUCTION

According to [FDM 5-2-1.1](#) Federal-Aid Oversight Agreement ([Appendix A](#)), the Wisconsin Division of FHWA requires certain policies and procedures to be submitted for review and/or approval before publication.

APPROVAL PROCEDURE

For all items listed below, WisDOT will timely submit changes to FHWA for approval, and will not proceed with execution or publication until FHWA has provided formal approval of changes. For those items that are sent for review purposes only, WisDOT *should* submit changes at least two weeks prior to execution; if comments are not

received within two weeks, WisDOT *may* proceed with execution or publication. Requests to FHWA **shall** be directed through the BTO Traffic Supervisor and State Traffic Engineer.

Table 1. FHWA Oversight Agreement List

| Item | FHWA Requirement |
|--|--------------------------------|
| Traffic Operations Manual | Submit to FHWA for review only |
| FDM Standard Detail Drawings | Submit to FHWA all changes |
| Standard/Additional Special Provisions | Submit to FHWA all changes |
| Standard Specifications | Submit to FHWA all changes |
| Public Interest Findings | Submit to FHWA all requests |
| Federal Workplans | Submit to FHWA all requests |
| Experimental Traffic Controls | Submit to FHWA all requests |

FORMAT FOR SUBMITTAL

All requests **shall** be in a professional electronic format (no hand drawings) and submitted via email to FHWA describing the changes or request.

1-16-3 Traffic Engineering Materials & Technology Standards

December 2008

INTRODUCTION

When requests are received from the Regions, vendors and contractors for use of new traffic engineering materials and technologies, it is necessary to follow the steps shown in the flowchart to consider the technology for possible use. If the technology is evaluated and found successful, results of the evaluation *may* lead to development of standards and specifications for use of such products and technologies in Wisconsin.

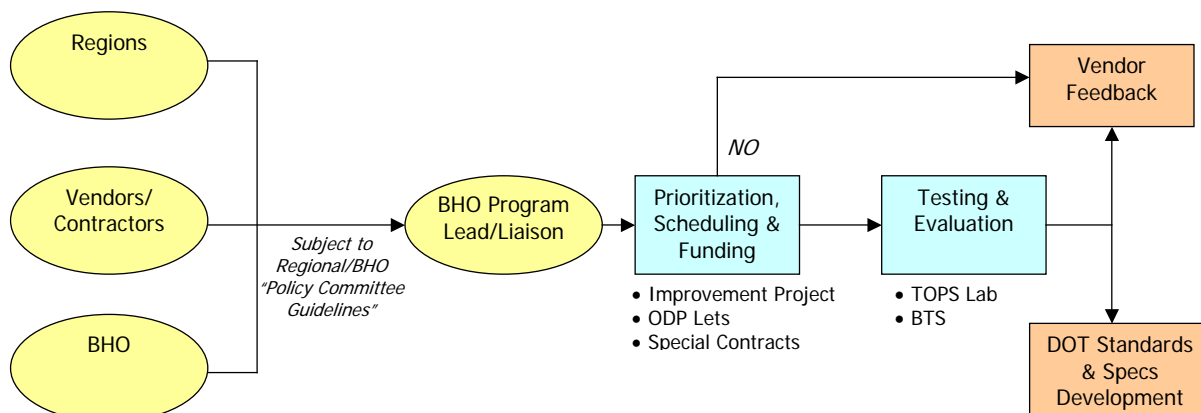
PROCEDURE

Typically, Regional staff, vendors or contractors suggest the use of a new material or technology for use in the WisDOT projects. Before a product can be used in the field, its expected benefits must be considered and an evaluation plan developed.

The appropriate standing committee or BTO Program lead must first consider the feasibility of the product (i.e., cost, benefits, disadvantages, life expectancy, etc.) in order to make a decision in pursuing the use of this product. If it is a proprietary product or is not in compliance with the MUTCD an experimental work plan must be submitted to FHWA for their review and approval before any further progress is made with the product. Refer to [TEOps 1-16-2](#), FHWA approvals for a list of items that require Federal approval.

The BTO Program lead prioritizes the use of the product depending on scheduling of pilot projects and funding for the use of the product. This product *may* be piloted in an improvement project, ODP project or set up in a special contract. If the BTO Program lead cannot effectively find a project or funding for use of the material or technology, he/she will provide feedback to the vendor for the reason not choosing the product. If the product is approved for a pilot test, the UW TOPS Lab or the Bureau of Technical Services Quality Assurance Unit *may* provide or assist with the testing and evaluation of the product.

If the product is successful in the testing and evaluation process and WisDOT chooses to standardize its use, standards and specifications must be developed in order to implement statewide. BTO staff will work with BPD and/or BTS staff to develop and publish language allowing the use of the material or technology in statewide projects. If the product is not successful or WisDOT chooses not to use the product, the BTO program lead *should* provide feedback to the vendor.





Traffic Engineering, Operations & Safety Manual

Chapter 1 General

Section 20 Special Topics

1-20-1 Liabilities of Tort

November 1992

The following was specially prepared by Risk Management for inclusion in this manual

GENERAL

Because traffic engineering functions are one of the most visible elements of the Wisconsin transportation system, the department's traffic engineers are convenient targets for litigation and are often named as defendants in tort liability actions arising from traffic accidents on/along the State Trunk Highway System. Experience has proven the following to be generally valid across a broad range of circumstances:

1. If it becomes apparent that a problem exists on/along the State Trunk Highway System, due to an accident having occurred or for other reason, do whatever is necessary to rectify the situation as soon as possible/practical. Correcting a problem situation that has been brought to your attention (by whatever means) does not establish a condition of guilt. Moreover, responding in a timely manner can prevent accidents from occurring or recurring and is in concert with the department's overall mission of providing a safe and efficient transportation system. Implement remedial actions, as soon as possible and document actions accordingly.
2. If you are named as a defendant in a civil action, it is recommended that you immediately inform your supervisor, the Risk and Safety Management Section of the Bureau of Management Services. *Should* you decide to consult with your own attorney, it is highly recommended that he/she discuss your case with representatives of the Risk Management and Safety Section before advising you in the matter. Consultations with your own attorney are at your expense.
3. As a representative of the department and as a named defendant, you're entitled to be represented in your defense by the Attorney General's office. As an employee of the State of Wisconsin, this representation is provided at not cost to you. Even if judgment is rendered against you, as long as you were acting of s. 895.45, Wis. Stats. And the State of Wisconsin will pay all judgments rendered against you. If you refuse representation by the Attorney General's office (which is your right) and hire your own attorney, you waive the right to be represented by the Attorney General's office if further actions are brought in the matter, and you will be responsible for your attorney's fees in any and all such actions. Your protection as a state employee under s. 895.45, Wis. Stats. Remain, however, as long as you were acting within the scope of your employment.

The prospect of being named in a tort action is unpleasant at best, and one which unfortunately confronts the department's traffic engineering professionals all too frequently. One can deal with this situation most effectively by:

1. Applying the traffic engineering principles and standards of practice in a consistent and uniform manner, to create wherever possible the sense of expectation in the driver, that will in turn ensure that his/her driving actions/responses are as close to "second nature" as possible (eliminate the choices or reduce them to a minimum at any decision point along the highway).
2. Develop a methodology for identifying areas of (or practices related to) high accident occurrence in order to determine what, if any, mitigative measures can be taken of any engineering nature.
3. Document your actions. Keep diary. Record complaints and investigations. Your records are your best means of defending your actions, decisions and professional conduct.
4. Remember that being named in a tort action, and even having a judgment rendered against you, does not impugn you as a conscientious, capable professional. Because the State of Wisconsin is a "deep pocket," you are a tempting target for litigation.

BASIS FOR LEGAL ACTION

Several considerations enter into the filing of a valid action against a state officer, employee, or agent.

1. Notice has to be served within 120 days of the date of the accident. (Certain exceptions apply.)
2. The named defendant/s must have owed the plaintiff a specific duty and have breached that duty causing the injury complained of.

The legal duties that accrue to department staff are divided into two categories:

1. **Ministerial Duties.** These are duties, which by their very nature are absolute, imperative and certain as to the time, mode, occasion, and performance that nothing is left for judgment and discretion. Typically, they are duties required by rules, regulations, standards, practice or law. For example, the duty to maintain certain signs or to properly install them.
2. **Discretionary Duties.** These are duties that require the exercise of judgment. Typically, these duties are exercised by upper levels of management. However, it is possible to establish discretion at any level. The true test involves the exercise of judgment, by a qualified and trained professional, over valid alternatives and based upon acceptable standards of the profession. For example, the decision to place a supplemental sign is generally considered to be a discretionary act.
3. **Negligence.** Negligence is the failure to exercise that degree of care expected of any reasonably prudent person in the same or similar circumstances. However, the comparison is based upon what other reasonably prudent traffic engineers would do under the same circumstances. In other words, your actions must be appropriate in terms of the practice of the industry or your profession at the time and not what *may* have been the practice in the past.
4. **Comparative Negligence.** This is a doctrine that assigns negligence to all the parties of a lawsuit in terms of percentages the total of which does not exceed 100%. Then any judgment is reduced by the percent assigned to the plaintiff and if any of the remaining defendants are assigned a percentage greater than that of the plaintiff, those defendants will pay the remaining judgment.
5. **Joint and Several Liability.** This doctrine requires the payment of the entire judgment by any one of the defendants in an action whose negligence is greater than the plaintiff's. That means that if a state employee defendant is assigned 1% more negligence than the plaintiff and some other defendant who *may* be grossly more negligent than the state employee, the state could still be required to pay. This generally happens when the other defendants are not solvent. This doctrine is often referred to as the "deep pocket theory."

LIABILITY REDUCTION

Adverse exposure can and *should* be reduced in the following ways:

Pre-accident Actions

While the efforts of traffic engineers are usually focused upon improving efficiency of operation, reducing accidents is usually a prime consideration. Because the best method of limiting liability is to reduce the potential for accidents, an accident reduction program is an integral part of the overall traffic effort. The following aspects are typically involved:

- A system of regular inspection *should* be established and maintained on a continuing basis.
- Design and operational reviews *should* be conducted before and after installation of traffic control elements.
- A procedure for handling citizen complaints *should* be established and records made and kept.
- Claims and judgments can be a major financial drain, and *should* be a consideration in expanding funds to improve highway systems.
- Engineering countermeasures to accident problems *should* be sought.
- Careful prioritization of needed improvements (as in the Traffic Operations Improvement Program) is an appropriate means of documenting why a specific improvement was not implemented earlier.
- Project and program evaluations should be undertaken regularly. A project is site specific, lending itself to a before-and-after engineering analysis. Program evaluation is a managerial function, and is particularly relevant to accident reduction and tort liability mitigation.
- Utilize positive guidance principles in the operation and the development of improvements to the highway system.
- Evaluate all feasible alternatives.
- Keep the highway system as simple, consistent and forgiving as possible.
- Maintain a system of documentation.

Post-accident Actions

Adequate instructing and training of personnel in on-site actions, accident investigations and use of accident data can go a long way toward preventing further unwarranted accidents close behind the initial incident, thereby reducing liability exposure. While the traffic engineer is not typically involved in site control, he/she is typically involved in analysis of "problem" locations. These investigations enable the cause of accidents to be identified,

and where feasible engineering countermeasures to be implemented.

1-20-4 Indemnification

April 1995

Standard indemnification provisions occur mostly in two areas in the Division of Highway's policies. One is in Standard Spec 107 covering construction activities. The basic premise there is that the contractor insures us while the construction activity is occurring. It also covers actions resulting from faulty materials or construction. The second indemnification in use is the standard provision for utility-type facilities administered by the Maintenance Office. This provision is part of every utility permit and is referenced therein to policy 96.03 of the Utility Accommodation Policy. This indemnification is tailored to cover the liability occurring while an object, most commonly a utility pole, is being installed, and also to cover liability during the time the object remains on the ROW.

The Office of Traffic has found on several occasions that Regional offices have attached the above indemnification to various traffic related permits issued by the Regions. These permits include closure of highway, banners, snowmobile crossings, and highway lighting. The Office of Traffic does not endorse the use of indemnification provisions. The perceived need for and use of provisions is left up to the Region. The following advisory comments about the usage *may* be helpful, however.

The Maintenance indemnification is tailored to cover utility-type situations. The provision first covers the period of installation, with the implication that the applicant *may* damage someone else's utility, and secondly, the period while the object is in place, which of course would be many years. The primary concern during that time could be inferred to be mainly crashes with the poles. The Maintenance indemnification applies to situations very similar to that covered by lighting permits, permits for flashing beacons and banners over highways, where new poles or supports are set. From that standpoint the Regions *may*, if they so choose, make use of or make reference to the Maintenance indemnification, using the full name.

On the other hand the Maintenance policy does not appear to fit the situations involved in highway closures, snowmobile crossings or routes, or painting crosswalks, etc. In these cases the anticipated major problem would likely be vehicle crashes resulting from alleged inadequate signing, marking or barricading; in other words, something which can be described as a traffic control device misuse or inadequacy. While this guideline makes no recommendation as to the need for indemnification statements in permits issued by the Regions related to traffic operations activities, caution is urged that unless the indemnification is tailored to the nature of the activity or situation the indemnification *may* have little or no substance.

In the case of small communities especially, the inclusion of an indemnification requirement *may* cause their insurance carrier to re-assess their coverage situation.

Indemnification related to work performed for us by others which is not being done under contract administered by the Construction Office *may* be referenced to Standard Spec 107. Again, this is not a recommendation that the activity be covered, but simply an appropriate and approved indemnification clause that can be used if the Region so chooses.

1-20-5 Avoiding Utility Damage

June 2005

LOCATING PRIOR TO DIGGING

It is the policy of the Department that all WisDOT employees comply with the provisions of s. 182.0175 (1m)(a), prior to any digging or excavating of earth either on or off the highway right-of-way whether manually or with powered equipment except in those cases where such digging or excavating is necessary for the immediate protection of highway users.

In all cases except emergencies as discussed below, WisDOT employees whose work requires digging or excavating **shall** investigate what utility companies and others *may* have underground transmission lines in the area where the digging or excavating is required. Diggers Hotline (1800-242-8511) **shall** be contacted prior to digging or excavating. No digging or excavating *may* be done until after the locate by Diggers Hotline.

Emergencies in which the practice of contacting the owners *may* be omitted include, in the traffic area, replacement of knocked down, missing, and severely damaged Stop signs, traffic control signals, Stop Ahead signs, Large Arrow signs, and Curve and Turn signs. The installation of new signs (including detour signs) and the routine maintenance of posts are not of an emergency nature.

DIGGERS HOTLINE MEMBERSHIP

Wisconsin law, s. 182.0175 (1m) (b) requires WisDOT to be a participating member of the one call service known as Diggers Hotline system. As a member, WisDOT needs to provide the one call service with information regarding the location of state-owned electrical facilities and WisDOT will receive tickets that require WisDOT to locate and mark its facilities when work is to be performed in the vicinity of those facilities.

In order to incorporate WisDOT electrical facilities into the Diggers Hotline database, the Regional offices submit location maps to Diggers. Typical electrical installations to include on the Diggers Hotline service are: signal systems, lighting systems, flashing beacons, ramp meters, changeable message signs, rest areas, and weigh scales.

Following receipt of a Diggers Hotline ticket, WisDOT electrical installations are field-located by Electrical personnel or a designated contractor. To ensure valid tickets are received, electrical installation location maps *should* be verified and updated routinely.

1-20-10 Response to Damage

June 2005

BACKGROUND

The Department has a 24/7 obligation to respond to failures or damage that *may* jeopardize traffic safety or mobility. Given the extent of the system and the role of the Department, it is most often the case that law enforcement or local government employees will become aware of these situations first. A protocol for dealing with those situations will benefit the entity that first becomes involved, as well as serving the public needs for safety and mobility.

NOTIFICATION TO OTHERS

In conjunction with and addition to the "Highway Facilities Damage Claim Program" coordinated by Risk Management, each region **shall** develop an on-going program of establishing and maintaining contacts with appropriate enforcement agencies, for the purpose of distributing information on whom to contact for emergency sign repair.

This notification *should* include the types of signs which are critical in nature and the telephone number and agency of whom the enforcement people are to contact at any given hour of the week -- day, night, weekday, weekends.

The notification *should* also include the appropriate contact regarding traffic signals, highway lighting and other appurtenances. Instructions *should* go on to cover reporting of routine damage or malfunction of a non-emergency nature.

The same notifications *should* be distributed to state maintenance people and others who *may* be in a position to see and report problems.

A suggested letter to be used for this purpose is included as part of this guideline.

CRITICAL SIGNS

Critical signs are stop signs and yield signs, and *may* include large arrows in critical locations, keep right signs on important transition sections, and similar applications.

Date

Addressee

Subject: Reporting Damage to Signs and Signals On State Trunk Highways

We are contacting you to reconfirm and/or update information on whom to contact regarding the repair of damaged highway signs and traffic signals which are owned and operated by the State Department of Transportation.

We have assumed that you have enforcement officers and/or maintenance workers who will come upon damage and will be obliged to initiate action to have repairs made. The list on the next page will serve to expedite obtaining the proper phone number and the circumstances necessitating a call. You *should* make copies of this list available to each person.

We suggest that the officer or employee keep a record of the time and circumstances when contact was made with the person on the list.

We thank you for your cooperation and welcome your comments or questions regarding notification of damage to traffic control devices.

Regional Chief Traffic Engineer or Supervisor

Contact Persons Below to Report Damage to Signals and Signs on State Highways

| | Agency-Person/Telephone Number | | |
|--------------------------|--------------------------------|--------------------|----------------|
| <u>Emergency Damage</u> | <u>Working Hours</u> | <u>Week Nights</u> | <u>Weekend</u> |
| Electrical | | | |
| Examples: | _____ | _____ | _____ |
| Traffic signal down | _____ | _____ | _____ |
| Signals on flash | _____ | _____ | _____ |
| (call top name first | _____ | _____ | _____ |
| then next, etc.) | _____ | _____ | _____ |
| | _____ | _____ | _____ |
| Signing: | | | |
| Critical sign down or | _____ | _____ | _____ |
| missing, such as stop, | _____ | _____ | _____ |
| yield, large arrow, keep | _____ | _____ | _____ |
| right sign, etc. | _____ | _____ | _____ |
| | _____ | _____ | _____ |

In most cases a sign can be re-erected temporarily until the next working day.

| <u>Non-Emergency Damage</u> | <u>Work Hours Only</u> |
|---|------------------------|
| Electrical | _____ |
| Example: lamp burned out | _____ |
| | _____ |
| Signs | _____ |
| Example: Less important sign damaged or missing | _____ |
| | _____ |



Traffic Engineering, Operations & Safety Manual

Chapter 1 General

Section 25 Business Management

1-25-6 Charging for Signs

September 1992

For signing, the cost of which is to be billed to another party, a professional and technical project *should* be set up to receive charges.

With a P and T project (Series 0663-3X-XX), there will be an automated billing by BAA. An advantage is that automated billing *should* ensure that a billing goes out, not forgotten, and will include labor, fringe benefits, vehicle costs as well as materials. Remember to remind your crews to record that number on all their record keeping paperwork.



INTRODUCTION

The following tables summarize the standard role for Traffic Operations in developing and delivering Improvement Projects in order to promote increased consistency of how traffic-related items are incorporated into projects, and to increase the consistency of work assignments played by Traffic Operations staff in the Regional Offices.

DEFINITIONS

'Acceptance Review' is defined as a field review of the completed project/item with the PDS Project Engineer for purposes of developing a 'punch-list' of activities to be accomplished within a specific Traffic Engineering function before the contractor moves off the project and/or payment to the contractor is made for the items in each work category. As a general rule, this is accepted as the minimal role Traffic Operations would provide for all Traffic Engineering functions on projects.

ROLES & RESPONSIBILITIES

Signing

Refer to Table 1 for Traffic Operations and PDS roles in the signing function. Traffic Operations is directly responsible for producing Signing Plans for all improvement projects. Traffic Operations *may* accomplish this in a variety of ways, including in-house design by Operations staff; consultant design under a Traffic Master contract; or consultant staff under a (PDS managed) Design Contract. If the latter method is utilized, it is critical that the Traffic Operations staff person in responsible charge of the Signing Plan remain in the communication chain with PDS staff and the Consultant so effective work reviews (Preliminary plan, DSR plan, Pre-PS&E) can occur. During construction inspection by PDS, Traffic Operations role is to provide technical guidance to PDS inspectors and be involved in acceptance review with the project engineer. The acceptance review *should* be completed shortly after signs are installed so the contractor can fix any signing that needs to be addressed before the contractors finish construction operations.

Table 1. Signing Roles

| NEEDS IDENTIFICATION | | DESIGN | | CONSTRUCTION | | | |
|---|---|--|-------------------------------------|--|----------------------------------|-------------------|----------------------------------|
| Identify need for replacement or new installation | Present need in project scoping or project initiation | Directly manage consultant in design & drafting (Consultant Mgmt for Delivery) | Complete design (In House Delivery) | Provide technical guidance to PDS staff or PDS consultant in construction inspection | Complete construction inspection | Acceptance Review | Field Review for Compliance WZTC |
| Operations | Operations | Operations | Operations | Operations | PDS | Operations | PDS |

Pavement Marking

Refer to Table 2 for Operations and PDS roles in the pavement marking function. Pavement Marking plan production remains the responsibility of the PDS section. Traffic Operations role is to provide technical guidance and design review when requested by PDS during design. Traffic Operations role is to provide technical guidance to PDS inspectors and be involved in acceptance review with the Project Engineer during construction inspection conducted by PDS. The acceptance review *should* be completed shortly after the pavement marking is placed so the contractor can fix any marking that needs to be addressed before the contractors finish construction operations.

Table 2. Pavement Marking Roles

| NEEDS IDENTIFICATION | | DESIGN | | | CONSTRUCTION | | | |
|---|---|---|--|-------------------------------------|--|----------------------------------|-------------------|----------------------------------|
| Identify need for replacement or new installation | Present need in project scoping or project initiation | Provide technical guidance to PDS staff or PDS consultant in design | Directly manage consultant in design & drafting (Consultant Mgmt for Delivery) | Complete design (In House Delivery) | Provide technical guidance to PDS staff or PDS consultant in construction inspection | Complete construction inspection | Acceptance Review | Field Review for Compliance WZTC |
| Operations | Operations | Operations | PDS | PDS | Operations | PDS | Operations | PDS |

Intersection Control

Traffic Operations role is to identify the need for replacement, upgrade, or new installation of intersection control and present the need in project scoping or project initiation. Refer to Table 3 for Operations and PDS roles in the various intersection control functions.

Intersection Geometrics

Traffic Operations role is to provide technical guidance on geometric and operational issues as necessary dependent upon skill levels of staff involved on projects during the design by PDS.

Traffic Signal/Electrical Plans

Traffic Operations staff is directly responsible for producing Signal/Electrical Plans (separate from geometrics). Traffic Operations *may* do this in a variety of ways including: via in-house staff; via a Traffic Master Contract; or via the Design Contract used for the project. If the latter method is used, it is critical that the Traffic Operations staff person in responsible charge of the Signal/Electrical Signing Plan remain in the communication chain with PDS staff and the Consultant so effective work reviews (Preliminary plan, DSR plan, Pre-PS&E) can occur.

Traffic Operations electrical staff are to serve as first-line inspectors on signal installations, and are involved in acceptance review with the Project Engineer during construction inspection. The PDS Project Engineer is the lead on contract administrative duties. Operations staff and the PDS Project staff agree prior to construction on proper level of inspection for electrical installations.

Roundabout Geometrics & Operations Analysis

Regional Traffic Operations staff *should* provide technical guidance to PDS staff or PDS consultant staff by completing needs analyses for alternative intersection control during the project initiation process, by analyzing intersection crash data, and comparing and evaluating the alternatives relative to intersection control guidelines and warrants. Traffic Operations staff *should* also estimate size and placement of roundabouts using traffic flow worksheets, geometric parameters, and/or Rodel software. Once the geometrics are determined, the Operations section *may* determine operational and maintenance costs, impacts on access, pedestrian and bicycle movements.

PDS role is to prepare cost estimates of intersection control alternatives and will work with TSS to incorporate right-of-way and utility costs. PDS will develop the roundabout geometrics and detailed design and will determine the impacts of the design. Traffic Operations and PDS staff will jointly perform technical outreach and support public information/awareness for projects.

Table 3. Intersection Control Roles

| | DESIGN | | | CONSTRUCTION | | |
|---------------------------------|---|--|-------------------------------------|----------------------------------|-------------------|----------------------------------|
| | Provide technical guidance to PDS staff or PDS consultant in design | Directly manage consultant in design & drafting (Consultant Mgmt for Delivery) | Complete design (In House Delivery) | Complete construction inspection | Acceptance Review | Field Review for Compliance WZTC |
| Intersection Geometrics | Operations | PDS | PDS | PDS | PDS | PDS |
| Traffic Signal/Electrical Plans | | Operations | Operations | Operations | Operations | PDS |
| Roundabout Geometrics | Operations | PDS | PDS | PDS | PDS | PDS |
| Roundabout Operations Analysis | Operations | PDS | PDS | | | |

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) includes items such as CCTV (closed circuit television) cameras, ramp meters, detector stations, count stations, permanent message boards, etc.

Refer to Table 4 for Operations and PDS roles in the ITS functional area. Traffic Operations staff is directly responsible for producing ITS Component Plans. Traffic Operations *may* do this in a variety of ways including: via in-house staff; via a Traffic Master Contract; or via the Design Contract used for the project. If the latter method is used, it is critical that the Traffic Operations staff person in responsible charge of the ITS Component Plan remain in the communication chain with PDS staff and the Consultant so effective work reviews (Preliminary plan, DSR plan, Pre-PS&E) can occur.

Traffic Operations/electrical staff are first-line inspectors on ITS construction installations, plus they are involved in acceptance review with Project Engineer.

Table 4. ITS Roles

| NEEDS IDENTIFICATION | | DESIGN | | CONSTRUCTION | | |
|---|---|--|-------------------------------------|----------------------------------|-------------------|----------------------------------|
| Identify need for replacement or new installation | Present need in project scoping or project initiation | Directly manage consultant in design & drafting (Consultant Mgmt for Delivery) | Complete design (In House Delivery) | Complete construction inspection | Acceptance Review | Field Review for Compliance WZTC |
| Operations | Operations | Operations | Operations | Operations | Operations | PDS |

State-owned Highway Lighting

Refer to Table 5 for Operations and PDS roles in the state-owned highway lighting function. Traffic Operations staff is directly responsible for producing State-Owned Highway Lighting Plans. Traffic Operations *may* do this in a variety of ways including: via in-house staff; via a Traffic Master Contract; or via the Design Contract used for the project. If the latter method is used, it is critical that the Traffic Operations staff person in responsible charge of the Lighting Plan remain in the communication chain with PDS staff and the Consultant so effective work reviews (Preliminary plan, DSR plan, Pre-PS&E) can occur.

Traffic Operations/Electrical staff are first-line inspectors on state owned lighting installations, and involved in acceptance review with the Project Engineer.

Table 5. Highway Lighting Roles

| NEEDS IDENTIFICATION | | DESIGN | | CONSTRUCTION | | |
|---|---|--|-------------------------------------|----------------------------------|-------------------|----------------------------------|
| Identify need for replacement or new installation | Present need in project scoping or project initiation | Directly manage consultant in design & drafting (Consultant Mgmt for Delivery) | Complete design (In House Delivery) | Complete construction inspection | Acceptance Review | Field Review for Compliance WZTC |
| Operations | Operations | Operations | Operations | Operations | Operations | PDS |

Work Zone Transportation Management Plan

Refer to Table 6 for Operations and PDS roles in the work zone transportation management plan (TMP) task. Traffic Operations role during the work zone TMP process is to provide technical guidance to PDS on:

- assessing work zone impacts
- determining mitigation strategies
- developing TMP documents, and
- reviewing work zone traffic operations during construction

Additional details on roles and responsibilities of Traffic Operations and PDS in the TMP process are discussed in [FDM 11-50-1](#).

Table 6. Work Zone TMP Roles

| NEEDS IDENTIFICATION | | DESIGN | | | CONSTRUCTION | | | |
|--|---|---|--|-------------------------------------|--|----------------------------------|-------------------|----------------------------------|
| Identify work zone management needs & issues | Present need in project scoping or project initiation | Provide technical guidance to PDS staff or PDS consultant in design | Directly manage consultant in design & drafting (Consultant Mgmt for Delivery) | Complete design (In House Delivery) | Provide technical guidance to PDS staff or PDS consultant in construction inspection | Complete construction inspection | Acceptance Review | Field Review for Compliance WZTC |
| Operations | Operations | Operations | PDS | PDS | Operations | PDS | PDS | PDS |



2-1-1 Introduction

September 1992

Beginning with Chapter 2 and extending through Chapter 9, Bicycle Facilities, the TEOpS entry heading and numbering system will follow the corresponding system in the [MUTCD](#). The SECTION designation will be numerical instead of alphabetic as in the [MUTCD](#) partly in order to differentiate between the two.

2-1-3 Standardization

December 2005

Although the Department exercises no control over the usage of non-conforming signs on other systems, except on sections being built under state contracts, the Department can and *should* be looked to for direction in preserving the uniformity of all traffic control devices. Signs are of special concern because they can be designed in almost endless variation.

[Part 1](#) of the [MUTCD](#) gives specific positive purposes for the use of standardized traffic control devices. If these were closely followed by all agencies there would be no need for further discussion. Unfortunately, there are some who believe that non-uniform signs are more effective, generally because of their uniqueness. The following discussion is intended to counter this attitude and service as a resource in replying on the subject of uniformity or objecting to the use of non-conforming signs.

While it *should* be quite clear as to the purposes of signing for the benefit of the motoring public, there are other purposes for signing which *may* be installed on streets and highways, some of which have no benefit to motorists at all. These side purposes *may* include efforts to:

- Attract
- Notify, inform
- Advertise
- Educate
- Influence
- Propagandize
- Memorialize
- Placate
- Landmark
- Reinforce

The consequences of displaying non-conforming signs would be expected to mainly affect the motorist, but sometimes *may* affect others, such as pedestrians. These consequences *may* include:

- Misinterpretation
- Incorrect message
- Message contrary to law
- Distracting from driving task
- Distracting from important signs
- Incomprehensive message
- Generation of humor rather than seriousness
- False trust by others (pedestrians)
- Wasted money
- Bad precedent
- Loss of respect
- Poor materials (deterioration)
- Poor aesthetics
- Liability

EXAMPLES

Some specific examples follow which are intended to explain why the usage is undesirable.

Slow Children

The use of this sign is probably the most common non-standard to be found on local streets. It is typically a black on yellow rectangular sign, with a running child figure. A variation *may* add the phrase "at play." It is often shown in sign catalogs.

The purpose of this sign is largely to placate the residents. While their concern for the safety of their children is understandable, the real issue is not being addressed, which the hazard is caused by children either playing in the street or entering the street without exercising care. Both actions are illegal. The sign therefore tends to endorse illegal actions, and that is why it *should* not be used.

Motorist Stop/Yield to Pedestrians

This sign is commonly a red and white rectangle, but could have several variations. It is usually erected at the crosswalk. A variation seen in other states refers to children and is probably used at crossings of neighborhood school routes. The departure from shape, color and message tends to diminish the impact of conforming signing. It *should* be expected that the public is slightly confused as to what is expected at these “special” places. The most serious reason why they *should* not be used would be if the pedestrians themselves observed the signs and reacted differently, thereby not exercising their normal caution. In Wisconsin, pedestrians have the right of way only if they do not cause the motorist to have difficulty in stopping.

Black Spot

This sign is used in foreign countries and perhaps in this country to indicate the scene of one or more fatal accidents. It is intended to warn motorists of a perceived dangerous location as well as to memorialize the location. In Wisconsin crosses have been erected by private persons to do the same thing. The negative aspects of this activity are the possibility that motorists will be distracted, that the location is only randomly the scene of a fatality, that the sign itself *may* be an obstruction to sight or otherwise an obstacle; that the sign is not informative as to what the hazard might be if there was one; and the prospect that the memorial will be unpleasant to local people if the victim was local.

Directional Signs to Generators

In a recent contract funded with federal aid, provisions were made to install directional signs on a downtown street. The design of the signs was non-conforming regarding the [MUTCD Sections 1A.02 and 2D.02 through 2D.08](#). The signs had two-color backgrounds, had arrows set in circles, which were black and white and raised above the sign surface and extended out beyond the edge of the sign, and had letter fonts and sized which would have made the signs illegible to the motoring public. The signs were removed from the project.

This was admittedly an extreme case of non-conformance. However, it is our obligation to advise that there are definite standards on all features of guide signs. To the extent that signs depart from any of these standards, the motoring public is not served, but rather some other interest is being addressed, some of which are listed above, along with the consequences.

2-1-7 Dynamic Speed Display Signs

January 2018

PURPOSE

The MUTCD section [2A.07](#) allows usage of Dynamic Speed Display Signs to measure and display individual speeds at a specific location. These signs are commonly referred to as “speed display signs,” “driver feedback signs” or “your speed is” signs. The signs are activated by radar to detect and display individual vehicle speeds to the vehicle driver. The expectation is that the driver will compare his speed with the legal posted speed and adjust accordingly. These sign installations may be portable installations that are installed on a temporary basis or may be permanent installations attached to new or existing signing. Local units of government have requested to install this signing. This policy provides guidance on the usage of these signs on state maintained roadways.

DEFINITIONS

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate Highways are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections and driveways.

Conventional Highways are defined as streets or roads other than freeways or expressways. They may be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

POLICY

Requests to install and maintain dynamic speed display signs on DOT-maintained roadways **shall** be made in writing by a local unit of government. Each request **shall** include a map showing the proposed location of the dynamic speed display sign(s). Upon Region review, approval or denial **shall** be made by a letter to the local

unit of government. If approval is granted, the letter **shall** confirm that all provisions of this policy are met by the request. If approval is given, the Region *should* also provide a copy of the R2-1C standard sign plate with the approval letter so consistency is maintained in the design and manufacture of the signs.

QUALIFYING CRITERIA

The following criteria **shall** be used by the Region to determine whether a roadway would qualify for dynamic speed display signs.

1. Dynamic Speed Display Signs *may* be allowed in the following locations on the state highway system:
 - a. School Speed Limit Zones
 - b. Reductions in Speed Zones within a community
 - c. Work Zone speed limit areas.
2. Portably mounted dynamic speed display signs *may* be permitted at locations where they can safely be deployed for a time not to exceed eight days.
3. Dynamic speed display signs for work zones *may* be allowed for the duration of the project. The decision to utilize dynamic speed display signs for construction work zones is determined through the work zone transportation management plan process.
4. Except for work zone areas, dynamic speed display signs **shall not** be allowed on freeways and expressways, including ramps.
5. The usage of dynamic speed display signs is limited to one sign per approach of speed transition zones such as at city limits, school zones or speed reduction transition. Transition points from expressways to conventional highways may be permitted.
6. Dynamic Speed Display sign installations **shall** comply with all NCHRP 350 crashworthy requirements.
7. When permanent mounted dynamic speed display signs are used, they **shall** be placed next to or downstream (typically 100'-200') of the regulatory speed limit sign (R2-1) or school speed assembly sign (S4-51) sign. The signs **shall** be at the same mounting height.
8. Dynamic speed display signs that do not conform to this policy **shall** be removed. Notification to communities **shall** be made by written letter. If existing non-permitted signs are not removed, WisDOT will remove the sign(s) at the owner's expense.
9. The local unit of government **shall** be responsible for manufacture, liability, installation and maintenance costs.
10. The local unit of government **shall** affix an identification label to the back of each sign, per Wisconsin State Statute 86.19(5).
11. WisDOT reserves the right to remove or move dynamic speed display signs in the event of a speed zone change, maintenance work or improvement project. WisDOT will notify the local unit of government, in writing, of the work and all costs associated with moving or removing the dynamic message speed signs. All costs for such moves **shall** be paid by the local unit of government.
12. The size lettering used on dynamic speed display signs **shall**, at a minimum, match the adjacent speed limit sign (see R2-1C sign plate).

USAGE CRITERIA

1. Dynamic speed display signs installed in permanent speed zones *should* operate 24 hours a day, 7 days a week.
2. Dynamic speed display signs installed on a temporary speed zone *should* operate for the time that the speed zone is in effect (e.g. school zones or work zones).
3. For work zones, the dynamic speed display signs *should not* be overused. Only one dynamic speed display sign *should* be used per direction of traffic flow.

SIGN DESIGN CRITERIA

1. The R2-1C sign (See Figure 1) **shall** be used for permanent applications.
2. The changeable portion of the dynamic speed display sign **shall** have a black background with an amber (yellow) legend. On devices equipped with flip discs, the legend color *may* be yellow or green.

Only one sign, in each direction of a two-way street approach or back-to-back signs, will be allowed for each crosswalk approach.

3. The changeable message portion of the sign **shall** display the speed of the approaching vehicle as "XX" in miles per hour. The following standards apply to the changeable message portion of the sign:
 - a. The sign **shall** flash at drivers traveling over the posted speed limit.
 - b. The flash rate *should* be between 50 and 60 cycles per minute.
 - c. Threshold speed setting *should* be set at 20mp below and above the posted speed.
 - d. For speeds measured over the speed threshold setting, the dynamic speed display sign **shall** go blank.
 - e. The dynamic speed display sign **shall** be either blank or display zeros when no vehicles are present.

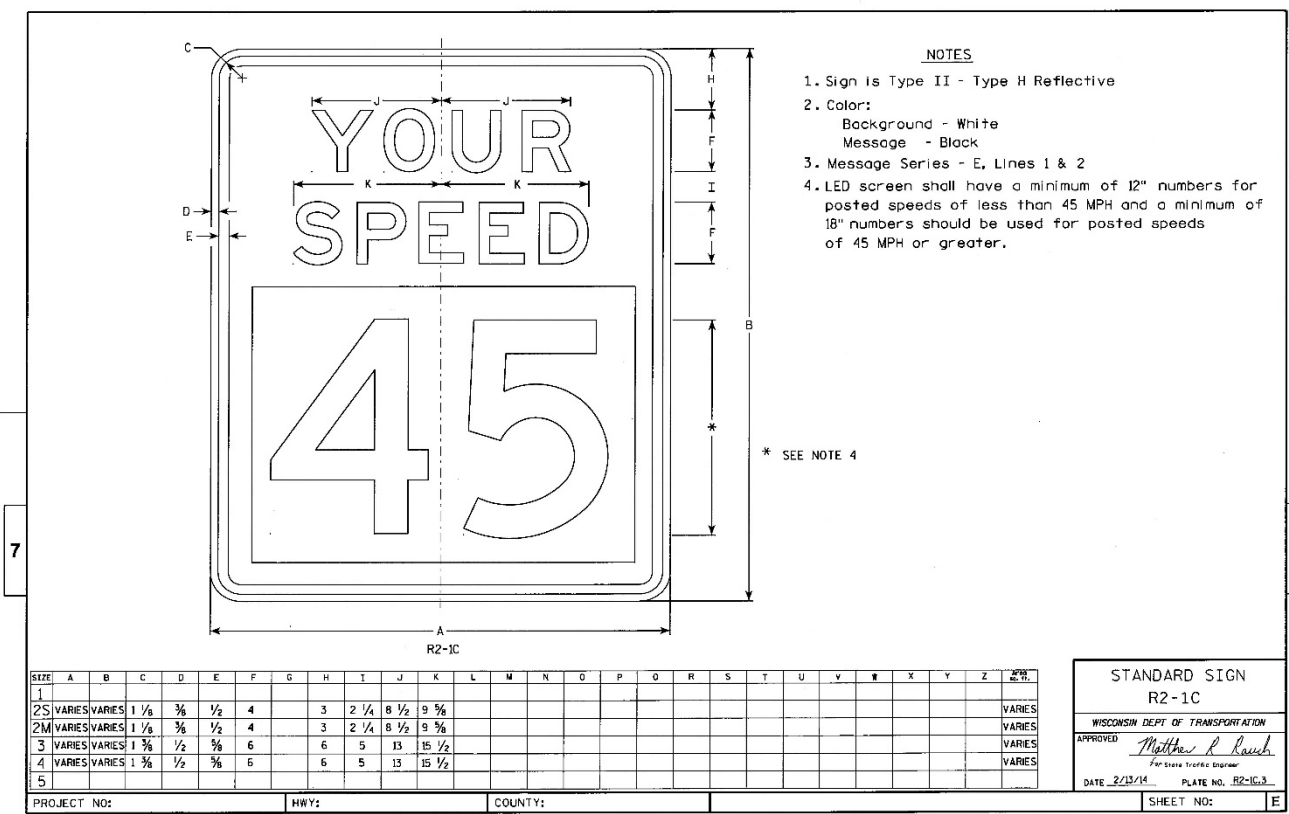


Figure 1. Dynamic Speed Display Sign R2-1C

2-1-8 LEDs (Blinker Signs)

June 2014

PURPOSE

The MUTCD section [2A.07](#) provides standards and options for the usage of Light Emitting Diode (LED) units within the face of a sign and in the border of a sign to improve conspicuity and increase the legibility of sign legends and borders. This policy provides requirements and guidance on the proper use of the LED (commonly referred to as blinker) signs on state-maintained highways. Per the [MUTCD](#), these blinker signs *may* be used on STOP signs, Warning signs and other regulatory signs such as speed limit sign or school signs. This policy provides guidance and requirements for usage on state-maintained highways.

BACKGROUND

The [MUTCD](#) includes language in [2A.07](#) which provides guidelines for the proper use of these devices. They

are considered similar to flashing beacons in section [4L](#) of the [MUTCD](#). The limiting guidelines under which they are considered in the Wisconsin Supplement are:

- Guideline 1: Demonstrated crash problem
- Guideline 2: Visibility restrictions
- Guideline 3: Unusual geometrics
- Guideline 4: Poor conspicuity—sign blending in with the environment

These four guidelines apply to all public highways and streets, including those not under state jurisdiction. The policy statements below pertain specifically to state-maintained highways.

DEFINITIONS AND MUTCD REQUIREMENTS (IF LEDS USED)

1. LEDs **shall** have a maximum diameter of ¼ inch and **shall** be the following colors based on the type of sign:
 - a. White or red, if used with STOP or YIELD signs.
 - b. White, if used with regulatory signs other than STOP or YIELD signs.
 - c. White or yellow, if used with warning signs.
2. If flashed, the LED units **shall** flash simultaneously at a rate of more than 50 and less than 60 times per minute.
3. The uniformity of the sign design **shall** be maintained without any decrease in visibility, legibility, or driver comprehension during either daytime or nighttime conditions.
4. A module of multiple LED units used as a closely-spaced, single light source **shall** only be used within the sign face for legends or symbols.

POLICY

The usage of any illumination methods for traffic signs, including LEDs, is strictly limited to situations with documented safety concerns.

1. Local authorities **shall not** be allowed to installed units on state-maintained highways.
2. Blinker signs **shall** only be considered at existing locations. A conversion from a two to four-way stop is also considered an existing location. New locations **shall not** be considered until a minimum of one-year crash data, volume data and other traffic data is available for a traffic evaluation safety **shall** be submitted to the State Safety Engineer for review.
3. For blinker STOP and STOP AHEAD signs, at a minimum, consider at intersections that meet both of the following criteria:
 - a. Crashes due to failure to stop (i.e. running the stop sign), not failure to yield the right of way (i.e. stopping and then proceeding)
 - b. At least two documented failures (crash reports) to stop in the most recent 12-month period, or three documented failures to stop within the past five years.
4. Other countermeasures *should* be considered first, prior to installation of blinker STOP and STOP AHEAD signs, to address safety concerns such as:
 - a. Clearing vegetation
 - b. Double-marking STOP or STOP AHEAD signs
 - c. Flags on signs
 - d. Rumble strips
 - e. Increasing sign sizes
 - f. Flashing beacons
 - g. Others.
5. Side-by-side ramps are common at partial cloverleaf interchanges where entrance and exit ramps operate directly adjacent to one another at the interchange ramp terminal. Geometric design

techniques to discourage wrong way maneuvers *should* be considered at side-by-side ramps. Where design constraints exist, blinker WRONG WAY signs *may* be utilized at side-by-side interchange ramps, provided there are documented wrong way movements noted by law enforcement or the Department. Blinker WRONG WAY signs **shall** not be used at locations other than side-by-side interchange ramps. WRONG WAY blinker signs shall only be used downstream of the ramp termini.

6. To maximize the effectiveness of the blinker WRONG WAY signs, vehicle actuated and time-of-day usage **shall** be considered by the Region. Some examples of time-of day usage would include:
 - a. Operation during periods when wrong way drivers are prevalent.
 - b. Operation during periods of low visibility or darkness, which may include a photocell operation.
7. To avoid a proliferation of blinker signs, now they **shall** only be used for STOP, STOP AHEAD, and WRONG WAY signs (at side-by-side ramps). These are considered the more important of the regulatory and warning sign series. There is the longstanding concern that overuse of the blinker signs will diminish their effectiveness.

*There have been requests to utilize different types of blinker signs. To address these requests, the Bureau of Traffic Operations is in the process of coordinating the evaluation of different types of blinker signs, and the evaluation results will determine the potential expansion of use per statewide policy. Presently, blinker signs are currently being evaluated on chevron signs in the SE and SW Regions, where there is a dynamic (vehicle actuated) system.

Any requests for additional blinker sign evaluations **shall** be approved by the Bureau of Traffic Operations.

8. Blinker STOP AHEAD signs **shall** be furnished and installed by WisDOT on state highways based on the criteria noted above.
9. Do not install blinker STOP signs and STOP AHEAD signs on the same approach. If used where there is a curve or hill approaching a STOP sign, use blinker on STOP AHEAD sign rather than STOP sign.
10. Do not mix beacons and blinker signs with STOP and STOP AHEAD signs on the same approach.

A cost comparison analysis *should* be done to determine where beacons or blinker sign is more appropriate. Studies have not been performed to determine if one device is more appropriate than the other.

2-1-30 Sign Numbering

January 2007

[Section 86.19\(5\) Wis. Stat.](#) provides that all maintaining agencies in the state must affix a unique code number to each of their signs for identifying the owner of the sign if it *should* be found elsewhere. Whereas the vandalism sticker is prescribed by law to be applied to the face of the sign, there is no provision about sign numbers in [86.19 \(5\)](#) to that effect, and therefor the number *may* be placed on the back of the sign, although it could be incorporated unobtrusively into the stenciling.

The format of the sign number *should* follow the example below for the Town of Big Flats in Adams County:

1-02

The numerals *should* be one inch in height and made of durable materials such as stencil paste on adhesive-backed vinyl film. Felt pen ink will not last. Paint applied directly to aluminum *may* come off if the aluminum is not specifically treated.

The numbers to be used are on the following pages.

| 1 ADAMS | | | |
|-----------------|--------------------------------|--------------------|----------------|
| Townships | Cities & Villages | | |
| 02 Adams | 201 Adams (C) | 20 New Chester | 04 Plainville |
| 04 Big Flats | 291 Friendship (V) | 22 New Haven | 05 White Creek |
| 06 Colburn | | 24 Preston | |
| 08 Dell Prairie | <u>Unincorporated Villages</u> | 26 Quincy | |
| 10 Easton | 17 Arkdale | 28 Richfield | |
| 12 Jackson | 10 Brooks | 30 Rome | |
| 14 Leola | 17 Dellwood | 32 Springville | |
| 16 Lincoln | 10 Grand Marsh | 34 Strongs Prairie | |
| 18 Monroe | 15 New Rome | | |

2 ASHLAND

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------------|---------------|
| 02 | Agenda | 201 | Ashland (C) |
| 04 | Ashland | 106 | Butternut (V) |
| 06 | Chippewa | 251 | Mellen (C) |
| 08 | Gingles | | |
| 10 | Gordon | | |
| Townships | | Unincorporated Villages | |
| 12 | Jacobs | 09 | Cayuga |
| 14 | La Pointe | 05 | Clam Lake |
| 16 | Marengo | 06 | Glidden |
| 18 | Morse | 02 | High Bridge |
| 20 | Peeksville | 13 | Marengo |
| 22 | Sanborn | 05 | Morse |
| 24 | Shanagolden | 11 | Odanah |
| 26 | White River | 13 | Sanborn |

3 BARRON

| Townships | | Cities & Villages | |
|-----------|--------------|-------------------------|------------------|
| 02 | Almena | 101 | Almena (V) |
| 04 | Arland | 206 | Barron (C) |
| 06 | Barron | 111 | Cameron (V) |
| 08 | Bear Lake | 211 | Chetek (C) |
| 10 | Cedar Lake | 212 | Cumberland (C) |
| 12 | Chetek | 116 | Dallas (V) |
| 14 | Clinton | 136 | Haugen (V) |
| 16 | Crystal Lake | 171 | Prairie Farm (V) |
| 18 | Cumberland | 276 | Rice Lake (C) |
| 20 | Dallas | 186 | Turtle Lake (V) |
| 22 | Dovre | 151 | New Auburn (V) |
| 24 | Doyle | | Also in Chippewa |
| 26 | Lakeland | | |
| Townships | | Unincorporated Villages | |
| 28 | Maple Grove | 05 | Angus |
| 30 | Maple Plain | 13 | Barronett |
| 32 | Oak Grove | 16 | Brill |
| 34 | Prairie Farm | 19 | Campia |
| 36 | Prairie Lake | 23 | Canton |
| 38 | Rice Lake | 08 | Comstock |
| 40 | Sioux Creek | 14 | Hillsdale |
| 42 | Stanford | 23 | Lehigh |
| 44 | Stanley | 05 | Mikana |
| 46 | Sumner | 07 | Poskin |
| 48 | Turtle Lake | | |
| 50 | Vance Creek | | |

4 BAYFIELD

| Townships | | Cities & Villages | |
|-----------|------------|-------------------------|--------------|
| 02 | Barksdale | 206 | Bayfield (C) |
| 04 | Barnes | 201 | Ashland (C) |
| 06 | Bayfield | 151 | Mason (V) |
| 08 | Bay View | 291 | Washburn (C) |
| 10 | Bell | | |
| 12 | Cable | | |
| Townships | | Unincorporated Villages | |
| 14 | Clover | 07 | Barkpoint |
| 16 | Delta | 14 | Benoit |
| 18 | Drummond | 02 | Bingo |
| 20 | Eileen | 05 | Cornucopia |
| 21 | Hughes | 08 | Delta |
| 22 | Iron River | 02 | Fresh Air |
| 24 | Kelly | 22 | Grandview |
| 26 | Keystone | 07 | Herbster |
| 28 | Lincoln | 20 | Moquah |
| 30 | Mason | | |
| 32 | Namekegon | | |
| 34 | Orients | | |
| 36 | Oulu | | |
| 38 | Piben | | |

| | |
|----|-----------|
| 40 | Port Wing |
| 42 | Grandview |
| 46 | Russell |
| 48 | Tripp |
| 50 | Washburn |

5 BROWN

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------------|-----------------|
| 10 | Eaton | 102 | Allouez (V) |
| 12 | Glenmore | 104 | Ashwaubenon (V) |
| 14 | Green Bay | 106 | Bellevue (V) |
| 18 | Holland | 126 | Hobart (V) |
| 22 | Humboldt | 116 | Denmark (V) |
| 24 | Lawrence | 216 | De Pere (C) |
| 25 | Ledgeview | 231 | Green Bay (C) |
| 26 | Morrison | 136 | Howard (V) |
| 28 | New Denmark | 171 | Pulaski (V) |
| 30 | Pittsfield | 178 | Suamico (V) |
| 34 | Rockland | 191 | Wrightstown (V) |
| 36 | Scott | | |
| Townships | | Unincorporated Villages | |
| 40 | Wrightstown | 15 | Anston |
| | | 19 | Big Suamico |
| | | 20 | Greenleaf |
| | | 12 | Little Rapids |
| | | 11 | New Franken |
| | | 13 | Wayside |
| | | 20 | W. Wrightstown |

6 BUFFALO WSP-6

| Townships | | Cities & Villages | |
|-----------|-----------|-------------------|-------------------|
| 02 | Alma | 201 | Alma (C) |
| 04 | Belvidere | 206 | Buffalo (C) |
| 06 | Buffalo | 111 | Cochrane (V) |
| 08 | Canton | 226 | Fountain City (C) |
| 10 | Cross | 251 | Mondovi (C) |
| 12 | Dover | 154 | Nelson (V) |
| 14 | Gilmanton | | |
| 16 | Glencoe | | |
| 18 | Lincoln | | |
| 20 | Maxville | | |
| 22 | Milton | | |
| 24 | Modena | | |
| 26 | Mondovi | | |
| 28 | Montana | | |
| 30 | Naples | | |
| 32 | Nelson | | |
| 34 | Waumandee | | |

7 BURNETT

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------------|----------------|
| 02 | Anderson | 131 | Grantsburg (V) |
| 04 | Blaine | 181 | Siren (V) |
| 06 | Daniels | 191 | Webster (V) |
| 08 | Dewey | | |
| 10 | Grantsburg | | |
| Townships | | Unincorporated Villages | |
| 12 | Jackson | 16 | Danbury |
| 14 | La Follette | 14 | Ferron Park |
| 16 | Lincoln | 12 | Gaslyn |
| 18 | Meenon | 07 | Hertel |
| 20 | Oakland | 01 | Randall |
| 22 | Roosevelt | 10 | Yellowlake |
| 24 | Rusk | | |
| 26 | Sand Lake | | |
| 28 | Scott | | |
| 30 | Siren | | |
| 32 | Swiss | | |

| | |
|----|----------------|
| 34 | Trade Lake |
| 36 | Union |
| 38 | Webb Lake |
| 40 | West Marshland |
| 42 | Wood River |

8 CALUMET

| Townships | | Cities & Villages | |
|-------------------------|--------------|-------------------|------------------|
| 02 | Brillion | 206 | Brillion (C) |
| 04 | Brothertown | 211 | Chilton (C) |
| 06 | Charlestown | 136 | Hilbert (V) |
| 08 | Chilton | 261 | New Holstein (C) |
| 10 | Harrison | 179 | Sherwood (V) |
| 12 | New Holstein | 181 | Stockbridge (V) |
| 14 | Rantoul | 201 | Appleton (C) |
| 16 | Stockbridge | 160 | Potter |
| 18 | Woodville | 241 | Kiel |
| | | 251 | Menasha |
| Unincorporated Villages | | | |
| 05 | | | Darboy |
| 09 | | | Dundas |
| 01 | | | Forest Junction |
| 03 | | | Hayton |
| 05 | | | Highcliff |

9 CHIPPEWA

| Townships | | Cities & Villages | |
|-----------|---------------|-------------------|-------------------------|
| 02 | Anson | 206 | Bloomer (C) |
| 04 | Arthur | 106 | Boyd (V) |
| 06 | Auburn | 111 | Cadott (V) |
| 08 | Birch Creek | 211 | Chippewa Falls (C) |
| 10 | Bloomer | 213 | Cornell (C) |
| 12 | Cleveland | 161 | New Auburn (V) |
| 14 | Colburn | | also in Barron Co. |
| 16 | Cooks Valley | 281 | Stanley (C) |
| 18 | Delmar | 128 | Lake Hallie (V) |
| 20 | Eagle Point | | |
| 22 | Edson | | Unincorporated Villages |
| 24 | Estella | 16 | Albertville |
| 26 | Goetz | 18 | Arnold |
| 28 | Hallie | 02 | Cobban |
| 32 | Howard | 10 | Eagleton |
| 34 | Lafayette | 01 | Jim Falls |
| 35 | Lake Holcombe | | |
| 36 | Ruby | | |
| 38 | Sampson | | |
| 40 | Sigel | | |
| 42 | Tilden | | |
| 44 | Wheaton | | |
| 46 | Woodmohr | | |

10 CLARK

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------|-----------------|
| 02 | Beaver | 201 | Abbotsford (C) |
| 04 | Butler | 211 | Colby (C) |
| 06 | Colby | 111 | Curtiss (V) |
| 08 | Dewhurst | 116 | Dorchester (V) |
| 10 | Eaton | 131 | Granton (V) |
| 12 | Foster | 231 | Greenwood (C) |
| 14 | Fremont | 246 | Loyal (C) |
| 16 | Grant | 261 | Neillsville (C) |
| 18 | Green Grove | 265 | Owen (C) |
| 20 | Hendren | 286 | Thorp (C) |
| 22 | Hewett | 191 | Withee (V) |
| 24 | Hixon | 186 | Unity (V) |
| 26 | Hoard | | |

| | | Unincorporated Villages | |
|----|-------------|-------------------------|-----------|
| 28 | Levis | 07 | Chili |
| 30 | Loyal | 20 | Humbird |
| 32 | Longwood | 27 | Riplinger |
| 3 | Lynn | 23 | Tioga |
| 36 | Mayville | 10 | Willard |
| 38 | Mead | | |
| 40 | Mentor | | |
| 42 | Pine Valley | | |
| 44 | Reseberg | | |
| 46 | Seif | | |
| 48 | Sherman | | |
| 50 | Sherwood | | |
| 52 | Thorp | | |
| 54 | Unity | | |
| 56 | Warner | | |
| 58 | Washburn | | |
| 60 | Weston | | |
| 62 | Withee | | |
| 64 | Worden | | |
| 66 | York | | |

11 COLUMBIA

| Townships | | Cities & Villages | |
|-----------|------------------|-------------------|-------------------------|
| 02 | Arlington | 101 | Arlington (V) |
| 04 | Caledonia | 111 | Cambria (V) |
| 06 | Columbus | 211 | Columbus (C) |
| 08 | Courtland | 116 | Doylestown (V) |
| 10 | Dekorra | 126 | Fall River (V) |
| 12 | Ft. Winnebago | 127 | Friesland (V) |
| 14 | Fountain Prairie | 246 | Lodi (C) |
| 16 | Hampden | 171 | Pardeeville (V) |
| 18 | Leeds | 271 | Portage (C) |
| 20 | Lewiston | 172 | Poynette (V) |
| 22 | Lodi | 176 | Randolph (V) |
| 24 | Lowville | 177 | Rio (V) |
| 26 | Marcellon | 291 | Wisconsin Dells (C) |
| 28 | Newport | 191 | Wyocena (V) |
| 30 | Otsego | | |
| 32 | Pacific | | Unincorporated Villages |
| 34 | Randolph | 119 | Okee |
| 36 | Scott | | |
| 38 | Springville | | |
| 40 | West Point | | |
| 42 | Wyocena | | |

12 CRAWFORD

| Townships | | Cities & Villages | |
|-------------------------|------------------|-------------------|----------------------|
| 02 | Bridgeport | 106 | Bell Center |
| 04 | Clayton | 116 | De Soto (V) |
| 06 | Eastman | 121 | Eastman (V) |
| 08 | Freeman | 126 | Ferryville (V) |
| 10 | Haney | 131 | Gays Mills (V) |
| 12 | Marietta | 146 | Lynxville (V) |
| 14 | Prairie du Chien | 151 | Mt. Sterling (V) |
| 16 | Scott | 271 | Prairie du Chien (C) |
| 18 | Seneca | 181 | Soldiers Grove (V) |
| 20 | Utica | 182 | Steuben (V) |
| 22 | Wauzeka | 191 | Wauzeka (V) |
| Unincorporated Villages | | | |
| 05 | | | Barnum |
| 05 | | | Petersburg |

13 DANE

| Townships | | Cities & Villages | |
|-----------|--------|-------------------|-----------------|
| 02 | Albion | 106 | Belleville (V) |
| 04 | Berry | 107 | Black Earth (V) |

| | | | |
|----|------------------|-----|---------------------|
| 06 | Black Earth | 108 | Blue Mounds (V) |
| | | 109 | Brooklyn (V) |
| 08 | Blooming Grove | 111 | Cambridge (V) |
| 10 | Blue Mounds | 112 | Cottage Grove (V) |
| 12 | Bristol | 113 | Cross Plains (V) |
| 14 | Burke | 116 | Dane (V) |
| 16 | Christiana | 117 | Deerfield (V) |
| 18 | Cottage Grove | 118 | De Forest (V) |
| 20 | Cross Plains | 221 | Edgerton (V) |
| 22 | Dane | 251 | Madison (C) |
| 24 | Deerfield | 151 | Maple Bluff (V) |
| 26 | Dunkirk | 154 | McFarland (V) |
| 28 | Dunn | 152 | Marshall (V) |
| 32 | Madison | 153 | Mazomanie (V) |
| 34 | Mazomanie | 255 | Middleton (C) |
| 36 | Medina | 258 | Monona (C) |
| 38 | Middleton | 157 | Mt. Horeb (V) |
| 40 | Montrose | 165 | Oregon (V) |
| 42 | Oregon | 176 | Rockdale (V) |
| 44 | Perry | 181 | Shorewood Hills (V) |
| 46 | Pleasant Springs | 281 | Stoughton (C) |
| 48 | Primrose | 282 | Sun Prairie (C) |
| 50 | Roxbury | 286 | Verona (C) |
| 52 | Rutland | 191 | Waunakee (V) |
| 54 | Springdale | | |
| 56 | Springfield | | |
| 58 | Sun Prairie | 20 | Basco |
| 60 | Vermont | 27 | Klevenville |
| 62 | Verona | 12 | London |
| 64 | Vienna | 34 | Morrisonville |
| 66 | Westport | 27 | Mt. Vernon |
| 68 | Windsor | 20 | Paoli |
| 70 | York | 27 | Riley |

14 DODGE

| Townships | | Cities & Villages | |
|-----------|--------------|-------------------|-----------------|
| 02 | Ashippun | 206 | Beaver Dam (C) |
| 04 | Beaver Dam | 106 | Brownsville (V) |
| 06 | Burnett | 111 | Clyman (V) |
| 08 | Calamus | 211 | Columbus (C) |
| 10 | Chester | 226 | Fox Lake (C) |
| 12 | Clyman | 230 | Hartford (C) |
| 14 | Elba | 236 | Horicon (C) |
| 16 | Emmet | 136 | Hustisford (V) |
| 18 | Fox Lake | 141 | Iron Ridge (V) |
| 20 | Herman | 241 | Juneau (C) |
| 22 | Hubbard | 143 | Kekoskee (V) |
| 24 | Hustisford | 146 | Lomira (V) |
| 26 | Lebanon | 147 | Lowell (V) |
| 28 | Le Roy | 251 | Mayville (C) |
| 30 | Lomira | 161 | Neosho (V) |
| 32 | Lowell | 176 | Randolph (V) |
| 34 | Oak Grove | 177 | Reeseville (V) |
| 36 | Portland | 186 | Theresa (V) |
| 38 | Rubicon | 291 | Watertown (C) |
| 40 | Shields | 292 | Waupun (C) |
| 42 | Theresa | | |
| 44 | Trenton | | |
| 46 | Westford | 07 | Astico |
| 48 | Williamstown | 05 | Atwater |
| | | 15 | Knowles |
| | | 21 | Marshville |
| | | 17 | Minnesota Jct |
| | | 20 | Richwood |
| | | 17 | Rolling Prairie |
| | | 10 | Woodland |

15 DOOR

| Townships | | Cities & Villages | |
|-----------|----------------|-------------------|--------------------------|
| 02 | Baileys Harbor | 121 | Ephraim (V) |
| 04 | Brussels | 127 | Forestville (V) |
| 06 | Clay Banks | 181 | Sister Bay (V) |
| 08 | Egg Harbor | 281 | Sturgeon Bay (C) |
| 10 | Forestville | 118 | Egg Harbor (V) |
| 12 | Gardner | | |
| 14 | Gibraltar | | |
| 16 | Jacksonport | 14 | Detroit Harbor |
| 18 | Liberty Grove | 09 | Ellison Bay |
| 20 | Nasewaupsee | 07 | Fish Creek |
| 22 | Sevastopol | 08 | Jacksonport-Sturgeon Bay |
| 24 | Sturgeon Bay | 05 | Mapelwood |
| 26 | Union | 53 | Sawyer-Sturgeon Bay |
| 28 | Washington | 14 | Washington Island |
| | | 04 | Carlsville |

16 DOUGLAS

| Townships | | Cities & Villages | |
|-----------|---------------|-------------------|----------------------|
| 02 | Amnicon | 146 | Lake Nebagamon (V) |
| 04 | Bennett | 165 | Oliver (V) |
| 06 | Brule | 171 | Poplar (V) |
| 08 | Cloverland | 181 | Solon Springs (V) |
| 10 | Dairyland | 281 | Superior (C) |
| 12 | Gordon | 182 | Superior Village (V) |
| 14 | Hawthorne | | |
| 16 | Highland | | |
| 18 | Lakeside | 55 | Allouez |
| 20 | Maple | 14 | Amnicon Lake |
| 22 | Oakland | 55 | Billings Park |
| 24 | Parkland | 10 | Blueberry |
| 26 | Solon Springs | 55 | East End |
| 28 | Summit | 14 | Foxboro |
| 30 | Superior | 07 | Hines |
| 32 | Wascott | 55 | Itasca |
| | | 05 | Dairyland |
| | | 14 | Patzau |
| | | 12 | South Range |
| | | 01 | Wentworth |

17 DUNN

| Townships | | Cities & Villages | |
|-----------|--------------|-------------------|----------------|
| 02 | Colfax | 106 | Boyceville (V) |
| 04 | Dunn | 111 | Colfax (V) |
| 06 | Eau Galle | 116 | Downing (V) |
| 08 | Elk Mound | 121 | Elk Mound (V) |
| 10 | Grant | 141 | Knapp (V) |
| 12 | Hay River | 251 | Menomonie (C) |
| 14 | Lucas | 176 | Ridgeland (V) |
| 16 | Menomonie | 191 | Wheeler (V) |
| 18 | New Haven | | |
| 20 | Otter Creek | | |
| 22 | Peru | 13 | Caryville |
| 24 | Red Cedar | 02 | Downsville |
| 26 | Rock Creek | 11 | Meridean |
| 28 | Sand Creek | 12 | Rusk |
| 30 | Sheridan | 13 | Rock Falls |
| 32 | Sherman | | |
| 34 | Spring Brook | | |
| 36 | Stanton | | |
| 38 | Tainter | | |
| 40 | Tiffany | | |
| 42 | Weston | | |
| 44 | Wilson | | |

18 EAU CLAIRE

| Townships | | Cities & Villages | |
|-----------|-----------------|-------------------------|----------------|
| 02 | Bridge Creek | 201 | Altoona (C) |
| 04 | Brunswick | 202 | Augusta (C) |
| 06 | Clear Creek | 221 | Eau Claire (C) |
| 08 | Drammen | 126 | Fairchild (V) |
| 10 | Fairchild | 127 | Fall Creek (V) |
| 12 | Lincoln | | |
| 14 | Ludington | | |
| Townships | | Unincorporated Villages | |
| 16 | Otter Creek | 03 | Allen |
| 18 | Pleasant Valley | 03 | Foster |
| 20 | Seymour | | |
| 22 | Union | | |
| 24 | Washington | | |
| 26 | Wilson | | |

19 FLORENCE

| Townships | | Unincorporated Villages | |
|-----------|--------------|-------------------------|--------------|
| 02 | Aurora | 05 | Spread Eagle |
| 04 | Commonwealth | | |
| 06 | Fence | | |
| 08 | Fern | | |
| 10 | Florence | | |
| 12 | Homestead | | |
| 14 | Long Lake | | |
| 16 | Tipler | | |

20 FOND DU LAC

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------------|--------------------|
| 02 | Alto | 106 | Brandon (V) |
| 04 | Ashford | 111 | Campbellsport (V) |
| 06 | Auburn | 121 | Eden (V) |
| 08 | Byron | 126 | Fair Water (V) |
| 10 | Calumet | 226 | Fond du Lac (C) |
| 12 | Eden | 151 | Mt. Calvary |
| 14 | Eldorado | 161 | N. Fond du Lac (V) |
| 16 | Empire | 165 | Oakfield (V) |
| 18 | Fond du Lac | 276 | Ripon (C) |
| 20 | Forest | 176 | Rosendale (V) |
| 22 | Friendship | 181 | St. Cloud (V) |
| 24 | Lamartine | 142 | Kewauskum (V) |
| 26 | Marshfield | 292 | Waupun (C) |
| 28 | Metomen | | |
| Townships | | Unincorporated Villages | |
| 30 | Oakfield | | |
| 32 | Osceola | 13 | Calvary |
| 34 | Ripon | 04 | Hamilton |
| 36 | Rosendale | 20 | Malone |
| 38 | Springvale | 15 | Oak Center |
| 40 | Taycheedah | 20 | Peebles |
| 42 | Waupun | 04 | S. Byron |
| | | 11 | Van Dyne |

21 FOREST

| Townships | | Cities & Villages | |
|-----------|-----------------|-------------------------|-------------|
| 02 | Alvin | 211 | Crandon (C) |
| 04 | Argonne | | |
| Townships | | Unincorporated Villages | |
| 06 | Armstrong Creek | | |
| 08 | Blackwell | 02 | Argonne |
| 10 | Caswell | 14 | Carter |
| 12 | Crandon | 05 | Cavour |
| 14 | Freedom | 08 | Hiles |
| 16 | Hiles | 11 | Jones Spur |
| 18 | Laona | 11 | Mole Lake |
| 20 | Lincoln | 11 | Nashville |
| 22 | Nashville | 01 | Nelma |
| 24 | Popple River | 13 | Newald |
| 26 | Ross | 14 | Padus |

| | | | |
|----|--------|----|----------|
| 28 | Wabeno | 10 | Planets |
| | | 14 | Soperton |
| | | 10 | Keith |

22 GRANT

| Townships | | Cities & Villages | |
|-----------|-----------------|-------------------------|-----------------|
| 02 | Beetown | 106 | Bagley (V) |
| 04 | Bloomington | 107 | Bloomington (V) |
| 06 | Boscobel | 108 | Blue River (V) |
| 08 | Cassville | 206 | Boscobel (C) |
| 10 | Castle Rock | 111 | Cassville (V) |
| 12 | Clifton | 211 | Cuba City (C) |
| 14 | Ellenboro | 116 | Dickeyville (V) |
| 16 | Fennimore | 226 | Fennimore (C) |
| 18 | Glen Haven | 136 | Hazel Green (V) |
| 20 | Harrison | 246 | Lancaster (C) |
| 22 | Hazel Green | 147 | Livingston (V) |
| 24 | Hickory Grove | 151 | Montfort (V) |
| 26 | Jamestown | 152 | Mt. Hope (V) |
| 28 | Liberty | 153 | Muscoda (V) |
| 30 | Lima | 171 | Patch Grove (V) |
| 32 | Little Grant | 271 | Platteville (C) |
| 34 | Marion | 172 | Potosi (V) |
| 36 | Millville | 186 | Tennyson (V) |
| 38 | Mt. Hope | 191 | Woodman (V) |
| 40 | Mt. Ida | | |
| Townships | | Unincorporated Villages | |
| 42 | Muscoda | | |
| 44 | North Lancaster | 27 | Georgetown |
| 46 | Paris | 13 | Kieler |
| 48 | Patch Grove | 13 | Louisburg |
| 50 | Platteville | 11 | Sinsinawa |
| 52 | Potosi | 14 | Stitzer |
| 54 | Smelser | 20 | Werley |
| 56 | South Lancaster | | |
| 58 | Waterloo | | |
| 60 | Watterstown | | |
| 62 | Wingville | | |
| 64 | Woodman | | |
| 66 | Wyalusing | | |

23 GREEN

| Townships | | Cities & Villages | |
|-----------|--------------|-------------------------|----------------|
| 02 | Adams | 101 | Albany (V) |
| 04 | Albany | 206 | Brodhead (C) |
| 06 | Brooklyn | 106 | Brooklyn (V) |
| 08 | Cadiz | 110 | Browntown (V) |
| 10 | Clarno | 251 | Monroe (C) |
| 12 | Decatur | 151 | Monticello (V) |
| 14 | Exeter | 161 | New Glarus (V) |
| 16 | Jefferson | | |
| Townships | | Unincorporated Villages | |
| 18 | Jordan | | |
| 20 | Monroe | 05 | Clarno |
| 22 | Mt. Pleasant | 08 | Juda |
| 24 | New Glarus | 04 | Martintown |
| 26 | Spring Grove | | |
| 28 | Sylvester | | |
| 30 | Washington | | |
| 32 | York | | |

24 GREEN LAKE

| Townships | | Cities & Villages | |
|-----------|------------|-------------------|----------------|
| 02 | Berlin | 206 | Berlin (C) |
| 04 | Brooklyn | 231 | Green Lake (C) |
| 06 | Green Lake | 141 | Kingston (V) |
| 08 | Kingston | 251 | Markesan (C) |
| 10 | Mackford | 154 | Marquette (V) |
| 12 | Manchester | 271 | Princeton (C) |

| | | | |
|----|-----------|--------------------------------|--------|
| 14 | Marquette | | |
| 16 | Princeton | <u>Unincorporated Villages</u> | |
| 18 | St. Marie | 04 | Dalton |
| 20 | Seneca | | |

25 IOWA

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|---------------|------------------------------|--------------------|
| 02 | Arena | 101 | Arena (V) |
| 04 | Brigham | 102 | Avoca (V) |
| 06 | Clyde | 106 | Barnevald (V) |
| 08 | Dodgeville | 108 | Blanchardville (V) |
| 10 | Eden | 111 | Cobb (V) |
| 12 | Highland | 216 | Dodgeville (C) |
| 14 | Landen | 136 | Highland (V) |
| 16 | Mifflin | 137 | Hollandale (V) |
| 18 | Mineral Point | 146 | Linden (V) |
| 20 | Moscow | 147 | Livingston (V) |
| 22 | Pulaski | | Also in Grant Co. |
| 24 | Ridgeway | 251 | Mineral Point (C) |
| 26 | Waldwick | 151 | Montfort |
| 28 | Wyoming | 176 | Rewey (V) |
| | | 177 | Ridgeway (V) |
| | | 153 | Muscoda (V) |
| | | | Also in Grant Co. |

Unincorporated Villages

| | |
|----|-----------|
| 07 | Edmund |
| 13 | Jonesdale |

26 IRON

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|----------|--------------------------------|--------------|
| 02 | Anderson | 236 | Hurley (C) |
| 04 | Carey | 251 | Montreal (C) |
| 06 | Gurney | | |
| 08 | Kimball | <u>Unincorporated Villages</u> | |
| 10 | Knight | 03 | Cedar |
| 12 | Mercer | 04 | Defer |
| 14 | Oma | 08 | Gile |
| 16 | Pence | 05 | Iron Belt |
| 18 | Saxon | 06 | Manitowish |
| 20 | Sherman | 10 | Powell |
| | | 07 | Sandrock |
| | | 10 | Springstead |
| | | 01 | Upson |
| | | 07 | Van Buskirk |

27 JACKSON

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|---------------|--------------------------------|-----------------------|
| 02 | Adams | 101 | Alma Center (V) |
| 04 | Albion | 206 | Black River Falls (C) |
| 06 | Alma | 136 | Hixton (V) |
| 08 | Bear Bluff | 151 | Melrose (V) |
| 10 | Brockway | 152 | Merrillan (V) |
| 12 | City Point | 186 | Taylor (V) |
| 14 | Cleveland | | |
| 16 | Curran | <u>Unincorporated Villages</u> | |
| 18 | Franklin | 01 | Disco |
| 20 | Garden Valley | 05 | Pray |
| 22 | Garfield | 11 | Sechlerville |
| 24 | Garfield | | |
| 26 | Irving | | |
| 28 | Knapp | | |
| 30 | Komensky | | |
| 32 | Manchester | | |
| 34 | Melrose | | |
| 36 | Millston | | |
| 38 | North Bend | | |

| | |
|----|-------------|
| 40 | Northfield |
| 42 | Springfield |

28 JEFFERSON

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|-------------|--------------------------------|-------------------|
| 02 | Aztalan | 111 | Cambridge (V) |
| 04 | Cold Spring | 226 | Ft. Atkinson (C) |
| 06 | Concord | 241 | Jefferson (C) |
| 08 | Farmington | 141 | Johnson Creek (V) |
| 10 | Hebron | 146 | Lac LaBelle (V) |
| 12 | Ixonia | 246 | Lake Mills (C) |
| 14 | Jefferson | 171 | Palmyra (V) |
| 16 | Koshkonong | 181 | Sullivan (V) |
| 18 | Lake Mills | 290 | Waterloo (C) |
| 20 | Milford | 291 | Watertown (C) |
| 22 | Oakland | 292 | Whitewater (C) |
| 24 | Palmyra | | |
| 26 | Sullivan | <u>Unincorporated Villages</u> | |
| 28 | Sumner | 07 | Helenville |
| 30 | Waterloo | 10 | Hubbleton |
| 32 | Watertown | 01 | Jefferson Jct |
| | | 13 | Oak Hill |
| | | 13 | Rome |

29 JUNEAU

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|---------------------|--------------------------------|---------------------|
| 02 | Armenia | 111 | Camp Douglas (V) |
| 04 | Clearfield | 221 | Elroy (C) |
| 06 | Cutler | 136 | Hustler (V) |
| 08 | Finley | 146 | Lyndon Station (V) |
| 10 | Fountain | 251 | Mauston (C) |
| 12 | Germantown | 161 | Necedah (V) |
| 14 | Kildare | 261 | New Lisbon (C) |
| 16 | Kingston | 186 | Union Center (V) |
| 18 | Lemonweir | 291 | Wisconsin Dells (C) |
| 20 | Lindina | 191 | Wonewoc (V) |
| 22 | Lisbon | | |
| 24 | Lyndon | <u>Unincorporated Villages</u> | |
| 26 | Marion | 14 | Cloverdale |
| 28 | Necedah | 04 | Finley |
| 30 | Orange | 08 | Mather |
| 32 | Plymouth | 08 | Meadow Valley |
| 34 | Seven Mile Creek | 14 | Sprague |
| 36 | Summit | | |
| 38 | Wonewoc | | |

30 KENOSHA

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|------------------|--------------------------------|----------------------|
| 02 | Brighton | 241 | Kenosha (C) |
| 04 | Bristol | 131 | Genoa City (V) |
| 06 | Paris | 171 | Paddock Lake (V) |
| 10 | Pleasant Prairie | 174 | Pleasant Prairie (V) |
| 12 | Randall | 181 | Silver Lake (V) |
| 14 | Salem | 186 | Twin Lakes (V) |
| 16 | Somers | | |
| | | <u>Unincorporated Villages</u> | |
| | | 05 | Bassett |
| | | 06 | Benet Lake |
| | | 06 | Camp Lake |
| | | 05 | Cross Lake |
| | | 05 | Crow Lake |
| | | 06 | Fox River |
| | | 08 | New Munster |
| | | 05 | Powers Lake |
| | | 05 | Richmond, Ill |
| | | 08 | Slades Corners |

06 Trevor
04 Truesdell
06 Wilmot
02 Woodworth

26 Rolling 08 Phlox
28 Summit 06 Pickerel
30 Upham 15 Summit Lake
32 Vilas
34 Wolf River

31 KEWAUNEE

| Townships | | Cities & Villages | |
|-----------|------------|-------------------|---------------|
| 02 | Ahnapee | 111 | Casco (V) |
| 04 | Carlton | 146 | Luxemburg (V) |
| 06 | Casco | 201 | Algoma (C) |
| 10 | Franklin | 241 | Kewaunee (C) |
| 12 | Lincoln | | |
| 14 | Luxemburg | | |
| 16 | Montpelier | | |
| 18 | Pierce | | |
| 20 | Red River | | |

32 LA CROSSE

| Townships | | Cities & Villages | |
|-----------|------------|-------------------|-------------------------|
| 02 | Bangor | 106 | Bangor (V) |
| 04 | Barre | 136 | Holmen (V) |
| 06 | Burns | 246 | La Crosse (C) |
| 08 | Campbell | 265 | Onalaska (C) |
| 10 | Farmington | 176 | Rockland (V) |
| 12 | Greenfield | 191 | West Salem (V) |
| 14 | Hamilton | | |
| 16 | Holland | | Unincorporated Villages |
| 18 | Medary | 09 | Midway |
| 20 | Onalaska | 05 | Mindoro |
| 22 | Shelby | | |
| 24 | Washington | | |

33 LAFAYETTE

| Townships | | Cities & Villages | |
|-----------|-------------------|-------------------|-------------------------|
| 02 | Argyle | 101 | Argyle (V) |
| 04 | Belmont | 106 | Belmont (V) |
| 06 | Benton | 107 | Benton (V) |
| 08 | Blanchard | 108 | Blanchardville (V) |
| 10 | Darlington | 211 | Cuba City (C) |
| 12 | Elk Grove | 216 | Darlington (C) |
| 14 | Fayette | 131 | Gratiot (V) |
| 16 | Gratiot | 281 | Shullsburg (C) |
| 18 | Kendall | 181 | South Wayne (V) |
| 20 | Lamont | 136 | Hazel Green (C) |
| 22 | Monticello | | |
| 24 | New Diggings | | Unincorporated Villages |
| 26 | Seymour | 17 | Calamine |
| 28 | Shullsburg | 14 | Dunbarton |
| 30 | Wayne | 12 | Leadmine |
| 32 | White Oak Springs | 02 | Leslie |
| 34 | Willow Springs | 18 | Woodford |
| 36 | Wiota | | |

34 LANGLADE

| Townships | | Cities & Villages | |
|-----------|-----------|-------------------|-------------------------|
| 02 | Ackley | 201 | Antigo (C) |
| 04 | Ainsworth | 191 | White Lake (V) |
| 06 | Antigo | | |
| 08 | Elcho | | Unincorporated Villages |
| 10 | Evergreen | 12 | Bryant |
| 12 | Langlade | 07 | Deerbrook |
| 14 | Neva | 05 | Elton |
| 16 | Norwood | 17 | Hollister |
| 18 | Parrish | 07 | Kempster |
| 20 | Peck | 06 | Lily |
| 22 | Polar | 17 | Markton |
| 24 | Price | 02 | Pearson |

35 LINCOLN

| Townships | | Cities & Villages | |
|-----------|------------|-------------------|-------------------------|
| 02 | Birch | 251 | Merrill (C) |
| 04 | Bradley | 286 | Tomahawk (C) |
| 06 | Corning | | |
| 08 | Harding | | Unincorporated Villages |
| 10 | Harrison | 10 | 119 Bloomville |
| 12 | King | 11 | Doering |
| 14 | Merrill | 10 | Gleason |
| 16 | Pine River | 01 | Irma |
| 18 | Rock Falls | 05 | Jeffris |
| 20 | Russell | 15 | Spirit Falls |
| 22 | Schley | 02 | Heafford Jct |
| 24 | Scott | | |
| 26 | Skanawan | | |
| 28 | Somo | | |
| 30 | Tomahawk | | |
| 32 | Wilson | | |

36 MANITOWOC

| Townships | | Cities & Villages | |
|-----------|------------------|-------------------|-------------------------|
| 02 | Cato | 112 | Cleveland (V) |
| 04 | Centerville | 126 | Francis Creek (V) |
| 06 | Cooperstown | 241 | Kiel (C) |
| 08 | Eaton | 251 | Manitowoc (C) |
| 10 | Franklin | 151 | Mishicot (V) |
| 12 | Gibson | 176 | Reedsville (V) |
| 14 | Kossuth | 181 | St. Nazianz (V) |
| 16 | Liberty | 286 | Two Rivers (C) |
| 18 | Manitowoc | 186 | Valders (V) |
| 20 | Manitowoc Rapids | 191 | Whitelaw (V) |
| 22 | Maple Grove | 147 | Maribel (V) |
| 24 | Meeme | 132 | Kellnersville (V) |
| 26 | Mishicot | | |
| 28 | Newton | | Unincorporated Villages |
| 30 | Rockland | 10 | Branch |
| 32 | Schleswig | 15 | Collins |
| 34 | Two Creeks | 01 | Grimms |
| 36 | Two Rivers | 02 | Hika |
| | | 15 | Quarry |
| | | 13 | Tisch Mills |

37 MARATHON

| Townships | | Cities & Villages | |
|-----------|--------------|-------------------|-------------------|
| 02 | Bergen | 201 | Abbotsford (C) |
| 04 | Berlin | 102 | Athens (V) |
| 06 | Bern | 104 | Biramwood (V) |
| 08 | Bevent | 106 | Brokaw (V) |
| 10 | Frighton | 211 | Colby (C) |
| 12 | Cassel | 116 | Dorchester (V) |
| 14 | Cleveland | 121 | Edgar (V) |
| 16 | Day | 122 | Elderon (V) |
| 18 | Easton | 126 | Fenwood (V) |
| 20 | Eau Pleine | 136 | Hatley (V) |
| 22 | Elderon | 145 | Kronewetter (V) |
| 24 | Emmett | 151 | Marathon City (V) |
| 26 | Frankfort | 250 | Marshfield (C) |
| 28 | Franzen | 251 | Mosinee (C) |
| 30 | Green Valley | 176 | Rothschild (V) |
| 32 | Guenther | 281 | Schofield (C) |
| 34 | Halsey | 181 | Spencer (V) |

| | | | |
|----|----------|-----|---------------|
| 36 | Hamburg | 182 | Stratford (V) |
| 38 | Harrison | 186 | Unity (V) |
| 40 | Hewitt | 291 | Wausau (C) |
| 42 | Holton | 192 | Weston (V) |

| Unincorporated Villages | | | |
|-------------------------|--------------|----|-----------------|
| | | | |
| 44 | Hull | | |
| 46 | Johnson | | |
| 48 | Knowlton | 23 | Corinth |
| 52 | Maine | 24 | Dancy |
| 54 | Marathon | 14 | Galloway |
| 56 | Mc Millan | 39 | Granite Heights |
| 58 | Mosinee | 23 | Milan |
| 60 | Norrie | 12 | Moon |
| 62 | Plover | 02 | Naugart |
| 64 | Reid | 08 | Rozellville |
| 66 | Rib Falls | | |
| 68 | Rib Mountain | | |
| 70 | Rietbrock | | |
| 72 | Ringle | | |
| 74 | Spencer | | |
| 76 | Stettin | | |
| 78 | Texas | | |
| 80 | Wausau | | |
| 82 | Weston | | |
| 84 | Wien | | |

38 MARINETTE

| Townships | | Cities & Villages | |
|-------------------------|--------------|-------------------|----------------|
| 02 | Amberg | 111 | Coleman (V) |
| 04 | Athelstane | 251 | Marinette (C) |
| 06 | Beaver | 261 | Niagara (V) |
| 08 | Beecher | 271 | Peshtigo (C) |
| 10 | Dunbar | 171 | Pound (V) |
| 12 | Goodman | 191 | Wausaukee (V) |
| 14 | Grover | 121 | Crivitz (V) |
| 16 | Lake | | |
| 18 | Middle Inlet | | |
| Unincorporated Villages | | | |
| 20 | Niagara | 01 | 189 Cedarville |
| 22 | Pembine | 02 | Intervale |
| 24 | Peshtigo | 08 | Loomis |
| 26 | Porterfield | 17 | Mc Allister |
| 28 | Pound | 01 | Marek |
| 30 | Silver Cliff | 13 | Walsh |
| 32 | Stephenson | | |
| 34 | Wagner | | |
| 36 | Wausaukee | | |

39 MARQUETTE

| Townships | | Cities & Villages | |
|-------------------------|--------------|-------------------|---------------|
| 02 | Buffalo | 121 | Endeavor (V) |
| 04 | Crystal Lake | 251 | Montello (C) |
| 06 | Douglas | 161 | Neshkoro (V) |
| 08 | Harris | 165 | Oxford (V) |
| 10 | Mecan | 191 | Westfield (V) |
| 12 | Montello | | |
| 14 | Moundville | | |
| Unincorporated Villages | | | |
| 16 | Neshkoro | 03 | Briggsville |
| 18 | Newton | 06 | Glen Oak |
| 20 | Oxford | | |
| 22 | Packwaukeee | | |
| 24 | Shields | | |
| 26 | Springfield | | |
| 28 | Westfield | | |

73 MEMOMONEE

| | |
|----|-----------------------|
| 01 | Indian Reservation |
| | Township of Menomonee |
| | County of Menomonee |

Unincorporated Villages w/Post Offices

| | |
|----|---------|
| 01 | Keshena |
| 01 | Neopit |

40 MILWAUKEE

| Unincorp.Villages | | Cities & Villages | |
|-------------------|-----------------|-------------------|---------------------|
| 57 | Alois | 106 | Bayside (V) |
| 57 | Bay View | 107 | Brown Deer (V) |
| 67 | Carrollville | 211 | Cudahy (C) |
| 57 | Granville | 126 | Fox Point (V) |
| 57 | North Milwaukee | 226 | Franklin (C) |
| 67 | Oakwood | 231 | Glendale (C) |
| 68 | Saint Martins | 131 | Greendale (V) |
| 56 | Silverdale | 236 | Greenfield (C) |
| 57 | Tippecanoe | 136 | Hales Corners (V) |
| 57 | Wood | 251 | Milwaukee (C) |
| | | 265 | Oak Creek (C) |
| | | 176 | River Hills (V) |
| | | 281 | Saint Francis (C) |
| | | 181 | Shorewood (V) |
| | | 281 | South Milwaukee (C) |
| | | 291 | Wauwatosa (C) |
| | | 292 | West Allis (C) |
| | | 191 | West Milwaukee (V) |
| | | 192 | Whitefish Bay (V) |

41 MONROE

| Townships | | Cities & Villages | |
|-------------------------|--------------|-------------------|-----------------|
| 02 | Adrian | 111 | Cashton (V) |
| 04 | Angelo | 141 | Kendall (V) |
| 06 | Byron | 151 | Melvina (V) |
| 08 | Clifton | 161 | Norwalk (V) |
| 10 | Glendale | 165 | Oakdale (V) |
| 12 | Grant | 281 | Sparta (C) |
| 14 | Greenfield | 286 | Tomah (C) |
| 16 | Jefferson | 191 | Wilton (V) |
| 18 | La Fayette | 192 | Wyeville (V) |
| 20 | La Grange | 185 | Warrens (V) |
| 22 | Leon | | |
| 24 | Lincoln | | |
| Unincorporated Villages | | | |
| 26 | Little Falls | 02 | Camp Mc Coy |
| 28 | New Lyme | 13 | Cataract |
| 30 | Oakdale | 03 | Shennington |
| 32 | Portland | 02 | Sparta Military |
| 34 | Ridgeville | 07 | Tunnel City |
| 36 | Scott | 03 | Valley Jct |
| 38 | Sheldon | | |
| 40 | Sparta | | |
| 42 | Tomah | | |
| 44 | Wellington | | |
| 46 | Wells | | |
| 48 | Wilton | | |

42 OCONTO

| Townships | | Cities & Villages | |
|-------------------------|-----------|-------------------|------------------|
| 02 | Abrams | 231 | Gillett (C) |
| 06 | Armstruck | 146 | Lena (V) |
| 08 | Bagley | 265 | Oconto (C) |
| 10 | Brazeau | 266 | Oconto Falls (C) |
| 12 | Breed | 171 | Pulaski (V) |
| 14 | Chase | 181 | Suring (V) |
| 16 | Doty | | |
| 18 | Gillett | | |
| Unincorporated Villages | | | |
| 19 | How | 23 | Lakewood |
| 20 | Lakewood | 08 | 229 Mosling |
| 22 | Lena | 02 | Mountain |

| | | | |
|----|----------------|----|----------|
| 24 | Little River | 12 | Sobieski |
| 26 | Little Suamico | | |
| 28 | Maple Valley | | |
| 29 | Morgan | | |
| 30 | Oconto | | |
| 32 | Oconto Falls | | |
| 34 | Pensaukee | | |
| 36 | Riverview | | |
| 38 | Spruce | | |
| 40 | Stiles | | |
| 42 | Townsend | | |
| 44 | Underhill | | |

43 ONEIDA

| Townships | | Cities & Villages | |
|-----------|---------------|-------------------|-------------------------|
| 02 | Cassian | 276 | Rhineland (C) |
| 04 | Crescent | | |
| 06 | Enterprise | | Unincorporated Villages |
| 08 | Hazelhurst | 17 | Clearwater Lake |
| 10 | Lake Tomahawk | 12 | Gagen |
| 12 | Little Rice | 01 | Harshaw |
| 14 | Lynne | 10 | McNaughton |
| 16 | Minocqua | 14 | Pelican Lake |
| 18 | Monico | 16 | Robbins |
| 20 | Newbold | 15 | Roosevelt |
| 22 | Nokomis | 15 | Starks |
| 24 | Pelican | 07 | Tripoli |
| 26 | Piehl | | |
| 28 | Pine Lake | | |
| 30 | Schoepke | | |
| 32 | Stella | | |
| 34 | Sugar Camp | | |
| 36 | Three Lakes | | |
| 38 | Woodboro | | |
| 40 | Woodruff | | |

44 OUTAGAMIE

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------|-------------------------|
| 02 | Black Creek | 201 | Appleton (C) |
| 04 | Bovina | 106 | Bear Creek (V) |
| 06 | Buchanan | 107 | Black Creek (V) |
| 08 | Center | 111 | Combined Locks (V) |
| 10 | Cicero | 136 | Hortonville (V) |
| 12 | Dale | 137 | Howard (V) |
| 14 | Deer Creek | 241 | Kaukauna (C) |
| 16 | Ellington | 141 | Kimberly (V) |
| 18 | Freedom | 146 | Little Chute (V) |
| 20 | Grand Chute | 261 | New London (C) |
| 22 | Grenville | 155 | Nichols (V) |
| 24 | Hortonia | 281 | Seymour (C) |
| 26 | Kaukauna | 181 | Shiocton (V) |
| 28 | Liberty | 191 | Wrightstown (V) |
| 30 | Maine | | |
| 32 | Maple Creek | | Unincorporated Villages |
| 34 | Oneida | 06 | Medina |
| 36 | Osborne | 16 | Sugar Bush |
| 38 | Seymour | | |
| 40 | Vandenbrock | | |

45 OZAUKEE

| Townships | | Cities & Villages | |
|-----------|----------------|-------------------|---------------|
| 02 | Belgium | 105 | Bayside (V) |
| 04 | Cedarburg | 106 | Belgium (V) |
| 06 | Fredonia | 211 | Cedarburg (C) |
| 08 | Grafton | 126 | Fredonia (V) |
| 12 | Pt. Washington | 131 | Grafton (V) |
| 14 | Saukville | 255 | Mequon (C) |

| | | | |
|----|---------------------------|-----|--------------------|
| | | 271 | Pt. Washington (C) |
| | <u>Unincorp. Villages</u> | 181 | Saukville (V) |
| 03 | Waubeka | 186 | Thiensville (V) |
| | | 161 | Newburg (V) |

46 PEPIN

| Townships | | Cities & Villages | |
|-----------|------------|-------------------|-------------------------|
| 02 | Albany | 216 | Durand (C) |
| 04 | Durand | 171 | Pepin (V) |
| 06 | Frankfort | 181 | Stockholm (V) |
| 08 | Lima | | |
| 10 | Pepin | | Unincorporated Villages |
| 12 | Stockholm | 07 | Arkansas |
| 14 | Waterville | | |
| 16 | Waubek | | |

47 PIERCE

| Townships | | Cities & Villages | |
|-----------|---------------|-------------------|-------------------------|
| 02 | Clifton | 106 | Bay City (V) |
| 04 | Diamond Bluff | 121 | Ellsworth (V) |
| 06 | Ellsworth | 122 | Elmwood (V) |
| 08 | El Paso | 151 | Maiden Rock (V) |
| 10 | Gilman | 171 | Plum City (V) |
| 12 | Hartland | 271 | Prescott (C) |
| 14 | Isabelle | 276 | River Falls (C) |
| 16 | Maiden Rock | 181 | Spring Valley (V) |
| 18 | Martell | | |
| 20 | Oak Grove | | Unincorporated Villages |
| 22 | River Falls | 16 | Beldenville |
| 24 | Rock Elm | 02 | Diamond Bluff |
| 26 | Salem | 15 | Hager City |
| 28 | Spring Lake | 09 | Martell |
| 30 | Trenton | | |
| 32 | Trimbelle | | |
| 34 | Union | | |

48 POLK

| Townships | | Cities & Villages | |
|-----------|-----------------|-------------------|-------------------------|
| 02 | Alden | 201 | Amery (C) |
| 04 | Apple River | 106 | Balsam Lake (V) |
| 06 | Balsam Lake | 111 | Centura (C) |
| 08 | Beaver | 112 | Clayton (V) |
| 10 | Black Brook | 113 | Clear Lake (V) |
| 12 | Bone Lake | 116 | Dresser (V) |
| 14 | Clam Falls | 126 | Frederic (V) |
| 16 | Clayton | 146 | Luck (V) |
| 18 | Clear Lake | 151 | Milltown (V) |
| 20 | Eureka | 165 | Osceola (V) |
| 22 | Farmington | 281 | St. Croix Falls (C) |
| 24 | Garfield | 168 | Turtle Lake (V) |
| 26 | Georgetown | | Also in Barron Co. |
| 28 | Johnstown | | Unincorporated Villages |
| 30 | Laketown | 14 | Andrus |
| 32 | Lincoln | 23 | Cushing |
| 34 | Lorain | 16 | Deronda |
| 36 | Luck | 23 | Evergreen |
| 38 | Mc Kinley | 08 | Joel |
| 40 | Milltown | 07 | Lewis |
| 42 | Osceola | 19 | Lorain |
| 44 | St. Croix Falls | 21 | Nye |
| 46 | Sterling | 12 | Wanderoos |
| 48 | West Sweden | 10 | Wolfcreek |

49 PORTAGE

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------|--------------------------------|
| 02 | Alban | 101 | Almond (V) |
| 04 | Almond | 102 | Amherst (V) |
| 06 | Amherst | 103 | Amherst Jct (V) |
| 08 | Belmont | 141 | Junction City (V) |
| 10 | Buena Vista | 151 | Milladore (V) |
| 12 | Carson | 161 | Nelsonville (V) |
| 14 | Dewey | 171 | Park Ridge (V) |
| 16 | Eau Pleine | 176 | Rosholt (V) |
| 18 | Grant | 281 | Stevens Point (C) |
| 20 | Hull | 191 | Whiting (V) |
| 22 | Lanark | 173 | Plover (V) |
| 24 | Linwood | | |
| 26 | New Hope | | <u>Unincorporated Villages</u> |
| 28 | Pine Grove | 17 | Arnott |
| 30 | Plover | 14 | Bancroft |
| 32 | Sharon | 05 | Coddington |
| 34 | Stockton | 17 | Custer |
| | | 16 | Polonia |

50 PRICE

| Townships | | Cities & Villages | |
|-----------|------------|-------------------|--------------------------------|
| 02 | Catawba | 111 | Catawba (V) |
| 04 | Eisenstein | 141 | Kennan (V) |
| 06 | Elk | 271 | Park Falls (C) |
| 08 | Emery | 272 | Phillips (C) |
| 10 | Fifield | 171 | Prentice (V) |
| 12 | Flambeau | | |
| 14 | Georgetown | | <u>Unincorporated Villages</u> |
| 16 | Hackett | 12 | Brantwood |
| 18 | Harmony | 04 | Dover |
| 20 | Hill | 13 | Kaiser |
| 22 | Kennan | 13 | Kennedy |
| 24 | Knox | 06 | Lugerville |
| 26 | Lake | | |
| 28 | Ogema | | |
| 30 | Prentice | | |
| 32 | Spirit | | |
| 34 | Worcester | | |

51 RACINE

| Townships | | Cities & Villages | |
|-----------|---------------------------|-------------------|------------------|
| 02 | Burlington | 206 | Burlington (C) |
| 04 | Caledonia | 104 | Caledonia (V) |
| 06 | Dover | 121 | Elmwood Park (V) |
| 08 | Mt. Pleasant | 151 | Mt Pleasant (V) |
| 10 | Norway | 161 | North Bay (V) |
| 12 | Raymond | 276 | Racine (C) |
| 14 | Rochester | 176 | Rochester (V) |
| 16 | Waterford | 181 | Sturtevant (V) |
| 18 | Yorkville | 186 | Union Grove (V) |
| | | 191 | Waterford (V) |
| | | 192 | Wind Point (V) |
| | <u>Unincorp. Villages</u> | | |
| 02 | Franksville | | |
| 03 | Kansasville | | |
| 05 | Wind Lake | | |

52 RICHLAND

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------|---------------------|
| 02 | Akan | 106 | Boaz (V) |
| 04 | Bloom | 11 | Cazenovia (V) |
| 06 | Buena Vista | 146 | Lone Rock (V) |
| 08 | Dayton | 276 | Richland Center (C) |
| 10 | Eagle | 186 | Viola (V) |

| | | | |
|----|------------|-----|--------------------------------|
| 12 | Forest | 196 | Yuba (V) |
| 14 | Henrietta | | |
| 16 | Ithaca | | <u>Unincorporated Villages</u> |
| 18 | Marshall | 02 | Bloom City |
| 20 | Orion | 12 | Excelsior |
| 22 | Richland | 09 | Gillingham |
| 24 | Richwood | 03 | Gotham |
| 26 | Rockbridge | 03 | Sextonville |
| 28 | Sylvan | 12 | Tavera |
| 30 | Westford | 10 | Twin Bluffs |
| 32 | Willow | 02 | West Lima |

53 ROCK

| Townships | | Cities & Villages | |
|-----------|---------------|-------------------|--------------------------------|
| 02 | Avon | 206 | Beloit (C) |
| 04 | Beloit | 210 | Brodhead (C) |
| 06 | Bradford | 111 | Clinton (V) |
| 08 | Center | 221 | Edgerton (C) |
| 10 | Clinton | 222 | Evansville (C) |
| 12 | Fulton | 126 | Footville (V) |
| 14 | Harmony | 241 | Janesville (C) |
| 16 | Janesville | 257 | Milton (V) |
| 18 | Johnstown | 165 | Orfordville (V) |
| 20 | La Prairie | | |
| 22 | Lima | | <u>Unincorporated Villages</u> |
| 24 | Magnolia | 17 | Afton |
| 26 | Milton | 03 | Avalon |
| 28 | Newark | 15 | Hanover |
| 30 | Plymouth | 11 | Lima Center |
| 32 | Porter | 19 | Shopiere |
| 34 | Rock | 19 | Tiffany |
| 36 | Spring Valley | 03 | Emerald Grove |
| 38 | Turtle | 12 | Cainville |
| 40 | Union | | |

54 RUSK

| Townships | | Cities & Villages | |
|-----------|--------------|-------------------|--------------------------------|
| 02 | Atlanta | 106 | Bruce (V) |
| 04 | Big Bend | 111 | Conrath (V) |
| 06 | Big Falls | 131 | Glen Flora (V) |
| 08 | Cedar Rapids | 136 | Hawkins (V) |
| 10 | Dewey | 141 | Ingram (V) |
| 12 | Flambeau | 246 | Ladysmith (C) |
| 14 | Grant | 181 | Sheldon (V) |
| 16 | Grow | 186 | Tony (V) |
| 18 | Hawkins | 191 | Weyerhauwer (V) |
| 20 | Hubbard | | |
| 22 | Lawrence | | <u>Unincorporated Villages</u> |
| 24 | Marshall | 02 | Apollonia |
| 26 | Murry | 10 | Crane |
| 28 | Richland | 17 | Horseman |
| 30 | Rusk | 02 | Island Lake |
| 32 | South Forks | 17 | Kalish |
| 34 | Strickland | 11 | Walrath |
| 36 | Stubbs | | |
| 38 | Thornapple | | |
| 40 | True | | |
| 42 | Washington | | |
| 44 | Wilkinson | | |
| 46 | Willard | | |
| 48 | Wilson | | |

55 ST. CROIX

| Townships | | Cities & Villages | |
|-----------|---------|-------------------|-------------------|
| 02 | Baldwin | 106 | Baldwin (V) |
| 04 | Cady | 116 | Deer Park (V) |
| 06 | Cylon | 231 | Glenwood City (C) |

| | | | |
|----|-----------------|--------------------------------|-------------------|
| 08 | Eau Galle | 136 | Hammond (V) |
| 10 | Emerald | 236 | Hudson (C) |
| 12 | Erin Prairie | 261 | New Richmond (C) |
| 14 | Forest | 161 | North Hudson (V) |
| 16 | Glenwood | 276 | River Falls (C) |
| 18 | Hammond | 176 | Roberts (V) |
| 20 | Hudson | 181 | Somerset (V) |
| 22 | Kinnickinnic | 182 | Star Prairie (V) |
| 24 | Pleasant Valley | 184 | Spring Valley (V) |
| 26 | Richmond | 191 | Wilson (V) |
| 28 | Rush River | 192 | Woodville (V) |
| 30 | St. Joseph | | |
| 32 | Somerset | <u>Unincorporated Villages</u> | |
| 34 | Springfield | 13 | Boardman |
| 36 | Stanton | 15 | Burkhardt |
| 38 | Star Prairie | 17 | Hersey |
| 40 | Troy | 15 | Houlton |
| 42 | Warren | 06 | Jewett |

56 SAUK

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|----------------|--------------------------------|-------------------|
| 02 | Baraboo | 206 | Baraboo (C) |
| 04 | Bear Creek | 111 | Cazenovia (V) |
| 06 | Dellona | 141 | Ironton (V) |
| 08 | Delton | 146 | Lake Delton (V) |
| 10 | Excelsior | 147 | La Valle (V) |
| 12 | Fairfield | 148 | Lime Ridge (V) |
| 14 | Franklin | 149 | Loganville (V) |
| 16 | Freedom | 151 | Merrimac (V) |
| 18 | Greenfield | 161 | North Freedom (V) |
| 20 | Honey Creek | 171 | Plain (V) |
| 22 | Ironton | 172 | Prairie du Sac |
| 24 | La Valle | 276 | Reedsburg (C) |
| 26 | Merrimac | 176 | Rock Springs (V) |
| 28 | Prairie du Sac | 181 | Sauk City (V) |
| 30 | Reedsburg | 182 | Spring Green (V) |
| 32 | Spring Green | 191 | West Baraboo (V) |
| 34 | Sumpter | 291 | Wis Dells (C) |
| 36 | Troy | | |
| 38 | Washington | <u>Unincorporated Villages</u> | |
| 40 | Westfield | 17 | Badger |
| 42 | Winfield | 01 | Devils Lake |
| 44 | Woodland | 19 | Hillpoint |
| | | 04 | Mirror Lake |

57 SAWYER

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|-------------|--------------------------------|--------------|
| 02 | Bass Lake | 111 | Corderay (V) |
| 04 | Couderay | 121 | Exeland (V) |
| 06 | Draper | 236 | Hayward (C) |
| 08 | Edgewater | 176 | Radisson (V) |
| 10 | Hayward | 190 | Winter (V) |
| 12 | Hunter | | |
| 14 | Lenroot | <u>Unincorporated Villages</u> | |
| 16 | Meadow Rock | 14 | Hauer |
| 18 | Meteor | 02 | Lemington |
| 20 | Ojibwa | 03 | Loretta |
| 22 | Radisson | 03 | Oxbow |
| 24 | Round Lake | 14 | Reserve |
| 26 | Sand Lake | 14 | Stone Lake |
| 28 | Spider Lake | 16 | Weirgor |
| 30 | Weirgor | 04 | Wooddale |
| 32 | Winter | 04 | Yarnell |

58 SHAWANO

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|--------------|--------------------------------|----------------|
| 02 | Almon | 101 | Aniwa (V) |
| 04 | Angelica | 106 | Birnamwood (V) |
| 06 | Aniwa | 107 | Bonduel (V) |
| 08 | Bartelme | 108 | Bowler (V) |
| 10 | Belle Plaine | 111 | Cecil (V) |
| 12 | Birnamwood | 121 | Eland (V) |
| 14 | Fairbanks | 131 | Gresham (V) |
| 16 | Germania | 282 | Marion (C) |
| 18 | Grant | 151 | Mattoon (V) |
| 20 | Green Valley | 171 | Pulaski (V) |
| 22 | Hartland | 281 | Shawano (C) |
| 24 | Herman | 186 | Tigerton (V) |
| 26 | Hutchins | 191 | Wittenberg (V) |
| 28 | Lessor | | |
| 30 | Maple Grove | <u>Unincorporated Villages</u> | |
| 32 | Morris | 09 | Caroline |
| 34 | Navarino | 09 | Hunting |
| 36 | Pella | 02 | Krakow |
| 38 | Red Springs | 12 | Leopolis |
| 40 | Richmond | 12 | Lyndhurst |
| 42 | Seneca | 10 | Pulcifer |
| 44 | Washington | 20 | Red River |
| 46 | Waukechon | 01 | Shepley |
| 48 | Wescott | 07 | Split Rock |
| 50 | Wittenberg | 20 | Thornton |
| 52 | Stockbridge | 21 | Tilleda |
| | | 02 | Zachow |

59 SHEBOYGAN

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|-----------------|--------------------------------|---------------------|
| 02 | Greenbush | 101 | Adell (V) |
| 04 | Herman | 111 | Cascade (V) |
| 06 | Holland | 112 | Cedar Grove (V) |
| 08 | Lima | 121 | Elkhart Lake (V) |
| 10 | Lyndon | 131 | Glenbeulah (V) |
| 12 | Mitchell | 135 | Howards Grove (V) |
| 14 | Mosel | 141 | Kohler (V) |
| 16 | Plymouth | 165 | Oostburg (V) |
| 18 | Rhine | 271 | Plymouth (C) |
| 20 | Russell | 176 | Random Lake (V) |
| 22 | Scott | 281 | Sheboygan (C) |
| 24 | Sheboygan | 282 | Sheboygan Falls (C) |
| 26 | Sheboygan Falls | 191 | Waldo (V) |
| 28 | Sherman | | |
| 30 | Wilson | <u>Unincorporated Villages</u> | |
| | | 07 | Haven |
| | | 04 | Hingham |

60 TAYLOR

| <u>Townships</u> | | <u>Cities & Villages</u> | |
|------------------|--------------|--------------------------------|------------------|
| 02 | Aurora | 131 | Gilman (V) |
| 04 | Browning | 146 | Lublin (V) |
| 06 | Chelsea | 251 | Medford (C) |
| 08 | Cleveland | 176 | Rib Lake (V) |
| 10 | Deer Creek | 181 | Stetsonville (V) |
| 12 | Ford | | |
| 14 | Goodrich | <u>Unincorporated Villages</u> | |
| 16 | Greenwood | 18 | Donald |
| 18 | Hammel | 04 | Hannibal |
| 20 | Holway | 08 | Interwald |
| 22 | Jump River | 09 | Perkinstown |
| 24 | Little Black | 06 | Polley |
| 26 | Mc Kinley | 03 | Whittlesey |
| 28 | Maplehurst | | |
| 30 | McKinley | | |

32 Medford
 34 Molitor
 36 Pershing
 38 Rib Lake
 40 Roosevelt
 42 Taft
 44 Westboro

61 TREMPEALEAU

| Townships | | Cities & Villages | |
|-----------|--------------|--------------------------------|------------------|
| 02 | Albion | 201 | Arcadia (C) |
| 04 | Arcadia | 206 | Blair (C) |
| 06 | Burnside | 121 | Eleva (V) |
| 08 | Caledonia | 122 | Ettrick (V) |
| 10 | Chimney Rock | 231 | Galesville (C) |
| 12 | Dodge | 241 | Independence (C) |
| 14 | Ettrick | 265 | Osseo (C) |
| 16 | Gale | 173 | Pigeon Falls (V) |
| 18 | Hale | 181 | Strum (V) |
| 20 | Lincoln | 186 | Trempealeau (V) |
| 22 | Pigeon | 291 | Whitehall (C) |
| 24 | Preston | | |
| 26 | Sumner | <u>Unincorporated Villages</u> | |
| 28 | Trempealeau | 14 | Centerville |
| 30 | Unity | | |

62 VERNON

| Townships | | Cities & Villages | |
|-----------|------------|--------------------------------|-----------------|
| 02 | Bergen | 111 | Chaseburg (V) |
| 04 | Christiana | 112 | Coon Valley (V) |
| 06 | Clinton | 116 | De Soto (V) |
| 08 | Coon | 131 | Genoa (V) |
| 10 | Forest | 236 | Hillsboro (C) |
| 12 | Franklin | 146 | La Farge (V) |
| 14 | Genoa | 165 | Ontario (V) |
| 16 | Greenwood | 176 | Readstown (V) |
| 18 | Hamburg | 181 | Stoddard (V) |
| 20 | Harmony | 186 | Viola (V) |
| 22 | Hillsboro | 286 | Viroqua (C) |
| 24 | Jefferson | 291 | Westby (C) |
| 26 | Kickapoo | | |
| 28 | Liberty | <u>Unincorporated Villages</u> | |
| 30 | Stark | 05 | Mt. Tabor |
| 32 | Sterling | 21 | Rockton |
| 34 | Union | 05 | Valley |
| 36 | Viroqua | 20 | Victory |
| 38 | Webster | 16 | West Prairie |
| 40 | Wheatland | | |
| 42 | Whitestown | | |

63 VILAS

| Townships | | Cities & Villages | |
|-----------|-------------------|--------------------------------|-----------------|
| 02 | Arbor Vitae | 221 | Eagle River (C) |
| 04 | Boulder Junction | | |
| 06 | Cloverland | <u>Unincorporated Villages</u> | |
| 08 | Conover | 12 | Knudson |
| 10 | Lac Du Flambeau | 05 | Lac Du Flambeau |
| 12 | Lincoln | 12 | Land O'Lakes |
| 14 | Phelps | 14 | Mishike |
| 16 | Plum Lake | 09 | Presque Lake |
| 18 | Presque Isle | 05 | Rest lake |
| 20 | St. Germain | 10 | St. Germain |
| 22 | Manitowish Waters | 08 | Sayner |
| 24 | Land O'Lakes | 08 | Starlake |
| 26 | Washington | 01 | Trout Lake |
| 28 | Winchester | 09 | Winegar |

64 WALWORTH

| Townships | | Cities & Villages | |
|-----------|----------------|--------------------------------|------------------|
| 02 | Bloomfield | 206 | Burlington (C) |
| | | 116 | Darien (V) |
| 04 | Darien | 216 | Delavan (C) |
| 06 | Delavan | 121 | East Troy (V) |
| 08 | East Troy | 221 | Elkhorn (C) |
| 10 | Geneva | 126 | Fontana (V) |
| 12 | La Fayette | 131 | Genoa City (V) |
| 14 | La Grange | 246 | Lake Geneva (C) |
| 16 | Linn | 153 | Mukwonago (V) |
| 18 | Lyons | 181 | Sharon (V) |
| 20 | Richmond | 191 | Walworth (V) |
| 22 | Sharon | 291 | Whitewater (C) |
| 24 | Spring Prairie | 192 | Williams Bay (V) |
| 26 | Sugar Creek | | |
| 28 | Troy | <u>Unincorporated Villages</u> | |
| 30 | Walworth | 02 | 119 Allen Grove |
| 32 | Whitewater | 15 | College Camp |
| | | 12 | Honey Creek |
| | | 04 | Lake Beulah |
| | | 01 | Pell Lake |
| | | 09 | Springfield |
| | | 14 | Troy Center |
| | | 08 | Zenda |

65 WASHBURN

| Townships | | Cities & Villages | |
|-----------|--------------|--------------------------------|----------------|
| 02 | Barronett | 106 | Birchwood (V) |
| 04 | Bashaw | 151 | Minong (V) |
| 06 | Bass Lake | 282 | Shell Lake (C) |
| 08 | Beaver Brook | 281 | Spooner (C) |
| 10 | Birchwood | | |
| 12 | Brooklyn | <u>Unincorporated Villages</u> | |
| 14 | Casey | 18 | Earl |
| 16 | Chicog | 06 | Lampson |
| 18 | Crystal | | |
| 20 | Evergreen | | |
| 22 | Frog Creek | | |
| 24 | Gull Lake | | |
| 26 | Long Lake | | |
| 28 | Madge | | |
| 30 | Minong | | |
| 32 | Sarona | | |
| 34 | Spooner | | |
| 36 | Spring Brook | | |
| 38 | Stinnett | | |
| 40 | Stone Lake | | |
| 42 | Trego | | |

66 WASHINGTON

| Townships | | Cities & Villages | |
|-----------|------------|--------------------------------|----------------|
| 02 | Addison | 131 | Germantown (V) |
| 04 | Barton | 236 | Hartford (C) |
| 06 | Erin | 141 | Jackson (V) |
| 08 | Farmington | 142 | Kewaskum (V) |
| 10 | Germantown | 251 | Milwaukee (C) |
| 12 | Hartford | 181 | Slinger (V) |
| 14 | Jackson | 291 | West Bend (C) |
| 16 | Kewaskum | 161 | Newburg (V) |
| 18 | Polk | | |
| 20 | Richfield | <u>Unincorporated Villages</u> | |
| 22 | Trenton | 01 | Aurora |
| 24 | Wayne | 01 | Allenton |
| 26 | West Bend | 10 | Colgate |
| | | 10 | Hubertus |
| | | 05 | Rockfield |

67 WAUKESHA

| Townships | | Cities & Villages | |
|-----------|--------------------|-------------------|---------------------|
| 02 | Brookfield | 106 | Big Bend (V) |
| 04 | Delafield | 206 | Brookfield (C) |
| 06 | Eagle | 107 | Butler (V) |
| 08 | Genesee | 111 | Chenequa (V) |
| 10 | Lisbon | 216 | Delafield (C) |
| 14 | Merton | 116 | Dousman (V) |
| 16 | Mukwonago | 121 | Eagle (V) |
| 22 | Oconomowoc | 122 | Elm Grove (V) |
| 24 | Ottawa | 136 | Hartland (V) |
| 28 | Summit | 146 | Lac La Belle (V) |
| 30 | Vernon | 147 | Lannon (V) |
| 32 | Waukesha | 151 | Menomonee Falls (V) |
| | | 152 | Merton (V) |
| | Unincorp. Villages | 250 | Milwaukee (C) |
| 13 | Duplainville | 251 | Muskego (C) |
| 04 | Genesee Depot | 153 | Mukwonago (V) |
| 07 | North Lake | 158 | Nashotah (V) |
| 11 | Okauchee | 261 | New Berlin (C) |
| 02 | Statesan | 161 | North Prairie (V) |
| 05 | Templeton | 265 | Oconomowoc (C) |
| | | 166 | Oconomowoc Lake (V) |
| | | 171 | Pewaukee (V) |
| | | 270 | Pewaukee (C) |
| | | 181 | Sussex (V) |
| | | 191 | Wales (V) |
| | | 291 | Waukesha (C) |

68 WAUPACA

| Townships | | Cities & Villages | |
|-----------|-------------|-------------------|-------------------------|
| 02 | Bear Creek | 106 | Big Falls (V) |
| 04 | Caledonia | 211 | Clintonville (C) |
| 06 | Dayton | 121 | Embarrass (V) |
| 08 | DuPont | 126 | Fremont (V) |
| 10 | Farmington | 141 | Iola (V) |
| 12 | Fremont | 251 | Manawa (C) |
| 14 | Harrison | 252 | Marion (C) |
| 16 | Helvetia | 261 | New London (C) |
| 18 | Iola | 165 | Ogdensburg (V) |
| 20 | Larrabee | 181 | Scandinavia (V) |
| 22 | Lebanon | 291 | Waupaca (C) |
| 24 | Lind | 292 | Weyauwega (C) |
| 26 | Little Wolf | | |
| 28 | Matteson | | Unincorporated Villages |
| 30 | Mukwa | 05 | King |
| 32 | Royalton | 07 | Northland |
| 36 | Scandinavia | 15 | Northport |
| 38 | Union | 02 | Readfield |
| 40 | Waupaca | 05 | Sheridan |
| 42 | Weyauwega | 19 | Symco |
| 44 | Wyoming | | |

69 WAUSHARA

| Townships | | Cities & Villages | |
|-----------|------------|-------------------|----------------|
| 02 | Aurora | 111 | Coloma (V) |
| 04 | Bloomfield | 136 | Hancock (V) |
| 06 | Coloma | 146 | Lohrville (V) |
| 08 | Dakota | 171 | Plainfield (V) |

| | | | |
|----|-------------|-----|-------------------------|
| 10 | Deerfield | 191 | Redgranite (V) |
| 12 | Hancock | 291 | Wautoma (C) |
| 14 | Leon | 191 | Wild Rose (V) |
| 16 | Marion | | |
| 18 | Mt. Morris | | Unincorporated Villages |
| 20 | Oasis | 01 | Auroraville |
| 22 | Plainfield | 07 | Pine River |
| 24 | Poy Sippi | 02 | W. Bloomfield |
| 26 | Richford | | |
| 28 | Rose | | |
| 30 | Saxeville | | |
| 32 | Springwater | | |
| 34 | Warren | | |
| 36 | Wautoma | | |

70 WINNEBAGO

| Townships | | Cities & Villages | |
|-----------|------------|-------------------|-------------------------|
| 02 | Algoma | 201 | Appleton (C) |
| 04 | Black Wolf | 251 | Menasha (C) |
| 06 | Clayton | 261 | Neenah (C) |
| 08 | Menasha | 265 | Omro (C) |
| 10 | Neenah | 266 | Oshkosh (C) |
| 12 | Nekimi | 191 | Winneconne (V) |
| 14 | Nepeuskun | | |
| 16 | Omro | | Unincorporated Villages |
| 18 | Oshkosh | 13 | Allenville |
| 20 | Poygan | 15 | Butte Des Morts |
| 22 | Rushford | 11 | Eureka |
| 24 | Utica | 12 | Fisk |
| 26 | Vinland | 03 | Larsen |
| 28 | Winchester | 12 | Pickett |
| 30 | Winneconne | 07 | Rush Lake |
| 32 | Wolf River | 11 | Waukau |
| | | 09 | Winnebago |

71 WOOD

| Townships | | Cities & Villages | |
|-----------|--------------|-------------------|-------------------------|
| 02 | Arpin | 101 | Auburndale (V) |
| 04 | Auburndale | 106 | Biron (V) |
| 06 | Cameron | 271 | Pittsville (C) |
| 08 | Cary | 171 | Port Edwards (V) |
| 10 | Cranmoor | 251 | Marshfield (C) |
| 12 | Dexter | 151 | Milladore (V) |
| 14 | Grand Rapids | 261 | Nekoosa (C) |
| 16 | Hansen | 178 | Rudolph (V) |
| 18 | Hiles | 186 | Vesper (V) |
| 20 | Lincoln | 291 | Wisconsin Rapids (C) |
| 22 | Marshfield | 122 | Hewitt (V) |
| 24 | Milladore | 100 | Arpin (V) |
| 26 | Port Edwards | | |
| 28 | Remington | | Unincorporated Villages |
| 30 | Richfield | 14 | Babcock |
| 32 | Rock | 12 | Blenker |
| 34 | Rudolph | 06 | Dexterville |
| 36 | Saratoga | 16 | Lindsey |
| 38 | Seneca | | |
| 40 | Sherry | | |
| 42 | Sigel | | |
| 44 | Wood | | |

PURPOSE

This subject provides general guidance on the sizes of signs to be used based on certain highway characteristics. **This guideline does not apply to sizes for STOP signs. There is a separate guideline pertaining to the required sizes for STOP signs for roadways ([TEOpS 2-2-5](#)).**

DEFINITIONS

For the purposes of this guideline, highways are grouped by certain characteristics into a defined highway facility:

Freeways are divided arterial highway facilities that have full control of access by means of grade separation at interchanges only.

Expressways are divided arterial highway facilities that have partial control of access, generally with grade separations at major intersections.

Conventional highways are either divided or undivided roadway facilities that have no control of access and no grade separations at intersections.

2S is the sign size designation of conventional highway signs for single-lane conventional highways or multi-lane conventional highways with a posted speed of 35mph or less.

2M is the sign size designation of regulatory and warning signs for multi-lane conventional highways with a posted speed of 40mph.

POLICY

This guideline establishes the standard sign size to be used for each defined highway facility. Signs larger than the standard size *may* be used selectively and with documentation of the specific situational reason for use of a sign larger than the standard. Whenever a sign smaller than the standard is used, the conditions such as space or visibility constraints *should* be documented and approved by the Regional traffic engineer. The designer **shall** work with the Region Traffic Section to determine the proper sign sizes:

1. Freeways and interstate highways, size 5 signs, regardless of the posted speed limit.
2. Expressways with posted speed limits of 65 mph, use size 5 signs. Expressways with posted speed limits of 60, 55, or 50 mph, use size 4 signs. Use size 2S signs for side road approaches or that when approaching a highway facility would require a larger sign size under this guideline, use the larger size.
3. On and off ramps for service interchanges, use size 2S signs. System interchange ramps, use size 5 signs.
4. Conventional highways with single lanes (all speeds) and multi-lane conventional highways with a posted speed of 35 mph or less, use size 2S signs. Size 2M signs *may* also be used, at the discretion of the Region, to upsize sign sizes on single lane conventional highways or multi-lane conventional highways with a posted speed of 35 mph or less.
5. Conventional multilane roadways, with a posted speed of 40 mph, use size 2M regulatory and warning signs.
6. Conventional multi-lane roadways, with a posted speed of 45 mph or greater, use size 3 signs. As an option, size 2M *may* be used for urban conventional multi-lane roadways with posted speeds of 45 mph if there are limiting physical factors that would not make size 3 signs feasible. Some of these limiting physical factors would include: narrow terrace or median widths, close driveway spacing and close intersection spacing.
7. Size 1 signs *may* be used on streets and highways which are neither state trunk highways, nor connecting highways when there is no more than one lane of traffic in each direction, and the posted speed limit is 30 mph or less.
8. Additional sign size criteria for bypasses are contained in [TEOpS 2-15-53](#) (bypass Signing).

2-1-41 Jurisdictional Boundary Signs

January 2015

GENERAL

Communities *may* request informational signing to either identify their municipal boundaries or to

promote/advertise their community. These types of signs are considered to be Jurisdictional Boundary signs and *may* take the form of three different types of signs:

- Welcome signs
- Enhanced political boundary signs
- Community population signs.

The community population signs and enhanced political boundary signs are considered a traffic sign and are allowed on the highway right-of-way. Welcome signs are interpreted as an off right-of-way. Some of these signing requests *may* get complicated as there are many different types of designs, messages and installation methods that are often proposed. This policy provides guidance for working with these types of signing requests.

AUTHORITY

[Section 86.19 of the Wisconsin statutes](#) prohibits signs within the limits of any highway except as are necessary for the guidance or warning of traffic and certain other exceptions as provided in that section. This statute also requires the Department to prescribe regulations with respect to erection of signs on public highways.

The MUTCD Section [1A.01](#) states that advertising messages **shall not** appear on traffic control devices and Section [1A.10](#) states that the design, application and placement of traffic control devices, other than those adopted in the MUTCD are prohibited.

Therefore, the 2009 MUTCD and Wisconsin State Statute 86.19 have specific standards regarding the design and installation of such signing:

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges.

Expressways are defined as divided arterial highway facilities that have partial control access and generally with grade separations at major interchanges.

Conventional highways are defined as either divided or undivided roadway facilities that have no control of access or grade separations at intersections. These highways can be two-lane or multi-lane facilities.

POLICY FOR COMMUNITY WELCOME SIGNS

Welcome signs are defined as any sign or marker that is erected by or for a local government near the municipal boundary with the primary function of welcoming people to the community.

1. Welcome signs along state highways **shall** only be permitted when located off the highway right-of-way with a permit as required for outdoor advertising signs and provided for in [Trans 201.05](#).
2. Existing permitted welcome signs inside the highway right-of-way will be allowed to remain temporarily without modification or replacement until the end of their useful life. Unpermitted welcome signs **shall** be removed as soon as possible.
3. Temporary existing welcome signs must be located outside the minimum clear zone specified in the [Facilities Development Manual](#). No welcome sign *may* be allowed to remain if it is a safety hazard. The permit holder **shall** be responsible for any costs incurred by the Department to correct or eliminate hazards related to the welcome sign.
4. Temporary existing on right-of-way welcome signs **shall** meet the standards for breakaway supports unless the sign is not reachable by an errant vehicle. Landscaping features such as retaining walls, landscape timbers or ground-mounted lighting fixtures **shall not** be allowed to remain if they are reachable by an errant vehicle.
5. Temporary existing welcome signs **shall not** have auxiliary plaques.

POLICY FOR ENHANCED POLITICAL BOUNDARY SIGNS

Enhanced political boundary signs are more of an informational sign as they do not directly provide a guidance function for the motorist. These signs are traffic signs that are installed on conventional highways, in the highway right-of-way, at the municipal limits by permit. The signs serve the functions of conveying the municipal limits of a community and *may* tie into the theme of the community by utilizing different colors and/or a pictograph on the sign.

GENERAL POLICY CRITERIA

1. If off-right-of-way location efforts fail for a welcome sign, then a community could apply for a permit to install and maintain an “enhanced political boundary sign.” Enhanced political boundary signs **shall not** be allowed if there is an off-right-of-way welcome sign in place.
2. If an enhanced political boundary sign is installed, then WisDOT would remove the standard population sign.
3. Enhanced political boundary signs *should* be ground-mounted on the right side of the roadway. Ground-mounted median signs *may* be installed if right-side installation opportunities are not available. No overhead sign installations are allowed.
4. Supplemental signs (tree city USA, 1979 baseball champs, lions clubs, etc.) **shall not** be allowed on the enhanced political boundary signs or supports.
5. Enhanced political boundary signs **shall** only be allowed on conventional highways for incorporated cities and villages, located at the municipality border. Enhanced political boundary signs **shall not** be allowed for townships or unincorporated communities.
6. All enhanced political boundary sign requests, including CSS projects, **shall** be approved by the Region Traffic Engineer. Requestor **shall** furnish proposed locations, sign and pictograph design and type of supports used.
7. The community population number *may* be included on the enhanced political boundary sign.
8. The community **shall** be responsible for all costs associated with the manufacture, installation and maintenance of the permitted enhanced political boundary signs.

SIGN DESIGN STANDARDS

1. Destinations, arrows or specific traffic generators **shall not** be allowed on the signs.
2. The pictograph (logo) height **shall not** exceed two times the height of the upper case letters and **shall** be located at the top or left side of the sign. The pictograph **shall** be the official designation adopted by the jurisdiction. The pictograph *may* contain wording, provided it is not a commercial advertising message. Only one pictograph is allowed per sign.
3. Enhanced political boundary signs **shall not** be lighted or contain any animated or moving parts, flashing lights or disks.
4. At a minimum, enhanced political boundary signs **shall** utilize Type H—High Intensity sheeting.
5. Minimum letter size **shall** be 4 ½” lowercase, 6: uppercase letters. Maximum sign size **shall** be 72: width by 48: height.
6. Sign base material **shall** be in accordance with [Section 637 of the WisDOT Standard Construction Specifications](#).
7. The sign shape **shall** be rectangular. Aluminum signs **shall** have rounded corners.
8. Border is required on the signs and **shall** be retroreflective, and of the same color as the text.
9. Colors **shall** meet the standards for highway colors specified by the Federal Highway Administration.

Two color combinations *may* be used which are:

- White or yellow on blue, green or brown
- Blue, green, black or brown on white
- Red or orange on white, but not the reverse
- The background colors of orange, red, yellow, purple, or the fluorescent versions thereof, fluorescent yellow green and fluorescent pink **shall not** be allowed. One background color only allowed. Lettering and border (if used) **shall** be of the same color.

SIGN INSTALLATION STANDARDS

1. The standard WisDOT posts (4” x 6” wood or 2” x 2” tube steel) *may* be used. The community also *may* be allowed to utilize other types of sign posts. Non-standard sign posts **shall** conform to [TEOpS 2-15-52](#).

2. Sign installation and placement **shall** be per WisDOT standards.
3. Sign mounting height **shall** be five feet to bottom of sign.
4. Sign locations **shall** be approved by WisDOT. Signs **shall** be located outside of the influence area of an intersection (typically 200' minimum distance from the intersection).
5. WisDOT **shall** approve any proposed landscaping plans. Any landscaping items **shall** meet breakaway standards or be shielded with FHWA approved shielding. For example, there is a 20" high decorative curb that meets FHWA standards.

POLICY FOR COMMUNITY POPULATION SIGNS

1. City or village limit signs *may* be installed on freeways or expressways at or near where the highway enters the municipality, unless the city or village is identified on the primary guide signs or a supplemental guide sign.
2. City or village population signs **shall** be installed on conventional highways at or near where the highway enters the municipal limits. WisDOT will install and maintain the standard signs with the official current decennial census figures. No other signs **shall** share the supports.
3. If the city or village requests a population update, the Regional Traffic Engineer *may* authorize the municipality to modify the numbers with a white on green Type H adhesive overlay, using the same size and font as the original sign.
4. Signing for unincorporated communities is covered in [TEOpS 2-4-48](#).

APPLICATION AND PERMIT

1. Permit **shall** be approved by the WisDOT Regional Traffic Engineer.
2. The application from the requesting community **shall** contain a plan showing the sign location(s) and sign fabrication detail (including colors and heights of letters and pictograph).

2-1-42 State Entrance Signing

February 2018

PURPOSE

In the past, several different signs have been installed along Department-maintained roadways at state entrances. In some cases, several signs have been installed on the same support. At some state entrances, blue signs with the state outline (I2-1-B) are installed. Based on an interpretation received from FHWA in 2013, the shape of these signs is not in conformance with the 2009 MUTCD. This policy will define the appropriate sequence of signs when entering the state along a Department-maintained roadway.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional Highways are defined as either divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways can be two lane or multilane facilities.

POLICY

Freeways and Expressways

The standard order of sign installations along a freeway or expressway, beginning at the state line, is shown below. 200' minimum spacing *should* be maintained between each sign installation. Note that this order may need to be adjusted based on field conditions.

1. I2-1 (Wisconsin) with I2-2 (County name) directly below.
2. J4-series (Reassurance Assembly)
3. R2-1 (Speed Limit)
4. R5-53-A (Buckle Up – It's the Law)

5. R5-60 (Move Over or Slow Down)
6. D12-5 (Travel Info Call 511)

In addition to this on-right-of-way signing, for freeway and expressway entrances to the state, a large timber “Wisconsin Welcomes You” sign is typically installed in an off-right-of-way location that is visible to traffic.

Conventional Highways

The standard order of sign installations along a conventional highway, beginning at the state line, is shown below. 200’ minimum spacing *should* be maintained between each sign installation in rural areas. 100’ minimum spacing *should* be maintained between each sign in urban areas. Note that this order *may* need to be adjusted based on field conditions.

1. I2-1 (Wisconsin) with I2-2 (County name) directly below.
2. I2-3 (Community population sign) – only if entering municipal limits
3. J4-series (Reassurance Assembly)
4. R2-1 (Speed Limit)
5. D2-series – not used if entering municipal limits

In addition to this on-right-of-way signing, for conventional highway entrances to the state that are part of the National Highway System, a large timber “Wisconsin Welcomes You” sign is typically installed in an off-right-of-way location that is visible to traffic.

IMPLEMENTATION

There is no formal phase-in period for installation of this signing. Existing non-conforming state entrance signs will be allowed to remain in place until the end of their useful life. Useful life ends when the sign message no longer meets legibility or condition standards. Existing non-conforming state entrance signs *may* be replaced prior to the end of their useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or when projects make replacement practical.

2-1-45 Usage of Fluorescent Sheeting on Signs

August 2013

PURPOSE

Fluorescent colored sheeting can be advantageous to use on certain traffic signs. In addition to enhanced nighttime retroreflectivity, the fluorescent color allows for greater daytime conspicuity of signs as well. This is especially important for enhancing traffic safety of the motorist and addressing the fact that a greater percentage of people in our population are becoming older and their eyesight requires a brighter sheeting material.

There are three colors of fluorescent sheetings that are commercially available: orange, yellow and yellow-green. The Federal Highway Administration allows the use of fluorescent yellow-green sheeting on some warning signs for pedestrian, bicycle, playground and school applications. The following guidelines limit the usage of the three fluorescent sheeting colors to certain specific signs in order to retain the unique quality of the sheeting.

POLICY

Fluorescent Yellow Sheeting

Beginning in 2010, WisDOT has been in the process of converting yellow warning signs from ASTM D4956 Type IV (prismatic high intensity yellow) to ASTM D4956 Type XI fluorescent yellow, starting with the most critical of warning signs. Phase 1 (June 2010) included signs such as Stop Ahead, No Passing Zone, Pedestrian Crossing, Chevrons and Large Arrows. Phase 2 (June 2012) included Curve and Turn signs, Intersection Warning signs, advisory speed signs and bridge object markers. The final phase for implementation (Phase 3) will be for the remainder of the warning signs. This change will be completed by December 1, 2013. Beginning with the December 2013 letting, all warning signs on WisDOT projects will be converted to ASTM D4956 Type XI fluorescent yellow. Replace existing conventional yellow signs with fluorescent yellow as they wear out, through improvement projects or sign damage/knockdowns.

All chevrons in a curve or turn **shall** match sheeting color (either fluorescent yellow or conventional yellow). If warning signs are doubled up on an approach, the sheeting **shall** match (either fluorescent yellow or conventional yellow). Supplemental warning plaques **shall** match the main signs that they supplement. No

mixing of colors.

Fluorescent Yellow-Green Sheeting

S1-1 School Crossing Signs, S4-51 School Speed Limit Assemblies, S4-52 School In-Street Pedestrian Crossing Signs, S4-5 School Reduced Speed Limit Warning Signs on the WisDOT highway system **shall** use fluorescent yellow-green sheeting. The usage of fluorescent yellow-green sheeting **shall** also be used on the Ahead plaque (WF16-9P) for the School Advance Sign location, and Diagonal Down Arrow Signs (WF16-7L and WF16-7R) for the School Crossing Sign location. No other signs **shall** use the fluorescent yellow=green sheeting.

S3-1 School Bus Stop Ahead and S3-51 School Bus Traffic Signs

Replace existing conventional yellow signs with fluorescent yellow signs as they wear out, through improvement projects or damage claim knockdowns. All School Bus Stop Ahead signs and School Bus Traffic signs **shall** be replaced with the fluorescent yellow-green symbol sign no later than January 1, 2016.

Any signs with fluorescent yellow=green sheeting other than the School Crossing signs that were installed before the date this policy became effective *may* remain in place. Once these signs have reached their useful life, the Region **shall** replace them with regular yellow sheeting signs.

Fluorescent Orange Sheeting

Fluorescent orange sheeting **shall** be used on all work zone warning signs.

Fluorescent orange sheeting **shall** be used for all construction detour route assemblies (M4-5 TO, M5 and M6 series arrows and M4-8 detour plaques) and traffic control fixed message signs.

2-1-50 Snowmobile Trail Signing

August 1995

At some locations on state trunk highway right-of-ways, local agencies *may* erect signing for the purpose of directing and controlling snowmobile operations. This is permissible unless there is some problem generated by the existence of snowmobiles at specific locations. Signing for the snowmobile trails is described in [Administrative Code NR 50](#), and also described with typical applications illustrated in DNR's "[Trail Signing Handbook](#)", 1994. A copy of this book *should* be kept in each traffic section.

In interpreting this book the following is offered:

1. All responsibility for signing along the trail is local, including installation and maintenance.
 2. The Department's responsibility includes only signs which *may* be requested directing to trail head parking lots, and such warning signs directed to motorists advising of snowmobile crossings where these warnings are warranted.
 3. Regarding illustrations in the book (figures on pages 19-22 and page 28):
 - a. Warning signs on the trail when visible from the highway *should* be the minimum size specified.
 - b. Orange markers on the right-of-way would usually be unnecessary except to mark a turn.
 - c. STOP signs are shown too close to the highway. They *should* be back of the snowplowing range, at least 20' from the pavement and desirably more.
 - d. STOP signs *should* be parallel to the highway, and the trail approaching the highway *should* be aligned to be as near to a right angle as possible.
 - e. Warning signs on the highway are shown routinely in the illustrations. On state trunk highways, they are only to be installed where warranted, usually due to sight conditions.
 4. On page 12 of the handbook: "If requested, the Department will install and maintain guide signs for trail head parking lots. The signs *should* contain the word 'Parking.'"
- The term "snowmobile route" is defined to mean snowmobile travel on an unplowed roadway. Consequently, "routes" are not to be signed on state trunk highways or connecting highways.
5. Sign posts on the right-of-way installed by local agencies **shall** meet the same small support safety standards as those erected by the Department.
 6. Trail signs **shall not** be attached to any of the Department's signposts.

2-1-55 Alternate Roadway Signing**April 2001****PURPOSE**

In some areas of the state, there are sections of roadways that are frequently closed to traffic for brief periods of time. As a result, motorists are directed to use an alternate route, usually by law enforcement officials. Many of these alternate route locations are used frequently enough that they could be permanently signed as alternate roadways.

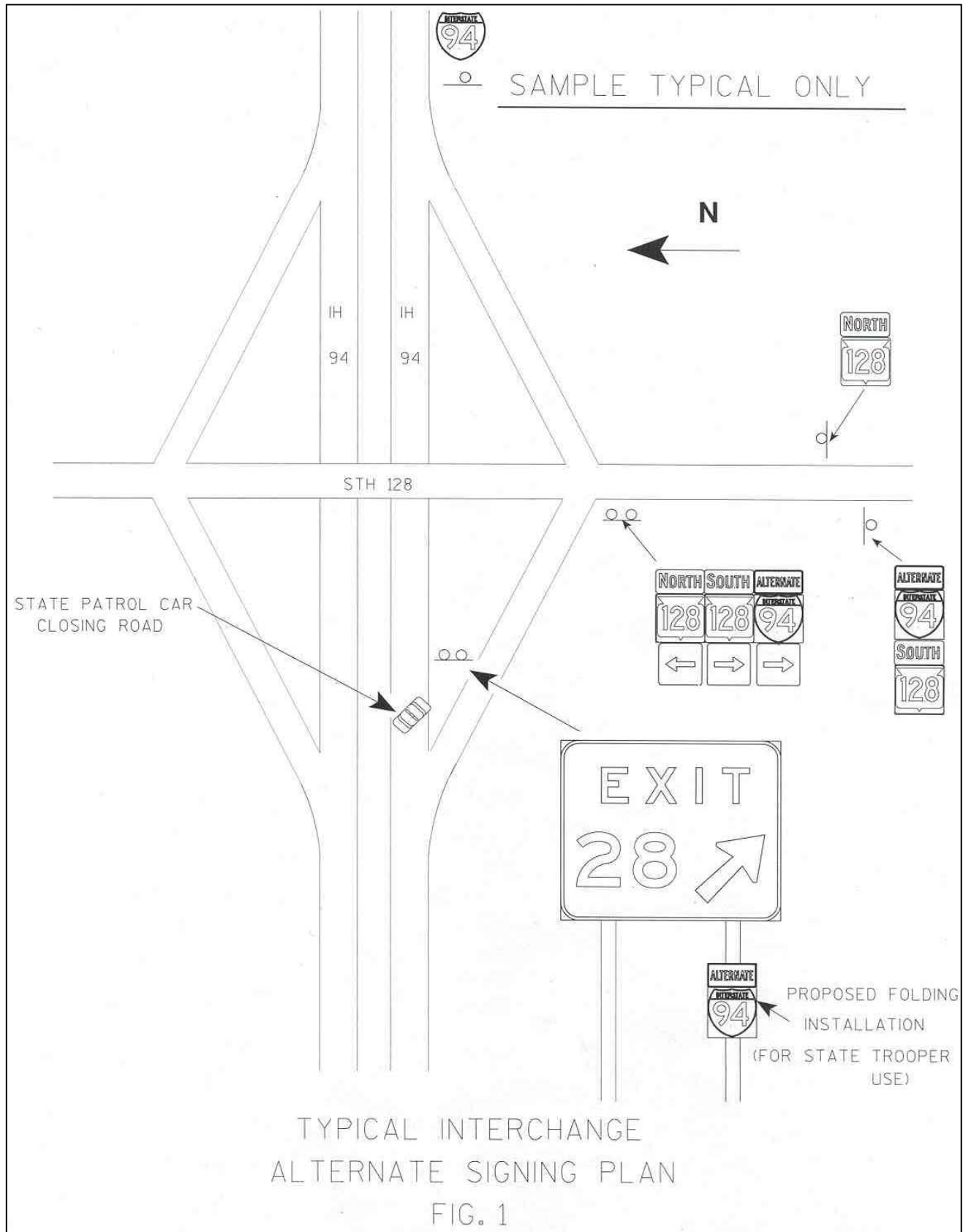
There are several benefits of alternate roadway signing. Alternate signing can direct traffic onto an alternate roadway in case the mainline roadway is closed, due to bad weather, crashes, or other incidents. A permanently signed alternate route can assist State Patrol Troopers and other personnel because less manpower will be required to direct motorists on an alternate route.

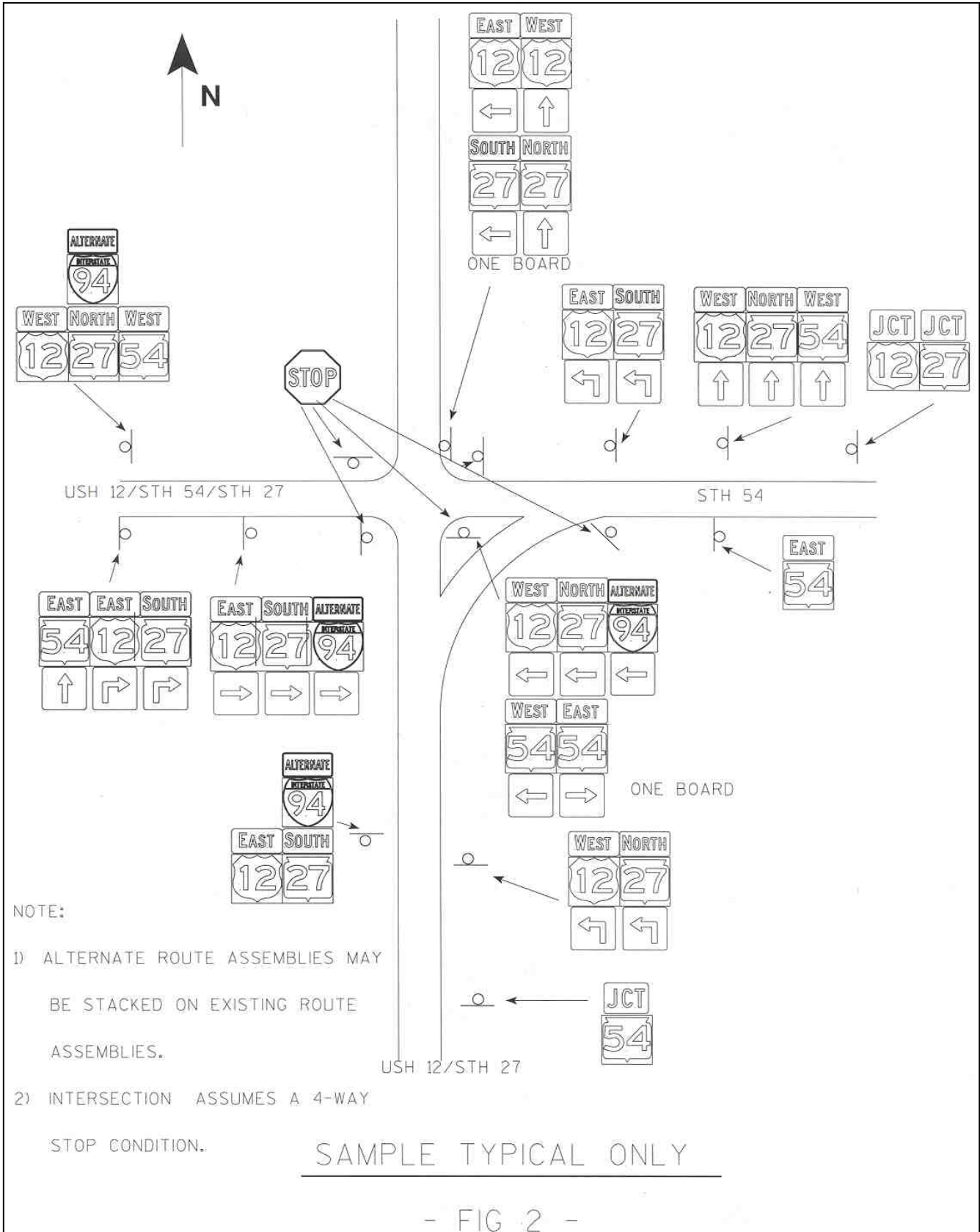
INSTALLATION GUIDELINES

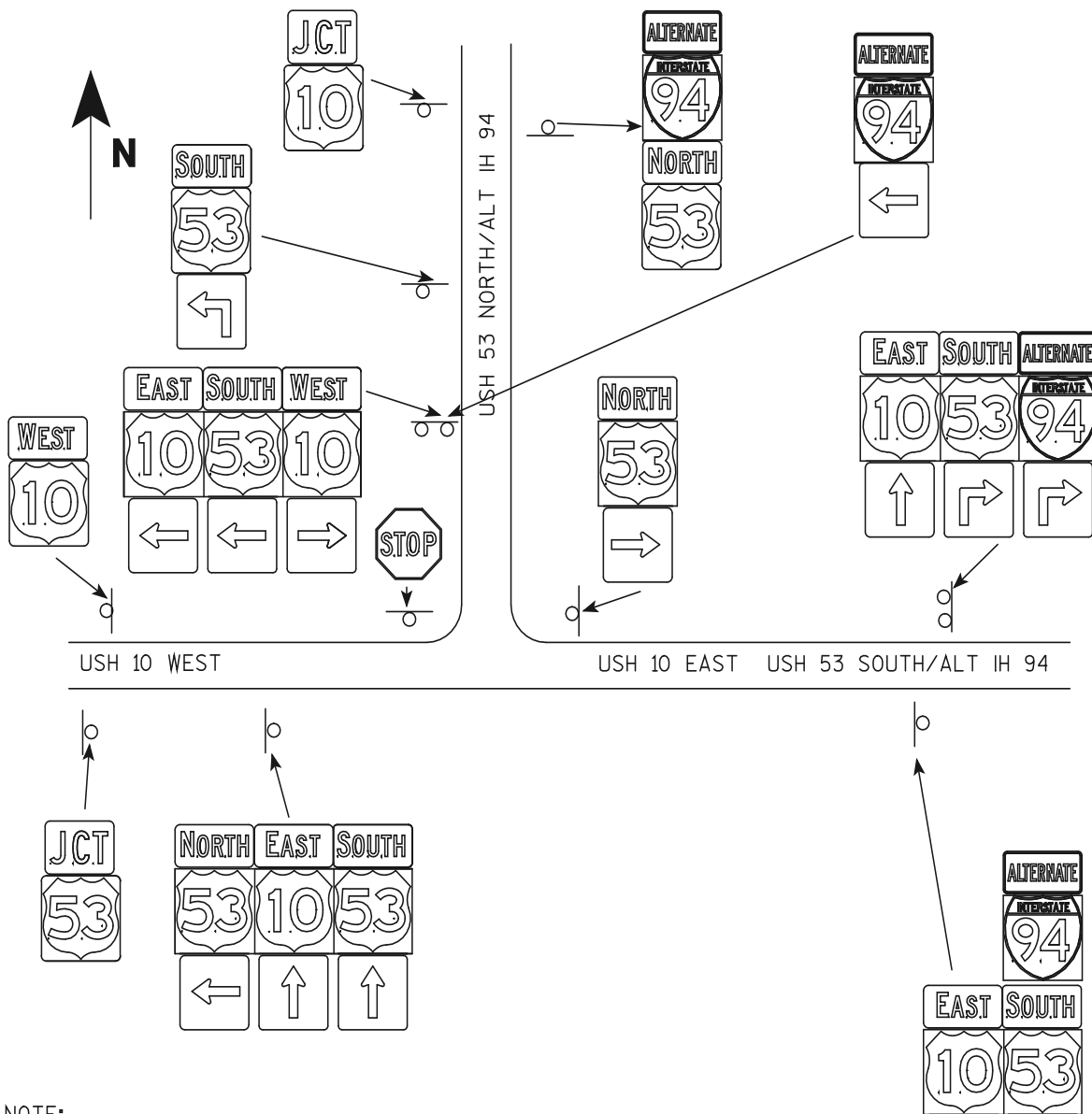
The following criteria *should* be considered by each Regional Traffic Section in the design/implementation of permanent signing for an alternate roadway. It *should* be noted that this type of alternate route signing is optional in each Region and the Region will have the final say on whether to approve or deny this signing. Example details are also provided as part of this policy. This policy applies to the signing of alternate routes for mainline roadways that re on the WisDOT system.

1. During the design of alternate roadway signing, the Regional Traffic Section *should* contact the State Patrol and local highway officials for comment. Some existing county trunk highways and local roads *may* not be suitable as alternate traffic routes. The Region *should* check to see if the alternate route being considered has been previously designated a long truck route. Per [Wisconsin Administrative Code 276.08](#), once a route is permanently signed as an alternate, it will legally be considered a long truck route. The Region *should* be aware that there is a potential problem of truckers legally using the alternate route even if the main route is open.
2. The alternate marker (M4-1 sign) **shall** be used in conjunction with the appropriate route marker shield. For interstate applications, the alternate marker (MB4-1 sign) **shall** be used with the interstate marker shield. The MB4-1 sign has white lettering on a blue background.
3. Figure 1 shows the use of a horizontal-cut aluminum folding alternate roadway sign. The folding alternate roadway sign is mounted below the EXIT gore sign. The State Patrol or other law enforcement officials could flip this sign open in times of roadway closure. Once traffic is directed off the mainline roadway, there would be alternate signing all along the alternate route that would direct motorists. **Usage of this sign has been determined to be optional. It is recommended that the Regional Traffic Section contact their State Patrol Regional office for input on the usage of this sign.**
4. No cardinal direction signs *should* be placed on the alternate route sign assemblies unless a specific direction is required.
5. The use of a vertical route panel is encouraged wherever possible (as shown on the examples). The placement of alternate route assemblies in urban areas *may* be difficult due to space restrictions. Alternate route assemblies *may* be stacked on existing route assemblies. Normally, 24" and 36" marker heads are used. For extreme space constraints, 18" marker heads can be specially ordered. For roadways that have multiple route assemblies (i.e. Interstate 39-90-94 in Southwest Region), one of the numbers can be used for the alternate route assembly on the alternate route.
6. The horizontal size of the alternate route marker sign *should* be the same as the horizontal size of the roadway marker signs already on the roadway.
7. The placement of reassurance markers will differ on each route, but in general they *should* be placed every (+/-) 5 miles, or as needed. The alternate reassurance markers *should* be stacked whenever possible and *may* be placed with every reassurance marker on the roadway.
8. Generally, for a stop condition or right turn no stop condition, alternate route assemblies with advanced turn arrows would not be used, as shown on Figure 2. However, conditions such as unusual intersection geometrics and/or multi-lanes *may* require the addition of alternate assemblies with advanced turn arrows.
9. For a no stop condition, as shown on Figure 3, alternate route assemblies with advanced turn arrows *should* be used.

10. It is recommended that the Regions send their completed alternate roadway signing layouts to Central Office Traffic Operations for review prior to installation.







NOTE:

- 1) ALTERNATE ROUTE ASSEMBLIES MAY BE STACKED ON EXISTING ROUTE ASSEMBLIES.
- 2) INTERSECTION ASSUMES A "NO STOP" CONDITION FOR USH 10 TRAFFIC.

SAMPLE TYPICAL ONLY

- FIG 3 -

PURPOSE

Community Sensitive Design for signing is the incorporation of a sign or logo to blend in architecturally with a structure. There are many requests to utilize community Sensitive Designs (CSD) for signing along state-maintained highways. This type of signing can be very popular because they add an aesthetic community value to the roadway. However, there are several policies and guidelines that must be followed in this approach. MUTCD section [1A.01](#) states that Traffic Control Devices or their supports **shall not** bear any advertising message or any other message that is not related to traffic control. Advertising is only allowed on signs off of the highway right-of-way. [Wisconsin State Statute 86.19\(1\)](#) states that no sign **shall** be placed within the limits of any street except such as necessary for the guidance or warning of traffic.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional highways are defined as divided or undivided roadway facilities that have limited access with no grade separations at intersections. These highways *may* be two lane or multi-lane facilities.

POLICY

Any Community Sensitive Design for signing *should* ensure that the message or logo does not compete with the essential message of any official traffic signs, nor create a distraction from conveying essential traffic information. In addition, any Community Sensitive Design for signing needs to ensure that there is no advertising of any kind. Welcome signs as part of the design aspect of a structure **shall not** be allowed. Stand-alone welcome signs are covered in [TEOps 2-1-41](#).

GUIDELINES

Community Sensitive Designs for signing will be allowed on state-maintained roadways provided the following criteria are met:

1. Except for street name identifications (covered in items 2, 3 and 4 below), other word messages **shall not** be used, including wording within logos.
2. Street name identifications *may* be formed into the concrete as part of the structure. They **shall** be independent and not included as part of a logo.
3. On freeways and expressways, street name identifications **shall** be a minimum of 6" lowercase or 8" uppercase letters, with a minimum letter stroke width equivalent to FHWA Series E.
4. On conventional highways, street name identifications **shall** be a minimum of 4 ½" lowercase or 6" uppercase letters, with a minimum letter stroke width equivalent to FHWA Series E.
5. Logos or designs **shall not** bear any resemblance to official logos already in place on official guidance or motorist Specific Information Signs (SIS signs).
6. Logos or designs **shall not** bear any resemblance to official advertising, correspondence or municipal logos.
7. Logo and designs, including designs for street name identifications, **shall** be submitted to WisDOT Central Office, Bureau of Highway Operations for review and approval.
8. Any existing non-conforming Community Sensitive Design signing already in place **shall** be allowed to remain until the end of its service life. Once the design has reached the end of its service life, it **shall** be removed and not be replaced.
9. Some architecturally acceptable logos would include logos of:
 - a. Wildlife
 - b. State Capitol
 - c. State outline
 - d. Floral patterns
 - e. Outlines of city buildings

- f. Animals
 - g. Ships/boats.
10. Internally or externally illuminated logos **shall not** be allowed.
 11. Portraits of people **shall not** be allowed.
 12. Logos or designs *should* be uniquely related to the community in which the structure is located.
 13. Bridge painting is not allowed to resemble a sign or message.

2-1-65 Pedestrian Crossing Flags

January 2018

GENERAL

There are currently efforts by communities to enhance the visibility of pedestrians within crosswalks. Typically, these are crosswalks that are not at a stop or signalized location. Communities have adopted a pedestrian flag program where flags are provided at the pedestrian crossing to assist with increasing visibility of pedestrians crossing the street. This flag concept is like the concept of placing retroreflective material on clothing. Based on an April 27, 2005 Interpretation Letter from FHWA, it has been determined that these flags are not traffic control devices and therefore, no direct guidance is given in the 2009 MUTCD on the design and application of pedestrian flags. The 2009 MUTCD, Section 6E.03 does provide standards and guidance for hand signaling devices, including flags, for work zones.

This policy is developed to provide specific guidelines for handling requests for the installation of pedestrian crossing flags for crossings on the state highway system.

POLICY

1. All requests to install pedestrian flag devices **shall** be made by the municipality.
2. Flag holder devices **shall not** be attached to WisDOT maintained sign posts.
3. The municipality **shall** be responsible for all installation and maintenance costs of the flag devices.
4. Pedestrian Crossing flags **shall** only be allowed at WisDOT permitted crosswalks.
5. For maximum visibility, flags **shall** be red or fluorescent orange-red in color. Flags **shall** be made of a retroreflective material or have a retroreflective strip attached to them.
6. Flags **shall** be a minimum of 18" x 18" in size, with a minimum 30" staff.



2-2-4 STOP and YIELD Signs for Separated Turn Lanes

August 2013

PURPOSE

The MUTCD, Section [2B.04](#) provides general guidance for the determination of STOP or YIELD sign usage to determine the right-of-way at intersections. The MUTCD also states that for signalized intersections, a STOP or YIELD sign **shall** only be used if there is a separated turn lane that is not controlled by the traffic signal.

In addition to separate, unsignalized turn lanes at signalized intersections, WisDOT has also installed roundabouts with separated turn lanes where the approaching, right-turning traffic can utilize a “bypass” lane to avoid going through the roundabout circle altogether.

Questions about whether to use a STOP or YIELD sign or no control for these applications has led to an inconsistent practice throughout the State. The purpose of this policy is to provide guidance on the signing treatments that are available and when they *should* be used, to help achieve a better consistency of practice statewide.

POLICY AND GUIDELINES

Signalized Intersections with Separated (Unsignalized) Turn Lane

1. Right turn lane with dedicated, long parallel receptor lane on the receiving roadway; typically, a STOP or YIELD sign would not be used. An added lane warning sign (W4-6) *should* be used in these cases. If traffic or crash problems persist, a YIELD sign *may* be used.
2. If there are two or more receptor lanes on the receiving roadway, a YIELD sign *should* be used. If traffic or crash problems persist, a STOP sign *may* be used in lieu of the YIELD sign.
3. If there is only one receptor lane on the receiving roadway, a STOP sign *should* be used. A YIELD sign *may* be used in lieu of a STOP sign where there is wider pavement and an available recovery area.
4. If double separated right turn lanes are used at a signalized intersection, traffic signal control **shall** be utilized.
5. If traffic or crash problems persist with any YIELD sign control, STOP signs or signal control *should* be considered.

Roundabouts with Separated Right Turn Lanes

1. YIELD signs *should* be used for both single and double separated right turn lanes at roundabouts.
2. If traffic or crash problems persist with any YIELD sign control, STOP signs *should* be considered.

SIGNING IMPLEMENTATION

1. The guidelines listed in Part B *should* be followed for newly installed intersections.
2. For existing intersections with signing not meeting these guidelines, there is no compliance date for making these changes. However, opportunities *should* be utilized through improvement projects, knockdowns or routine sign replacements to bring the signing up to the current guidelines.

2-2-4.5 STOP and YIELD Signs on Driveways and Private Roads

April 2008

GENERAL

The Department uses regulatory and warning signs conservatively, as recommended in the Manual on Uniform Traffic Control Devices (Section [2A.04](#)). This conservative use is important to retain the effective impact of signs on driver behaviors; used in excess, regulatory and warning signs tend to lose their effectiveness. There is the concern that a proliferation of unnecessary STOP or YIELD signs at driveways and private roads will lead to their disregard and could cause potential safety issues at locations where STOP or YIELD signs are necessary.

Oftentimes the Department is requested to install and/or maintain STOP or YIELD signs for driveways and private roads. The Department is not obligated to provide STOP or YIELD signs for many of these locations, by basis of Wisconsin Statutes and the 2009 MUTCD.

AUTHORITY

The following Wisconsin State Statutes establish relevant rules of the road that drivers must obey without requiring a sign to be posted and describe the authority to place signs, and the MUTCD Sections provide standards and guidance for installations of these signs.

Chapter 346, Rules of the Road

[s. 346.02](#) (7) Applicability of Provisions Requiring Signposting.

...Whenever a particular section does not state that signs are required, such section is effective even though no signs are erected or in place.

[s. 346.18](#) (4) Entering Highway from Alley or Non-highway Access.

The operator of a vehicle entering a highway from an alley or from a point of access other than another highway **shall** yield the right-of-way to all vehicles approaching...

[s. 346.18](#) (7) (b) Entering Alley or Driveway from Highway

The operator of any vehicle crossing a sidewalk...**shall** yield the right-of-way to any pedestrian...on the sidewalk.

[s.346.41](#) (1) Display of Unauthorized Signs and Signals Prohibited

No person **shall** place, maintain or display upon or in view of any highway...any unauthorized sign...which:
(a) purports to be...an official traffic sign...

MUTCD, [1A.08](#), Authority for Placement of Traffic Control Devices.

Traffic control devices... **shall** be placed only as authorized by a public authority or the official having jurisdiction...

Any unauthorized sign placed on the highway right-of-way by a private organization or individual constitutes a public nuisance. All unofficial and nonessential traffic control devices, signs, or messages *should* be removed.

All regulatory traffic control devices **shall** be supported by laws, ordinances, or regulations.

These statutory provisions clarify that signs are not required to affect a requirement to comply with rules of the road, and it is apparent that a motorist is not required to comply with rules of the road, and it is apparent that a motorist is not required to stop before entering a street or highway from a driveway. STOP signs are not required in these situations. The following policy is established consistent with the stated objective of conservatively using regulatory signs to retain their effectiveness.

POLICY

1. STOP signs or YIELD signs **shall not** be erected on state highway right-of-way at driveways, except as noted below:
 - a. STOP or YIELD signs **shall** be installed and maintained by WisDOT at driveways to state, county or municipal parks, and state forest, driveways on school grounds, and driveways to county institutions. These intersections often appear to be driveways, but are defined as highways under [s.340.01\(22\)](#).
 - b. If a private driveway operates and functions like a public street, the Regions *may* provide a temporary exception to allow a STOP or YIELD sign while working to encourage the local government to make the intersecting road a public roadway.
 - c. When there are demonstrated operational or safety issues resulting from a lack of a STOP or YIELD sign, and best efforts of the region to locate the STOP or YIELD sign off the state highway right-of-way do not work, a permit *may* be granted by the Region to allow the STOP sign in the highway right-of-way. The permit *should* be documented using the standard application/permit to work on highway right-of-way ([DT 1812 form](#)). The owner of the STOP or YIELD sign **shall** be responsible for the installation and long-term maintenance of the sign.
2. For pre-existing STOP or YIELD signs installed at driveway connections to state highways, not consistent with this policy and located in the right-of-way of the state highway, the Region *should* remove the sign from the right-of-way. Before removal, make every effort to work with the driveway owner, as opportunities permit, to relocate privately owned STOP or YIELD signs off the state highway

right-of-way. An ideal time for working with property owners for relocation of STOP or YIELD signs would be during an improvement project or if any other work is being performed on the right-of-way.

3. STOP or YIELD signs for private driveways connecting to state highways *should* be located off the state highway right-of-way in a location that is reasonably close to the ideal starting point. The 2009 MUTCD, Section 2A.16 states that a STOP sign *may* be located a maximum of 50 feet from the mainline roadway edgeline.
4. When privately owned STOP or YIELD signs are allowed in the highway right-of-way, the proper size STOP or YIELD sign for that particular state trunk highway **shall** be used, in accordance with [TEOpS 2-2-5](#). In addition, the owner of the private road or driveway **shall** install STOP or YIELD in accordance with the MUTCD, Sections [2B.04](#), [2B.05](#), [2B.06](#), [2A.18](#), [2A.19](#) and [6F.05](#).

2-2-5 Size of STOP Signs on Roadways

September 2010

PURPOSE

The intent of this policy is to establish minimum STOP sign sizes on WisDOT roadway. These guidelines are applicable for intersections with single-lane conventional State Trunk Highways, intersections with multi-lane conventional State Trunk Highways and intersections with Expressways.

DEFINITIONS

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate highways are freeways with the interstate route designation.

Expressways are divided arterial highway facilities that have partial control of access, generally with grade separations at major intersections.

Conventional highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

INSTALLATION GUIDELINES

The following minimum sizes **shall** be used for the installation of STOP signs on WisDOT system roadways.

1. A 36" STOP sign size **shall** be used for all STH/STH intersections, regardless of the number of approach lanes on each STH.
2. A 36" STOP sign size **shall** be used for all roadways intersecting multi-lane conventional state trunk highways and expressways.
3. A 36" STOP sign size **shall** be used for multi-lane conventional roadways intersecting single-lane conventional state trunk highways.
4. A 30" STOP sign size **shall** be used for single-lane conventional roadways intersecting single-lane conventional state trunk highways.
5. Additional STOP sign size criteria for bypasses are contained in [TGM 2-15-53](#) (Bypass Signing).

If there are demonstrated or perceived problems at these intersections, the Regions have the option of increasing the STOP sign size. A traffic engineering study can be used to identify problems at intersections. Justification *may* be based on unusual roadway geometrics, crash problems, or sight restrictions.

2-2-12 In-Street Pedestrian Crossing Signs

June 2005

PURPOSE

The MUTCD section [2B.12](#) allows usage of in-street pedestrian crossing signs to remind motorists of laws regarding pedestrian right-of-way at an unsignalized location. While these signs *may* be useful to remind motorists of traffic/pedestrian right-of-way laws, it is important to develop and use additional application standards to promote consistency, safety and efficiency of the roadway. Local units of government have requested to install this signing. This policy provides guidance on the usage of these signs on state maintained roadways.

POLICY

Local units of government **shall** request, in writing, permission to install and maintain in-street pedestrian

crossing signs on DOT permitted crosswalks. A map **shall** be provided to the District by the local unity of government showing the proposed locations of the in-street pedestrian crossing signs. Upon District review, approval or denial *should* be made by a letter to the local unit of government. If approval is given, the District *should* also provide a copy of the R1-6 standard sign plate with the approval letter so consistency is maintained in the design and manufacture of the signs.

The following guidelines **shall** be used by the District to determine whether a roadway crossing would qualify for in-street pedestrian crossing signs.

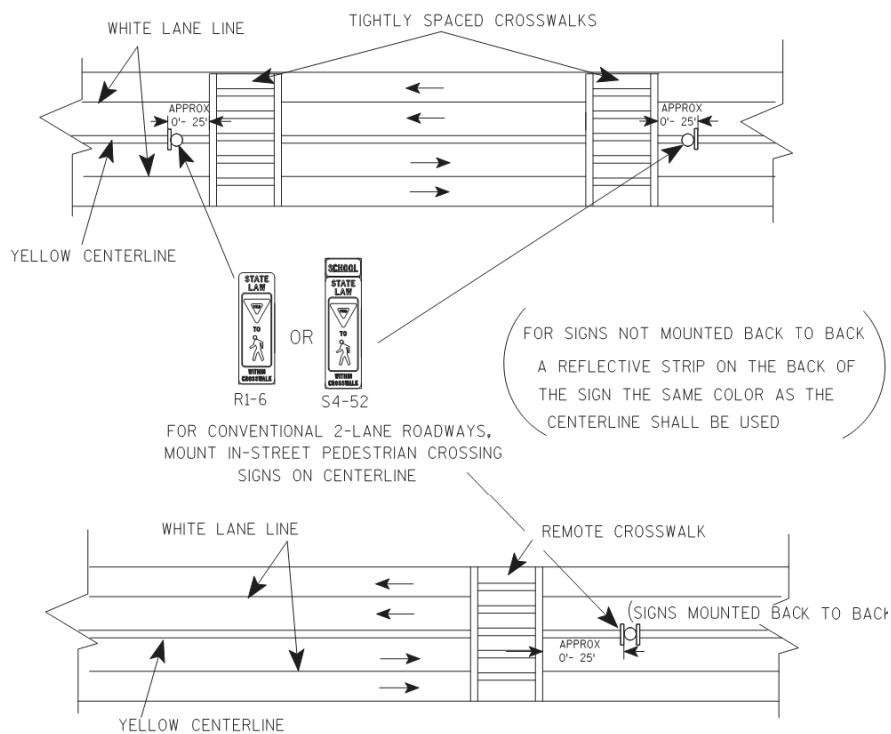
GUIDELINES

1. The local unit of government **shall** be responsible for all liability costs.
2. Only the R1-6, in-street YIELD TO PEDESTRIANS WITHIN CROSSWALK sign **shall** be allowed only on roadways with posted speeds of 40 mph or less.
3. The R1-6, in-street YIELD TO PEDESTRIANS WITHIN CROSSWALK sign message shall only be used in Wisconsin since [State Statute 346.24](#) requires drivers must yield to a pedestrian in a crosswalk. The R106a, STOP FOR PEDESTRIANS WITHIN CROSSWALK, sign should not be used.
4. Existing in-street pedestrian crossing signs that do not conform to this policy **shall** be removed. Notification to communities **shall** be made by written letter. *Should* existing non-permitted signing not be removed, WisDOT will remove the sign(s).
5. The in-street YIELD TO PEDESTRIAN sign **shall** only be used as a supplement to the standard pedestrian crossing sign (W11-2) with diagonal down arrow (WF16-7L/R) or standard school warning sign (S1-1) with diagonal down arrow (W16-7L/R). As an exception, the in-street YIELD TO PEDESTRIAN WITHIN CROSSWALK sign *may* be used alone provided there are no sight restrictions.
6. The in-street YIELD TO PEDESTRIAN sign **shall** only be used as an in-street sign, not on the outside shoulder or parking lane.
7. The in-street YIELD TO PEDESTRIAN sign **shall** only be used at marked and maintained crosswalk approaches that are not controlled by a STOP sign or traffic signal. Signs *should* be restricted to key locations, such as high-volume pedestrian crosswalks, to avoid overuse. The minimum spacing of signs **shall** be every other block, where there are several consecutive marked and maintained pedestrian crossings.
8. The sign locations **shall not** impede traffic movements (through or turning). Signs *may* have to be temporarily removed due to maintenance operations or oversized loads. WisDOT is not responsible for sign removal or reinstallation costs.
9. Only one sign, in each direction of a two-way street approach or back-to-back signs, will be allowed for each crosswalk approach.
10. For pedestrian crossing applications, the signs **shall** have a black legend on yellow background the design on the R1-6 sign plate **shall** be used.
11. For school crossing applications, the signs **shall** include the SCHOOL plaque and **shall** have black legend on fluorescent yellow-green background. The design on the S4-52 sign plate **shall** be used.
12. The reduced size in-street school warning sign (S1-1) with reduced size AHEAD sign (WF16-9P) or reduced size diagonal down arrow sign (WF16-7L/R) *may* be used in lieu of in-street pedestrian crossing signs for school applications as shown in the MUTCD, sections [7B.08](#) and [7B.09](#).
13. Supports **shall** be freestanding (maximum 2" square or 2" round post), meeting National Cooperative Highway Research Program (NCHRP) 350 breakaway standards. The maximum mounting height **shall** be 2 feet to the bottom of the sign. The sign **shall** be securely attached to the pavement if left in place for more than 24 hours. Sign support bases **shall not** be bolted or cored into the pavement.
14. Communities *may* use the following mounting devices. Mounting devices not included in this list **shall** be approved by the District Traffic section, prior to use:
 - a. *Impact Recovery Systems* Mount or Portable models (portable model #103QR or fixed model #101NS).
 - b. *Safe-Hit Surface Mount* or Potable models (portable model #ST948PCD44WX or fixed model #ST948SMP44WX).
15. For signs not mounted back-to-back, a reflective strip the same color as the centerline or lane line **shall**

be used to warn traffic approaching from the opposite direction.

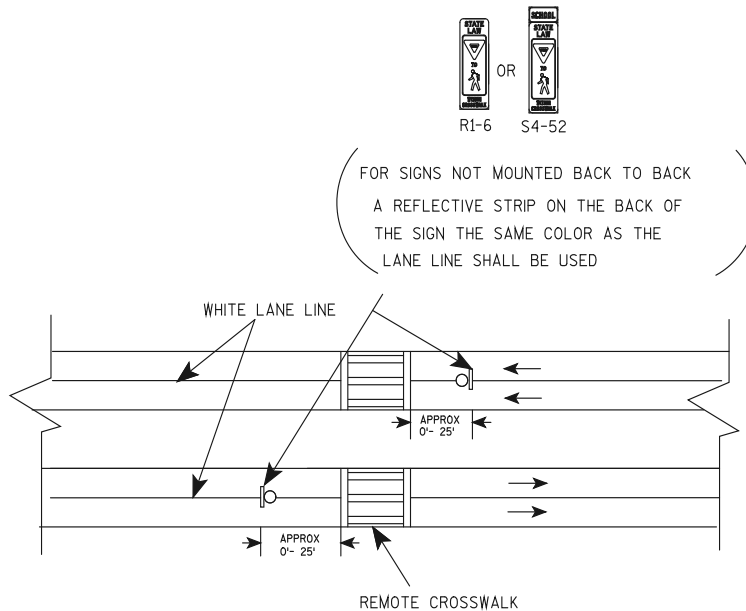
16. The local unit of government **shall** be responsible for manufacture, liability, installation and maintenance costs, which includes removal prior to snowfall and re-installation in the spring. If signs are not removed prior to November 1, WisDOT will remove and charge the local unit of government for all costs associated with removal. The in-street pedestrian crossing signs **shall not** be installed prior to April 1.
17. The local unit of government **shall** affix an identification label to the back of each sign, per Wisconsin State Statute 86.19(5).

TYPICAL PLACEMENT OF IN-STREET PEDESTRIAN CROSSING SIGN



FOUR LANE UNDIVIDED SECTION

TYPICAL PLACEMENT OF IN-STREET PEDESTRIAN CROSSING SIGNS



FOUR LANE DIVIDED SECTION

2-2-13 Location of Speed Limit Signs

June 2015

PURPOSE

The following is to provide policy guidelines for distance between and proper location of speed limit signs. The policy pertains to signing on freeways, expressways, and conventional highways.

BACKGROUND (AUTHORITY)

The Wisconsin Statutes in [Section 346.57](#) discusses Speed Restrictions. The statutes require certain statutory limits to be posted. Refer to this statute for locations that require Speed Limit signs to be posted.

[TEOpS 13-5-1](#) discusses the statutory and approval process and setting limits. Refer to this section for information on these issues.

The MUTCD Section [2B-13](#) discusses location of Speed Limit signs.

Note: Reduce speed ahead sign requirements and placement is covered under a separate [TEOpS 2-3-30](#), "Reduced Speed Ahead" signing.

POLICY

Based on the requirements in the MUTCD Section [2B-13](#), the following **shall** be the location where speed limit signs **shall** be placed:

1. Speed limit signs **shall** be placed at points of change from one speed limit to another and when leaving a zoned area such as a town, village, city, or municipality to return to rural speed.
2. After a school zone, where speed limit was reduced.

The following chart or table indicates MINIMUM criteria for each specific speed limit:

70/65/60/55/50 mph (Freeways)

1. After each interchange
2. Beginning and end of freeway segment
3. Changes in speed zone (double mark—outside and inside shoulder for reductions from 70 or 65 to 65/60/55/50 mph)

65/60/55/50 mph (Expressways)

1. After each interchange
2. At state or county highways
3. Changes in speed zone (consider double marking outside and inside shoulder)
4. Beginning and end of expressway section

Note: An expressway is defined as a divided arterial highway facility that has partial control of access and generally with grade separations at major intersections.

55 mph (Conventional Highways)

1. Leaving a zoned area less than 55 mph such as a town, village, city or municipality
2. After every state highway in a rural area
3. Typically, after major intersections with higher volumes
4. Reminder signs *should* be spaced approximately every 15 miles, when signs under criteria 1, 2, or 3 do not provide a reminder within 15 miles

50/45 mph (Conventional Highways)

1. At points of change from one speed limit to another
2. After major intersections with higher volumes
3. Every ½ mile (maximum distance between reminder signs)

Note: Engineering judgment *should* be used when placing every ½ mile to coordinate with other criteria above such as after major intersections to avoid unnecessary duplication.

40 mph and BELOW (Conventional Highways)

1. After major intersections with higher volumes
2. **Maximum** distance between reminder signs
 - a. 40 mph = 2000 feet
 - b. 35 mph = 1500 feet
 - c. 30 mph = 1000 feet
 - d. 25 mph = 1000 feet

Note: Field conditions *may* require varying from these criteria for these speed and highway categories.

SIZE OF SIGNS

See [TEOpS 2-1-35](#) for optimum size of signs.

DOUBLE MARKING

Double marking (right and left side) for the first set of signs **shall** be employed for any reduction from 70 or 65 mph and *should* be employed for other speed limit reductions on divided highways.

PHASE IN PERIOD

As signs are replaced due to wear or where there are problem areas with spacing, maximum of five years from the effective date of this policy.

WORK ZONE TRAFFIC CONTROL SPEED LIMIT SIGNS

The spacing shown in this policy does not apply to work zone traffic control speed limit changes. See work zone standard detail drawings for applicable requirements.

2-2-15 NO TURNS (R3-3) Signs—Freeways

November 1992

In the early 1970s there was some special concern expressed about wrong-way movements on the freeway system. Some of the concern was being generated by the Federal Highway Administration, and some of it was local in nature. As a result, standardized signing practices were developed and implemented throughout the state on the freeway system. Along with some other extensive signing, NO TURNS signs were installed in the areas between the merging roadways at on-ramps on all freeways. These signs were intended to discourage illegal U-turns, whether made purposefully or by accident. There was subsequently some feedback from the State Patrol that the signing improvements were effective in reducing wrong-way movements.

Unfortunately, the NO TURNS signs in the merging area are in a rather vulnerable location and have no doubt suffered more than their share of knockdowns, thus incurring maintenance costs, and costs and damages to the public. Over the years, the public has come to understand and accept the restrictive nature of the freeway roadways, which make U-turns difficult.

Consequently, it has been determined that there is no longer a need for the sign, and it can be eliminated.

There *may* be some specific locations where the geometrics or condition peculiar to the locations, or where an awareness of unusual driving habits, would seem to make the retention of these signs desirable. In these cases, the R3-3 sign *may* still be used. Consultation with the State Patrol or other enforcement agencies *may* be desirable in these instances.

2-2-19 No U-Turn Sign (Freeway/Expressway median Crossover Sign Placement)

January 2013

GENERAL

The MUTCD Section [2B.18](#) gives some guidance and options for the placement of No U Turn Signs (R3-4 sign with R3-4a plaque, or R3-4B sign). However, the 2009 MUTCD is lacking on guidance for the placement of these signs in median crossovers. Guidance as to the proper number and placement of these signs in the median is important. The median width plays a role in the effective placement of the signs.

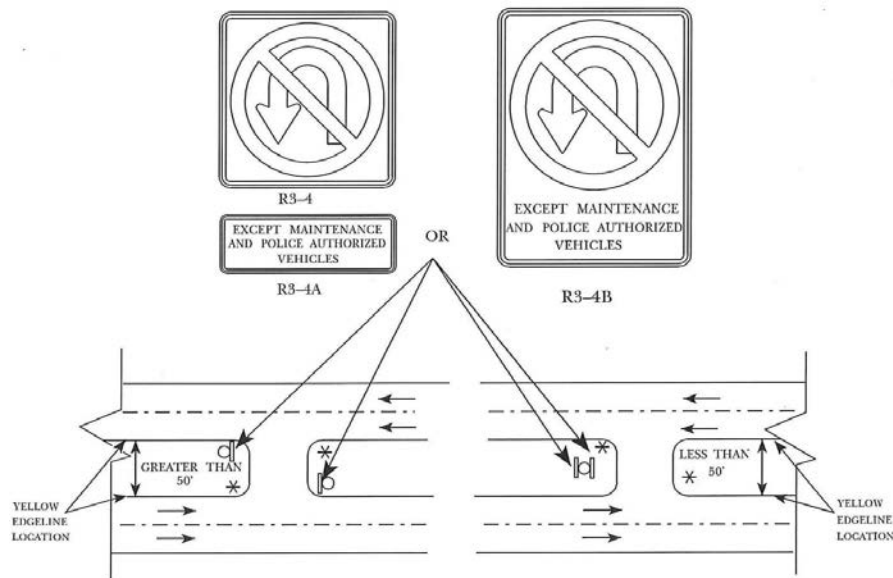
GUIDANCE/POLICY

The following guidelines/policy apply to these signs:

1. The Region has the option of using the R3-4 sign with R3-4A supplemental plaque or the combination R3-4B sign for these applications.
2. If used for freeway and expressway median crossovers with a width of 50 feet or greater (distance from yellow edgeline to yellow edgeline), separate No U-Turn signs **shall** be installed on the far side of the median crossover facing traffic.
3. If used for freeway and expressway median crossovers with a width of less than 50 feet (distance from yellow edgeline to yellow edgeline), the No U-Turn signs *may* be mounted back-to-back in the center of the median. Vegetation or other sight obstructions *should* be considered to ensure visibility of the signs all year.
4. A double yellow delineator *should* be placed on the left side of the through roadway on the near side of the crossover for each roadway (see Figure 1).
5. Any existing median crossover No U-Turn signs not conforming to this policy will be allowed to remain in place until the end of their useful life. Useful life ends when the sign message no longer meets legibility or condition standards. Existing signs *may* be removed prior to the end of their useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or when projects make removal practical.

Figure 1

MEDIAN CROSSOVER SIGNING AND DELINEATION



* DOUBLE YELLOW DELINEATOR (ON SEPARATE POST)

2-2-19.1 No U-Turn Signs (Controlled Intersection Placement)

April 2010

BACKGROUND

Historically, Wisconsin State Law has not allowed U-turns at intersections controlled by traffic control signals or intersections controlled by an officer. Effective January 1, 2010, the State law was changed to make U-turns legal at intersections that do not have signs prohibiting the maneuver. Traffic engineering experience has shown that the permitting of U-turns at controlled intersections can be a safe and beneficial traffic maneuver. From an economic standpoint, the permitting of U-turns can reduce costs and issues connected with access control where highway projects result in median closings because reasonable access to the businesses can be possible via U-turns. It is noteworthy to point out that all other states allow U-turns at intersections to one degree or another.

For dual left turn applications, [Wisconsin State Statute 346](#) states that U-turns would be made from the innermost left turn lane in the same fashion as a left turn. Vehicles on the intersecting streets turning right on red will need to yield to the U-turning vehicle. Statute 346 also states that backing is not permitted as part of a U-turn maneuver, therefore a motorist will need to have knowledge of the turning radius of their vehicle. A U-turn is also prohibited on undivided highways for crest and vertical curve locations where the sight distance is less than 500 feet.

Usage of turn prohibition signs, specifically No U-turn Signs, is covered in MUTCD Section [2B.19](#). However, the MUTCD does not get into specific engineering criteria as to when signs *should* be used. Motorists are not necessarily familiar with state statute language and signing *may* be appropriate at certain intersections to prohibit U-turns, due to motorist safety issues or to help enforce the state statute. Wisconsin State Statute 346 gives maintaining governments the authority to prohibit U-turns at specific intersections. Intersections where U-turns are prohibited **shall** be signed.

DEFINITIONS

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate highways

are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections and driveways.

Conventional highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

QUALIFYING CRITERIA FOR SIGNING

1. No U-Turn (R3-4 signs) **shall** be installed at the following signal and stop controlled intersections where U-turns are prohibited:
 - a. Intersections where there are existing no left turn signs: The no U-turn (R3-4) sign **shall** be installed at these locations in conjunction with the no left turn (R3-2) sign. The combination no left turn/no U-turn (R3-18) sign *may* be utilized for these locations instead.
 - b. Intersections where there are signalized right turns that operate simultaneously with protected left turn movements. The no U-turn (R3-4) sign *may* be utilized for these locations instead.
 - c. Signalized intersections that are interconnected to a railroad crossing and operate with advance (not simultaneous) pre-emption. The no U-turn (R304) sign **shall** be installed on any divided highway approach that crosses the railroad tracks.
2. No U-turn (R3-4) signs *may* be installed at other signal and stop controlled intersections that have demonstrated the following operational issues:
 - a. Intersections with less than 500 feet of sight distance and demonstrated crashes attributed to U-turns that are above the statewide average for that type of intersection.
 - b. Intersections with dual left turn lanes and demonstrated problems with motorists making U-turns from the outside left turn lane. For this issue, the lane control sign (R3-8 UU) *should* be used to emphasize that U-turns *may* only be made from the inside left lane. For overhead signing applications, the R3-5U (with 6" black border) *may* be installed in place of the R3-5L or R3-50L.
 - c. Intersections with a deficient truck turning radius that present repeated problems with trucks backing up to complete a U-turn, signs and/or signals being damaged or other safety or operational issues cause by the deficient truck turning radii. Intersections *may* have signing to just restrict trucks in making U-turns. For these applications, the standard no U-turn (R3-4) sign with supplemental truck plaque (M4-4) sign would be used.
 - d. Temporary signalized intersections during improvement projects where left turns *may* be restricted or eliminated.
 - e. Intersections that have poor geometrics and there are demonstrated crashes attributed to U-turns that are above the statewide average for that type of intersection. Examples would be skewed intersections or nearby railroad crossings.
3. Eliminations of signs. In the past, many signalized intersections were signed mainly from requests by law enforcement due to repeated problems with illegal U-turns at intersections and the signs aided in enforcement of the law. The Region *should* make efforts to review these intersections, based on the criteria outlined in items 1 and 2 above, and adjust or remove signs as necessary.

GUIDANCE FOR FIELD PLACEMENT OF SIGNS

1. Installation of no U-turn signs at controlled intersections can be challenging due to lack of space to install signs and the presence of many other signs. A minimum of one no U-turn sign **shall** be installed at each intersection approach where the U-turn move is prohibited. Below is a hierarchy of where the sign *should* be installed:
 - a. Primary choice is mounting of the no U-turn (R3-4) sign on the far side median signal pole if it does not conflict with any other signs (keep right, etc.).
 - b. Secondary choice is to install the no U-turn (R3-4) sign side-by-side with the keep right sign on the far side median signal pole. This *may* be accomplished by a separate post or bracket system. If a bracket system is used, the no U-turn sign *should* be mounted to the left of the keep right sign.
 - c. Third choice is to install the no U-turn (R3-4) sign on a nearside median signal pole.

- d. Fourth choice is to install the no U-turn (R3-4) sign underneath the keep right on the far side median signal pole. This option is the last desirable because the no U-turn sign will be lower than the minimum 5-foot mounting height as specified by the MUTCD.
2. A second no U-turn (R3-4) sign *may* be installed in advance of the intersection approach for areas where compliance is still a problem that is resulting in safety issues or if visibility of the mandatory no U-turn sign is compromised due to intersection geometrics or the presence of other signs.
3. Placement of the ground mounted R3-8UU sign mentioned in 2B above *should* be in advance of the near median signal head in the median at a minimum distance of 150 feet back from the signal.

2-2-20 Intersection Lane Control Sign

May 2011

PURPOSE

The MUTCD sections [2B.19](#), [2B.20](#), [2B.21](#), and [2B.22](#) provide standards and guidance for the usage of intersection lane control signs, mandatory movement lane control signs, optional movement lane control signs, and advanced intersection lane control signs. This policy provides requirements and guidance to the proper use of the signs on state maintained highways.

DEFINITIONS

1. Intersection lane control signs (R3-5 through R3-8 and R3-20L or LL and R3-20R or RR) include mandatory movement lane control signs, optional movement lane control signs, and advanced intersections lane control signs.
2. Mandatory movement lane control signs are as follows:
 - a. R3-5, R3-5A, R3-5XL and R3-50 series contain an arrow and word ONLY
 - b. R3-7 series indicate RIGHT (CENTER or LEFT) LANE MUST TURN RIGHT (CENTER or LEFT).
3. Optional movement lane control signs (R3-6 series) indicate a combination arrow.
4. Advanced intersection lane control signs (R3-8 series) indicates the configuration of all lanes ahead. The R3-20 series signs indicate the start of a turn lane with the text LEFT (RIGHT) TURN LANE (tilting down arrow).

POLICY

1. Mandatory movement lane control signs (Figures 1, 2 and 3)

R3-5, R3-5A, R3-5XL and R3-50 series are generally used as overhead signs directly over the lane to which they apply. The R3-5, R3-5A, R3-5XL and R3-6 **shall not** be used as a ground mounted sign on a multi lane approach.

R3-7 series signs **shall** only be used as ground mounted signs. The RIGHT (LEFT) LANE MUST TURN RIGHT (LEFT) **shall** be installed whenever there is a mandatory turn lane and **shall** be accompanied by pavement marking arrows/only per [3B.20](#) of the MUTCD. A mandatory turn lane is one where a through lane becomes a mandatory turn lane and the driver must change lanes to continue straight. An R3-7 series sign *should* be placed in advance of the intersection and repeated at the intersection depending on space availability for signs and the speed limit of the roadway. For higher speed roadways, 45 MPH or higher place the sign a minimum of 400' prior to the intersection and repeat the sign at the intersection. For lower speed roadways, 40 MPH and below, place the sign a minimum of 300' prior to the intersection and repeat the sign if necessary. An option to the R3-7 series ground mounted sign is an overhead R3-5 series sign (ONLY, ARROW). NOTE: The R3-8 series sign *may* be used in lieu of the R3-7 series sign when there is only one lane approaching an intersection and the roadway widens into separate turn lane(s).
2. Optional movement lane control signs

R3-6 series signs indicate a combination arrow and are installed overhead. The word OK **shall not** be used on the sign per [2B.19](#) of the Wisconsin supplement to the 2009 MUTCD.
3. Advanced intersection lane control signs (Figures 4, 5, 6, 7, 8, 9 and 10)

R3-8 signs show the configuration of all lanes ahead. This sign *should* be placed in advance of the tapers for the turn lanes to allow for drivers to read the sign and change lanes accordingly. This sign is

required for complex intersections where it *may not* be apparent to the driver what each lane movement is. Examples where it is not apparent include horizontal and vertical curves approaching an intersection or lack of physical barrier channelization. Examples of complex intersections include dual rights and dual lefts. At other locations, it is an optional sign.

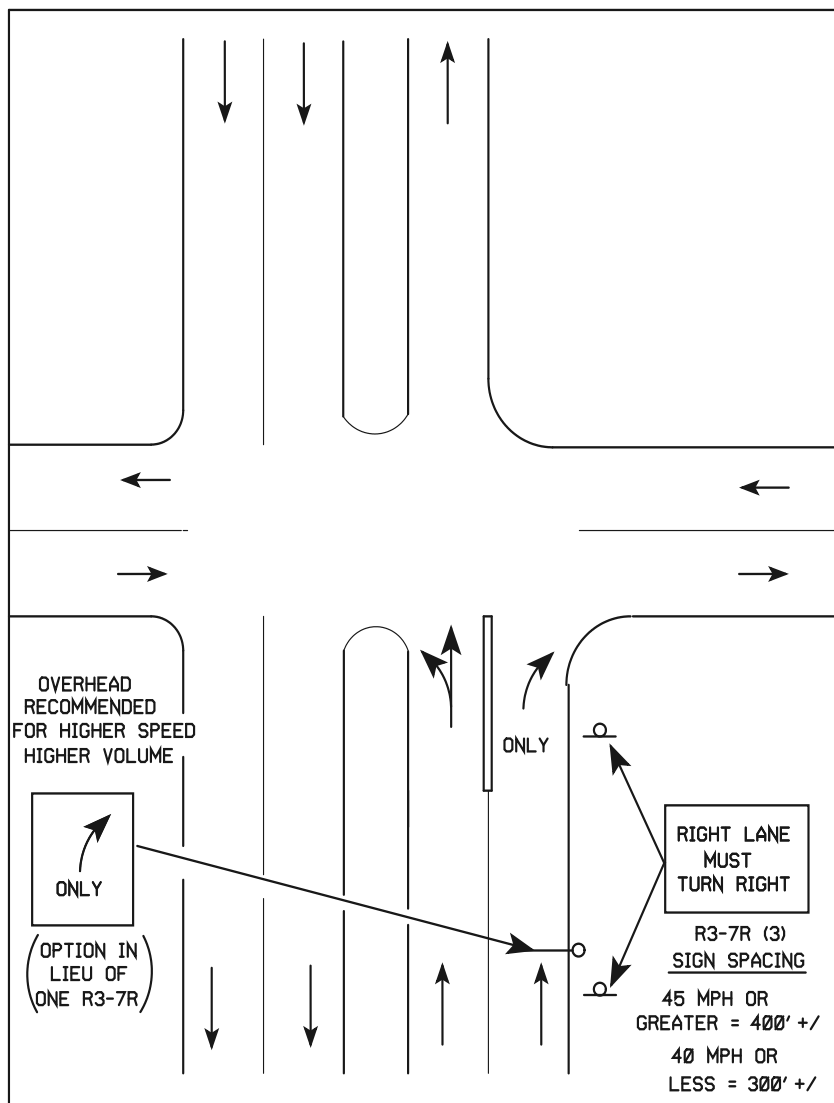
R3-20L or LL and R3-20R or RR signs which indicate LEFT (RIGHT) TURN LANE and tilted down arrow are intended to be placed at the start of the taper for the turn lane. This sign is required:

- a. For dual left turns where there is a median physical separation.
- b. At single or dual turn lanes where there is a physical separation between the left turn lane and through lane. Note: If the R3-20 sign is used between the through lane and turn lane per Figure 7, the advanced sign is optional.

The R3-20 series sign is not necessary at other locations unless there is a horizontal curve where the driver cannot distinguish the turn lane taper from the through lane.

4. Mandatory turn lane downstream of an intersection (Figure 3)

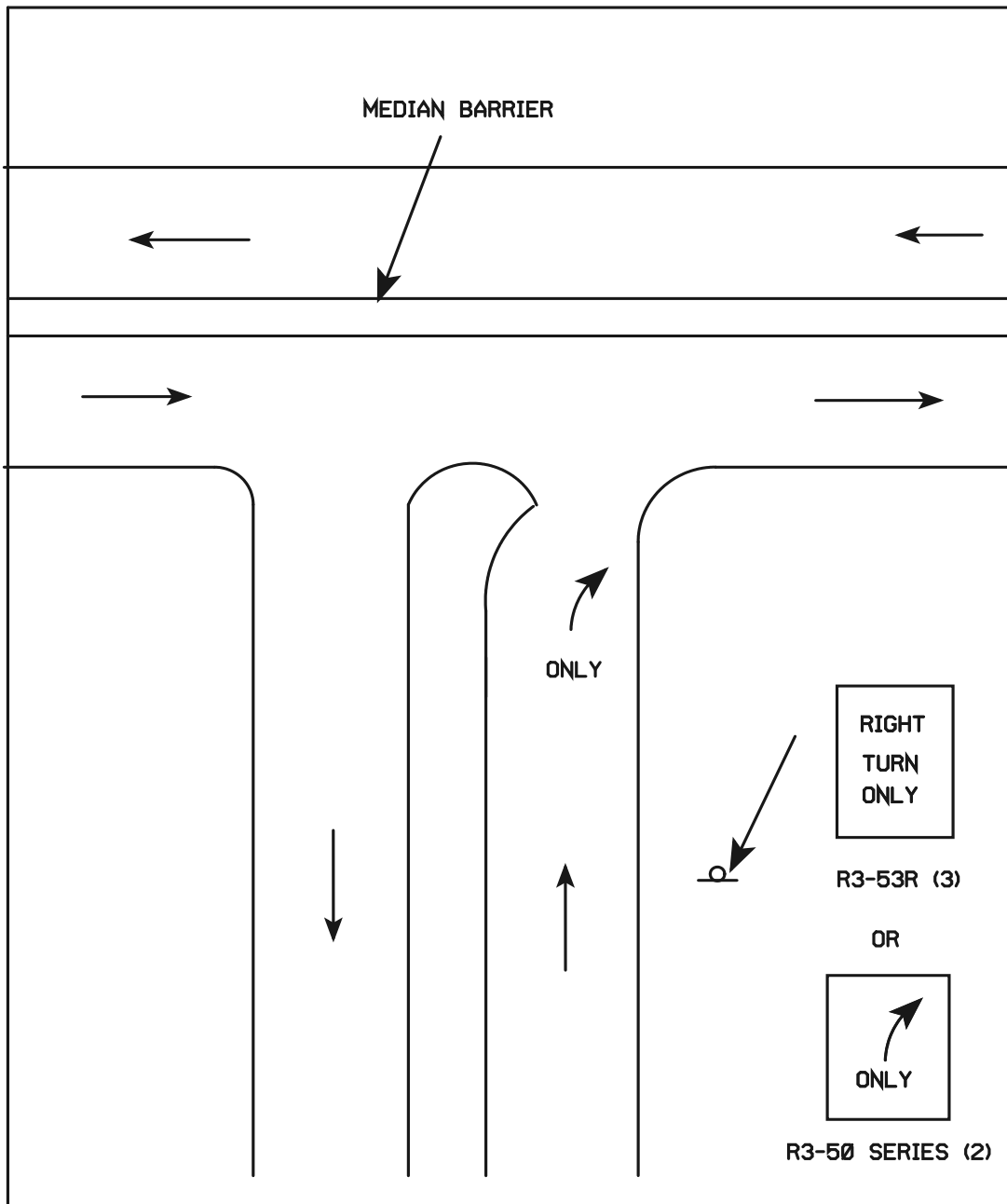
An R3-7 series sign, RIGHT (LEFT) LANE MUST TURN RIGHT (LEFT) **shall** be used where a lane becomes a mandatory turn lane after an intersection. Option—overhead sign R3-5 series sign is recommended for higher speed facilities in lieu of the ground mounted R3-7 series sign.



MANDATORY MOVEMENT LANE CONTROL SIGNS

FIGURE 1

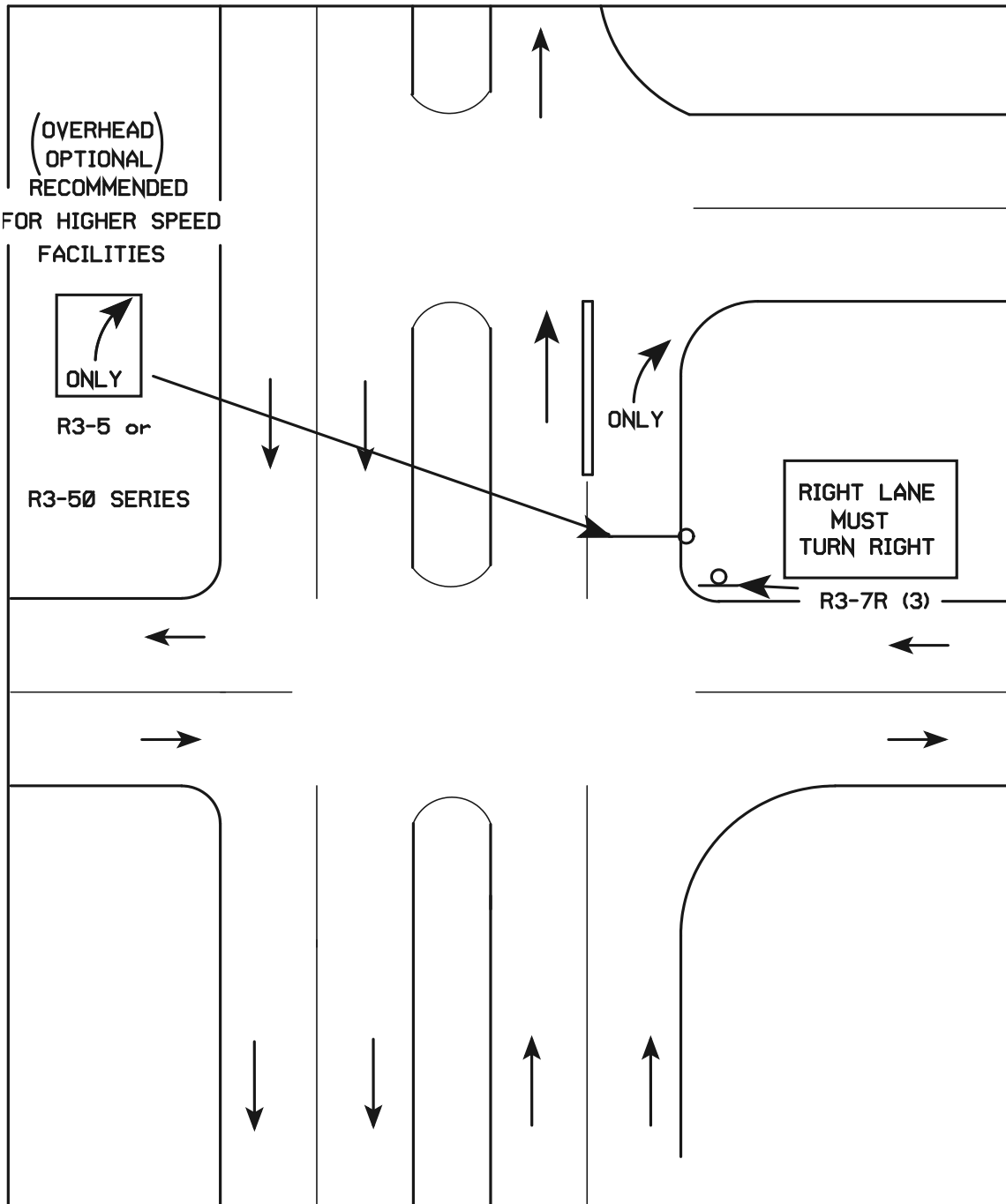
CODE



MANDATORY MOVEMENT LANE CONTROL SIGNS

FIGURE 2

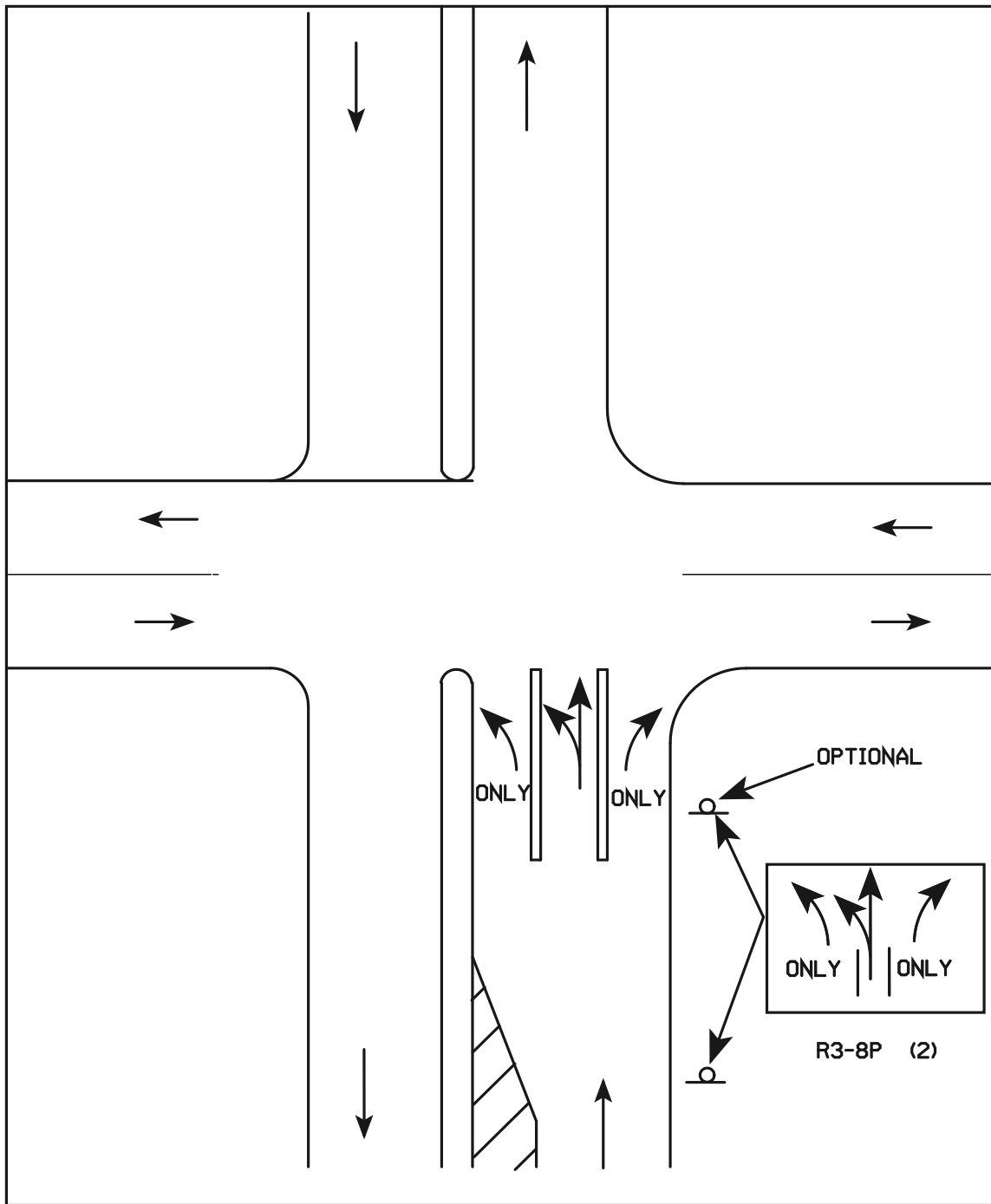
: CODE



MANDATORY TURN LANE AFTER INTERSECTION

FIGURE 3

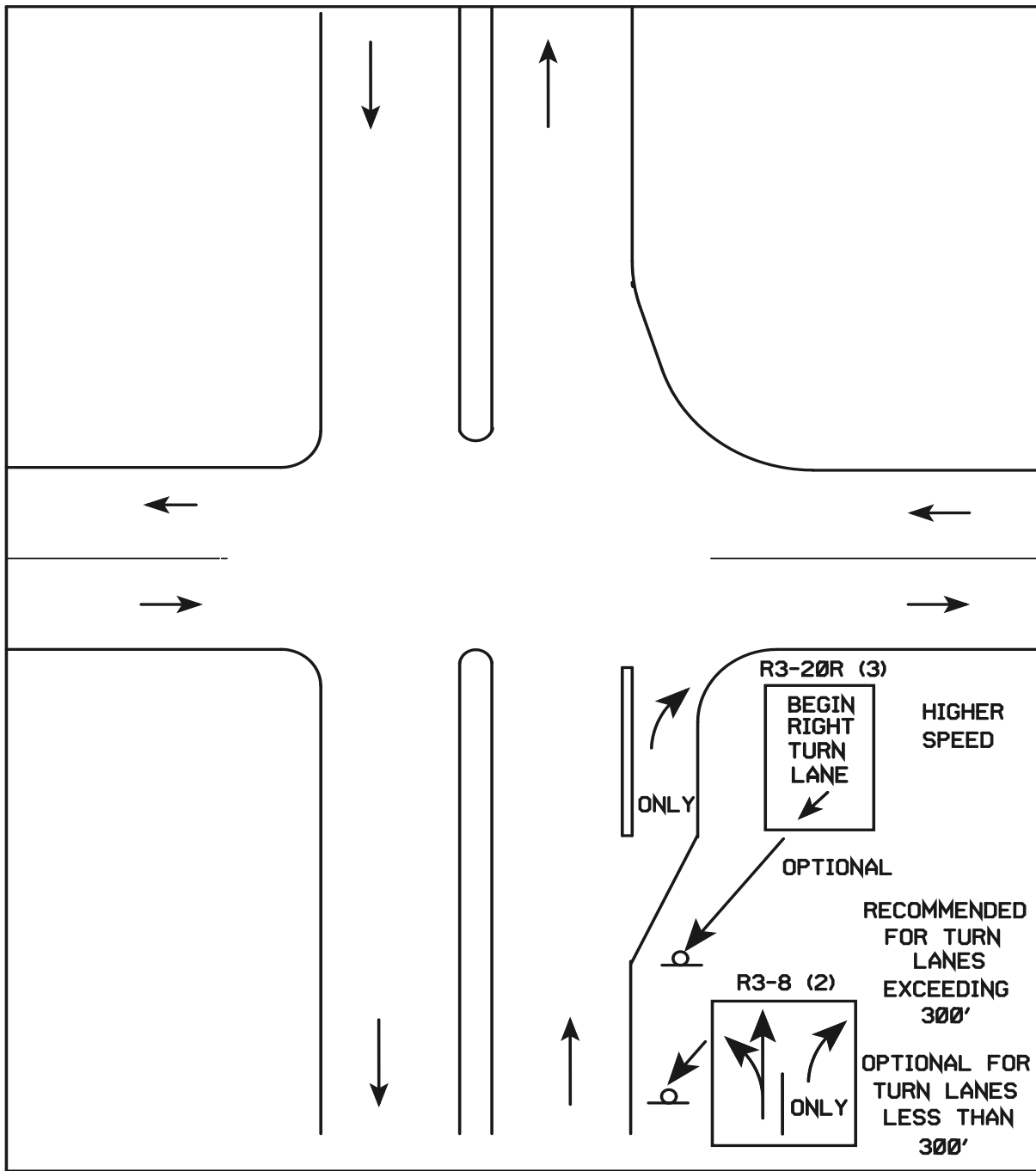
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ADVANCED INTERSECTION LANE CONTROL SIGNS

FIGURE 4

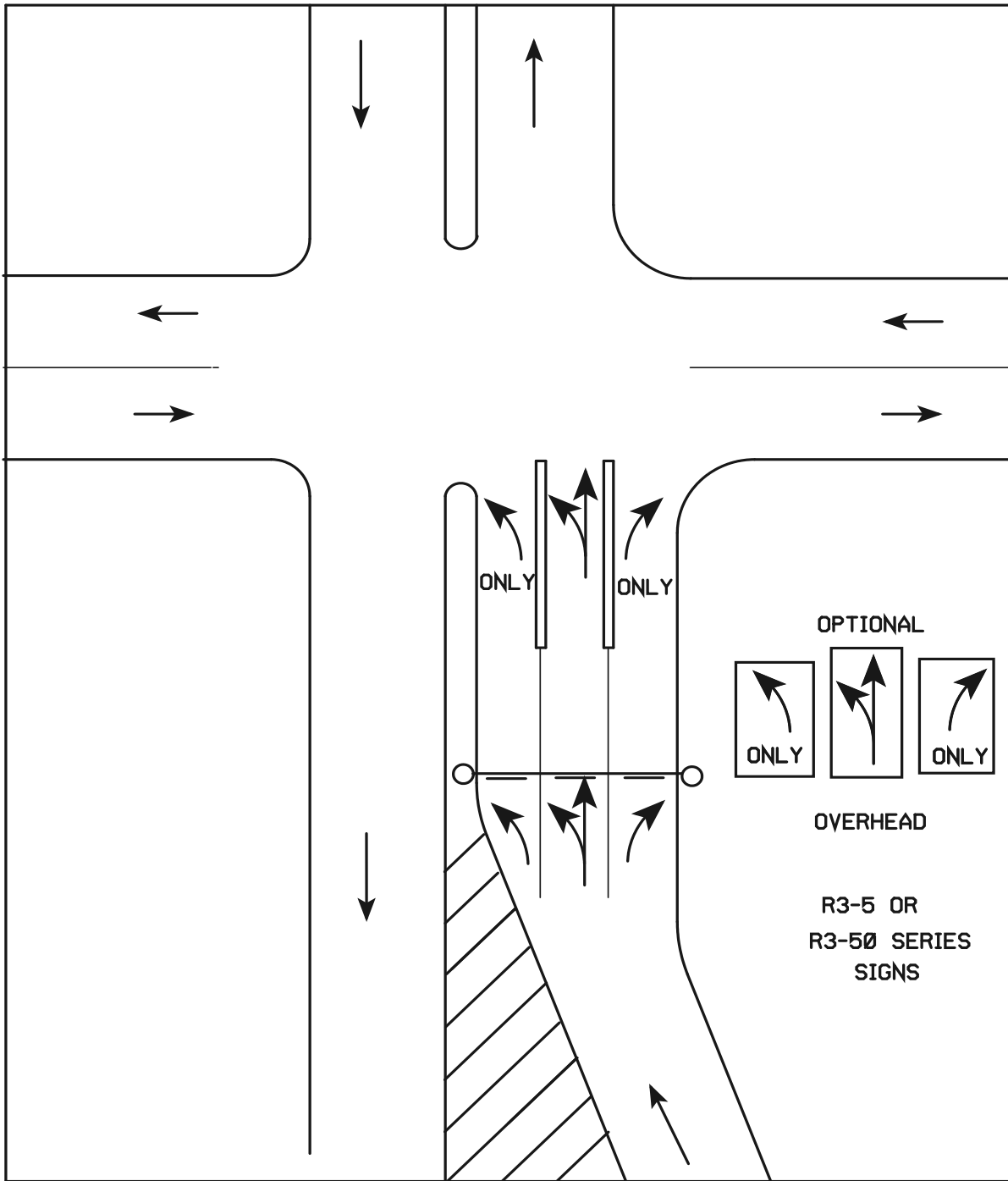
SIZE CODE



ADVANCED INTERSECTION LANE CONTROL SIGNS

≡ CODE

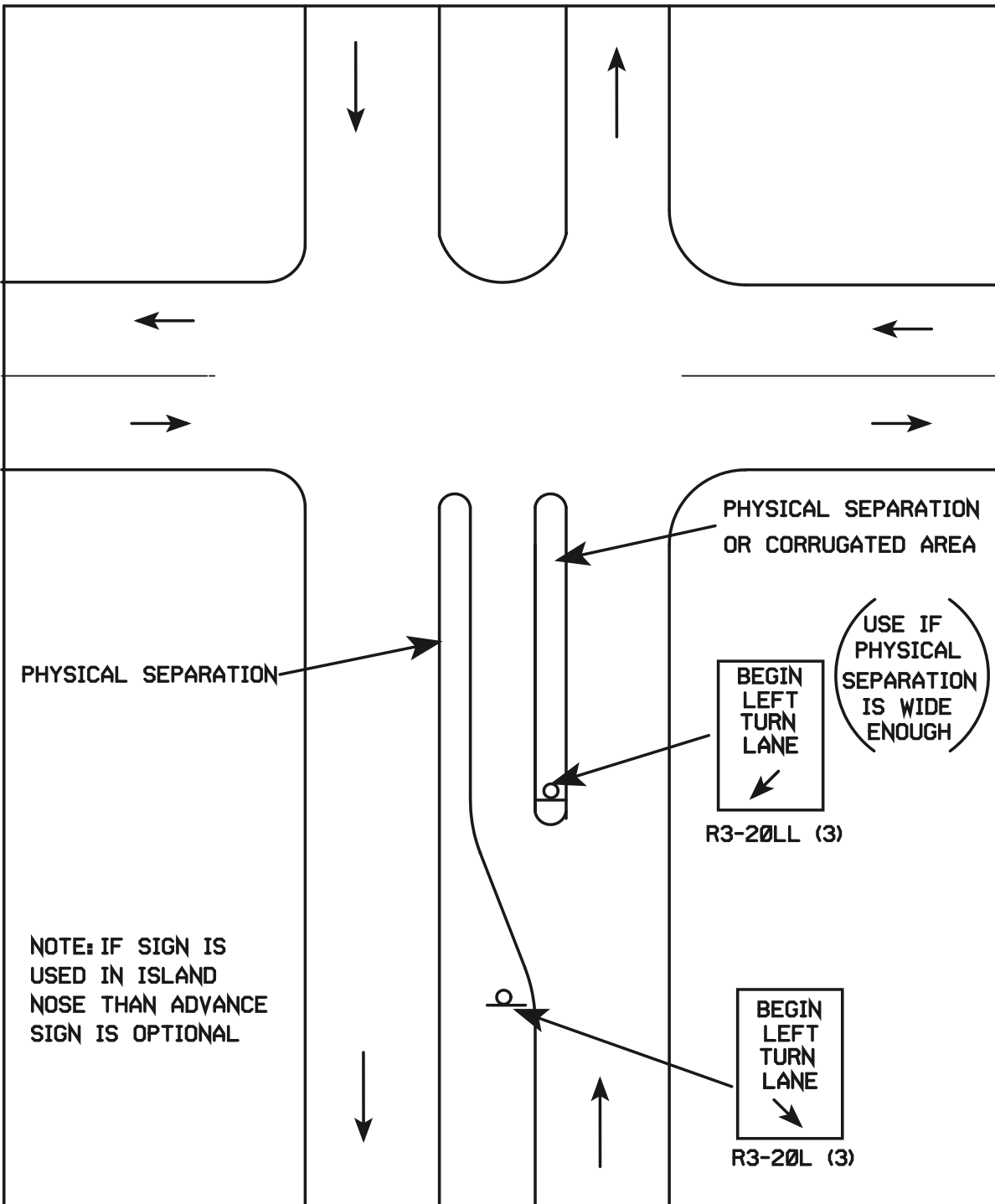
FIGURE 5



ADVANCED INTERSECTION LANE CONTROL SIGNS
(OVERHEAD LANE CONTROL SIGNS)

CODE

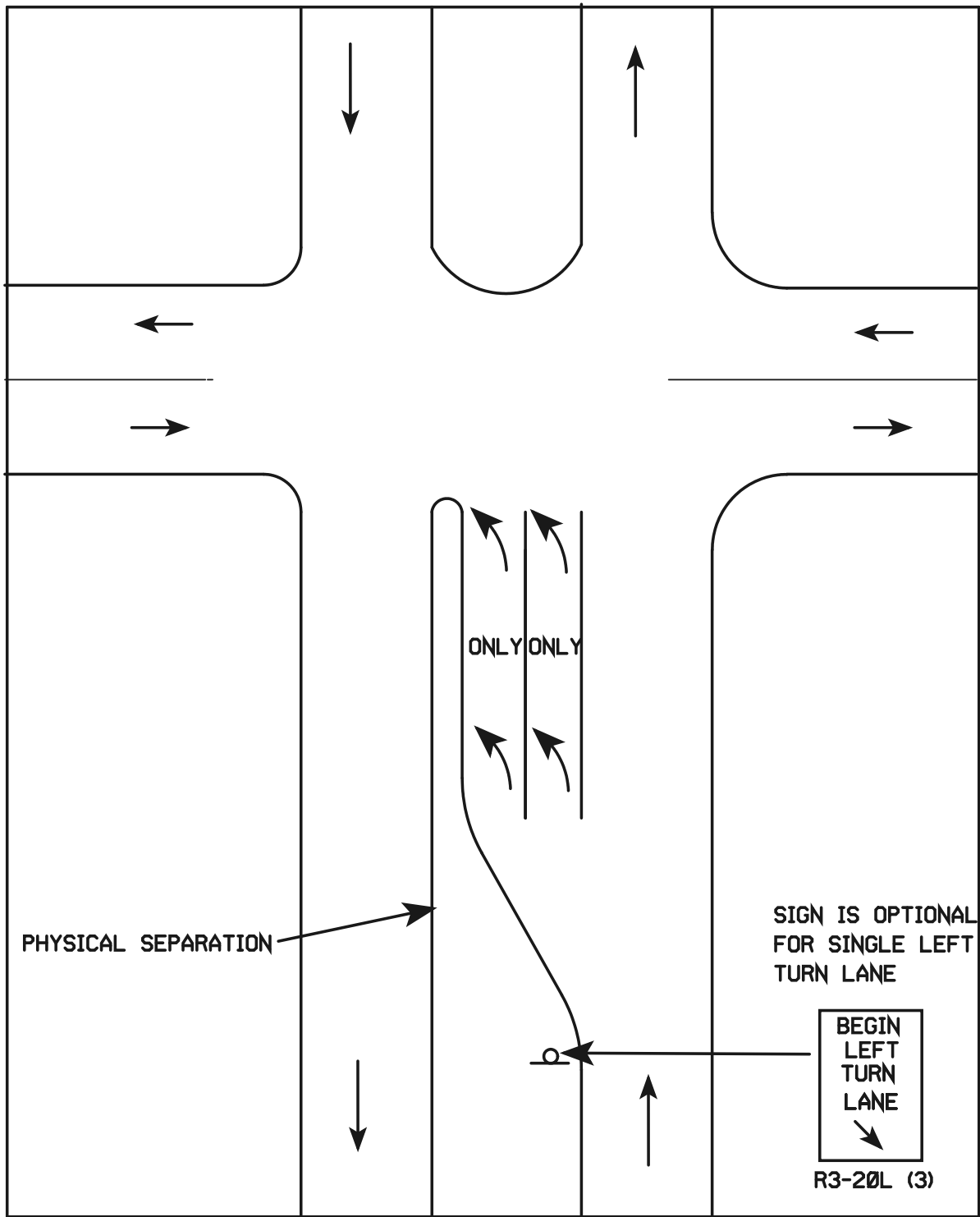
FIGURE 6



ADVANCED INTERSECTION LANE CONTROL SIGNS

FIGURE 7

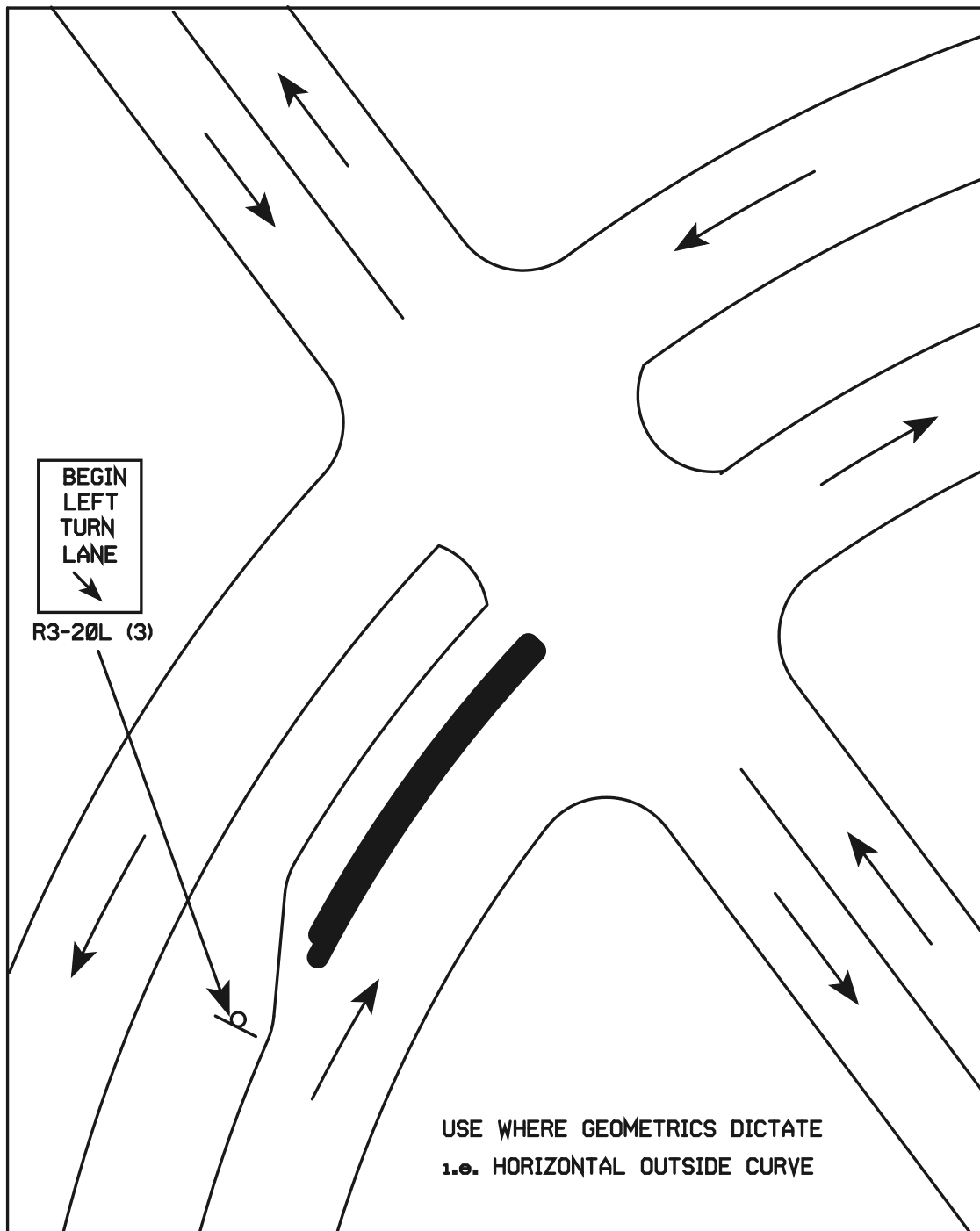
TE CODE



ADVANCED INTERSECTION LANE CONTROL SIGNS

FIGURE 8

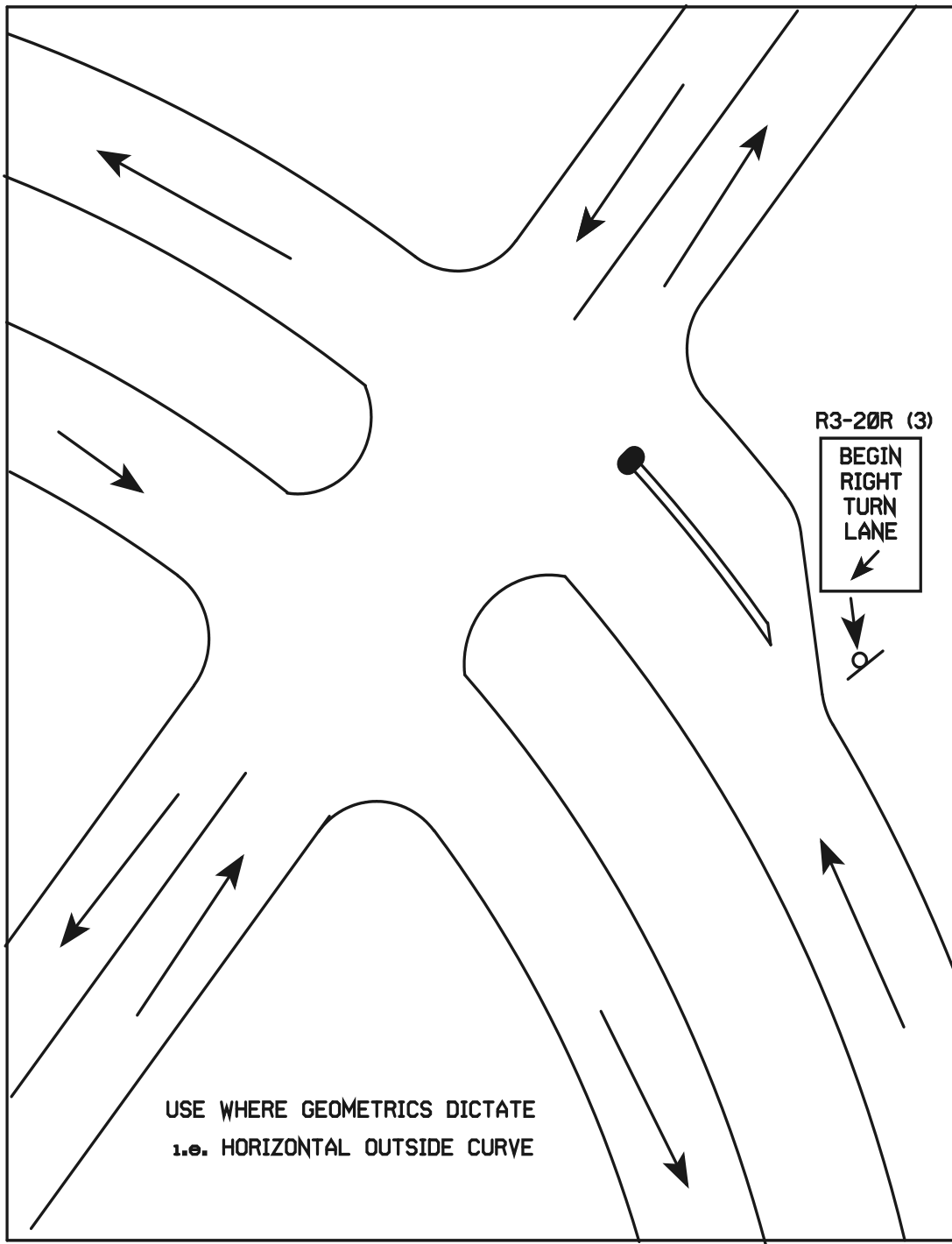
CODE



ADVANCED INTERSECTION LANE CONTROL SIGNS
(LEFT TURN LANE ON CURVE)

IZE CODE

FIGURE 9



ADVANCED INTERSECTION LANE CONTROL SIGNS

(RIGHT TURN LANE ON CURVE)

FIGURE 10

ZE CODE

PURPOSE

The operation of non-motorized vehicles or pedestrians on high-speed multi-lane facilities are incompatible uses that create hazards. The Department *may* prohibit certain traffic on freeways or expressways. To apply these restrictions on traffic, the Department is required to erect and maintain official signs giving notice of the prohibition.

This subject provides guidance on the official signs that *may* be used to give notice of restrictions on the use of controlled access highways, expressways and freeways.

AUTHORITY

[State Statute 349.105](#) provides the authority to prohibit certain traffic on expressways and freeways. The authority in charge of maintenance of an expressway or freeway *may*, by order, ordinance or resolution, prohibit the use of such expressway or freeway by pedestrians, persons riding bicycles or other non-motorized traffic or by persons operating mopeds or motor bicycles. The state or local authority adopting any such prohibitory regulation **shall** erect and maintain official signs giving notice thereof on the expressway or freeway to which such prohibition applies.

DEFINITIONS

[State Statute 990.01 \(9a\)](#) Freeway means a highway with full control of access and with all crossroads separated in grade from the pavements for through traffic.

[State Statute 990.01 \(7a\)](#) Express highway or expressway is a divided arterial highway for through traffic with "full" or "partial" control of access and generally with grade separations at intersections. "Full" control of access means that the authority to control access is exercised to give preference to through traffic by providing access connections with selected public roads only and by prohibiting crossings at grade or direct private driveway connections. "Partial" control of access means that the authority to control access is exercised to give preference to through traffic to a degree that, in addition to access connections with selected public roads, there *may* be some crossings at grade and some private driveway connections.

Listings of declared freeways and expressways are available from the Region Planning Section.

POLICY FOR HIGHWAYS CLOSED TO CERTAIN TRAFFIC

Freeways

Freeways **shall** be closed to use by pedestrians, by persons riding bicycles or other non-motorized traffic and by persons operating mopeds or motor bicycles. Any exceptions to open freeway segments to use by pedestrians, by persons riding bicycles or other non-motorized traffic and by persons operating mopeds or motor bicycles *may* only be approved by the Director of the Bureau of Traffic Operations and listed in this policy.

Freeway exceptions (approved by Director, Bureau of Traffic Operations): none, as of October 1, 2007.

Expressways

Expressways *should* be open to use by pedestrians, by persons riding bicycles or other non-motorized traffic and by persons operating mopeds or motor bicycles. A general exception to open use of expressways is for those expressways with a parallel trail for pedestrians, persons riding bicycles or other non-motorized traffic and by persons operating mopeds or motor bicycles. In those cases, the Department **shall** prohibit that traffic from using the expressway and erect and maintain signs giving notice of the prohibition. Any other exceptions to close expressway segments to use by pedestrians, by persons riding bicycles or other non-motorized traffic and by persons operating mopeds or motor bicycles *may* only be approved by the Director of the Bureau of Traffic Operations and listed in this policy.

Expressway exceptions (approved by Director, Bureau of Traffic Operations): USH 10, Wood County, from CTH BB to CTH N

SIGN INSTALLATION POLICY

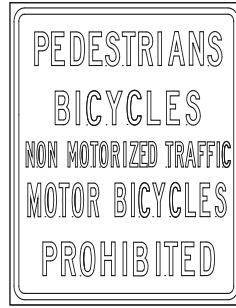
The R5-57 sign (see Figure 1) **shall** be erected on each ramp leading from a crossroad or frontage road to a restricted freeways or expressway within approximately 100 feet of the point where the ramp leaves the crossroad, and at other locations where pedestrian entrance has occurred or *may* reasonably be anticipated.

Transition from expressway to freeway

For areas that transition from a non-restricted expressway to a restricted freeway, the R5-57 sign *should* be

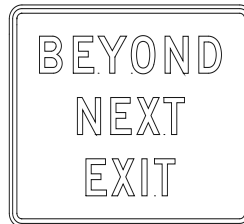
placed after the last at-grade intersection and the R5057B sign (see Figure 2) BEYOND NEXT EXIT *may* be used to supplement the R5-7 sign. The R5-57 sign *should* be placed on all freeway on-ramps after this point.

Figure 1



R5-57

Figure 2



R5-57B

2-2-30 Engine Brake Signing

January 2018

PURPOSE

One method of slowing the motion of a vehicle is to use the compression of the engine as part of vehicle braking. This method is often referred to as compression braking or exhaust braking. Engine braking can produce excessive, undesirable noise when muffler systems are not functioning as designed or are otherwise inadequate.

Noise from engine braking in vehicles with inadequate muffler systems has led some communities to take actions to restrict the noise. Compression braking is typically an unavoidable result of operating a vehicle that the driver cannot prevent or fully disengage. However, for some vehicles there are driver choices as to whether or when engine compression braking is used. Objectionable noise levels *may* be produced by any car or truck when using compression braking and often are related to equipment failure or aftermarket modifications.

There are several advantages to compression braking on vehicles and especially on large trucks. In addition to assisting deceleration, when a truck engine brake system is engaged, it helps prevent the conventional truck air brakes from overheating, thus saving on the normal wearing life of the truck air brakes. This is especially true on roadways with steep downgrades with long distances, where the safety of the truck can be enhanced using engine brakes.

Communities have installed or requested signing on state highways to address noise concerns associated with use of compression braking. The Department controls traffic signs on highways maintained by the state. Local governments do not have the authority to erect signs on those highways except when written permission is provided by the Department.

The Department supports efforts to deal with excessive noise from all vehicles and encourages enforcement of laws requiring effective mufflers (for example, [State Statute Section 347.39](#)). The use of signs specific to engine or compression braking has become popular among many communities, although it is unclear whether those signs are effective or necessary. Generally, the Department does not allow installation of traffic signs on state highways that have not been shown to be necessary or effective. In the case of engine braking, the Department has chosen to work with communities and allow limited use of these signs on state highways under certain conditions, despite the lack of evidence that they are effective in reducing noise problems.

POLICY

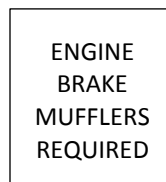
The Department *may* permit local governments to place signs on highways under WisDOT jurisdiction subject to

the requirements included here:

1. Requests for a permit to allow these signs must be in writing to the WisDOT Regional Office and *should* contain the following information
 - a. Locations where signs are to be installed, including state highway route number and distance to the nearest public roadway intersection
 - b. Sign offset (distance from edge of travel lane) and type of post to be used
 - c. Assurance that sign will be free standing (not attached to other signs)
2. The local government **shall** be responsible for supplying, installing, and maintaining the signs in conformance with the permit. The local government **shall** furnish their identification sticker on the sign.
3. The local government must be committed to actively enforce the requirements of the signs with local law enforcement personnel.
4. Only the standard ENGINE BRAKE MUFFLERS REQUIRED sign (R10-64) *may* be used on highways under state maintenance responsibility and those signs *may* be installed only on conventional highways at or near the corporate limits of the community (see Figure 1). This sign **shall not** be used on freeways, expressways, interchange ramps, or site-specific locations on conventional highways.
 - a. For freeway locations going through communities, engine brake signs *may* be permitted on conventional state highways after the entry point to the conventional highway from the freeway, provided signs are already approved at the city/village limits.
 - b. Engine brake signs *may* be allowed for urbanized townships provided they have the means to enforce it. Documentation **shall** be provided by the local law enforcement indicating that the ordinance will be enforced throughout the township. Urbanized townships are defined by having at least two of the following features:
 - i. Urban cross section
 - ii. Residential development abutting the highway that meets the definition of “semi urban district” as defined in [Wisconsin State Statutes 346.57\(1\)\(b\)](#)
 - iii. Reduced speed zone
 - iv. Qualify for an unincorporated community sign.

For qualifying urban townships, only 1 sign is allowed in each direction on any given state highway. The signs **shall** be installed at the township limits.
 - c. The local government must obtain the approval of the appropriate Regional office for the location of the sign. The sign language **shall** meet the requirements of the WisDOT R10-64 sign plate as described in item 4.
 - d. Any other signs related to use of engine braking installed on highways under WisDOT jurisdiction within or for the local government that do not meet the requirements of this policy *should* be replaced by the local government, as opportunities arise (knockdowns, improvement projects or replacement due to age) to comply with this policy.

Figure 2. R10-64 Sign



2-2-35 Littering Signs

September 2000

PURPOSE

The intent of this guideline is to eliminate signs that inform the public about fines for littering since the signs are not necessary for the guidance or warning of traffic.

Signs with the message \$500 FINE FOR THROWING LITTER OR TRASH ON HIGHWAYS KEEP WISCONSIN CLEAN (R5-56) have been installed on state highways in the past. The purpose of these signs was to discourage littering and to reinforce to motorists the maximum statutory fine for littering on highways. While littering has the potential to create safety hazards as well as diminishing the quality of state highways, there is reason to believe that usage of these signs has a minimal effect on curbing littering problems. The State Patrol has mentioned that these signs have little effect on the motoring public, the law is very difficult to enforce, and citations have very rarely been given out. The State Patrol does not object to removing these signs. Due to

previous cutbacks in resources and funding, these signs had previously been declared nonessential. Given the limited effectiveness of the signs, it has been determined these signs are not necessary.

POLICY

Littering signs (R5-56) are declared nonessential on state highways. As a result, the following actions are expected:

1. No new littering signs **shall** be erected on state highways.
2. Littering signs that have been installed on state highways will be allowed to remain in place until the end of their useful life, when they are to be removed and not replaced. Useful life ends when the sign message no longer meets legibility or condition standards. Littering signs *may* be removed prior to the end of the signs' useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or projects make removal practical.

2-2-40 Seatbelt Signs

January 2018

PURPOSE

Over the years seatbelt signs have been installed to reinforce to motorists the importance of fastening safety belts and to remind motorists that there are penalties for people not fastening safety belts. These signs were placed at various locations on state highways and in rest areas, waysides, and weigh stations. It is typically expected that many motorists now know the importance of buckling up by means of media advertisements and safety campaigns. Consequently, it has been determined that these signs are no longer necessary.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional highways are defined as either divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways can be two-lane or multilane facilities.

POLICY

1. No new seatbelt signs **shall** be erected.
2. Seatbelt signs that have been installed will be allowed to remain in place until the end of their useful life, when they *should* be removed and not replaced. Useful life ends when the sign message no longer meets legibility or condition standards. Seatbelt signs *may* be removed prior to the end of the signs' useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or projects make removal practical.

2-2-41 Community Parking Restriction Signs

December 2008

PURPOSE

Oftentimes, municipalities will adopt ordinances for the prohibition or restriction of parking on certain roadways during certain periods of time. Wisconsin State Statutes [349.13\(1e\)\(c\)\(2\)](#) gives municipalities the authority to enact ordinances and post signs at or reasonably near the corporate limits of the municipality on all state and county trunk highways and connecting highways.

The intent of posting signs is to inform motorists that 24-hour parking limitations, night parking regulations or snow emergency regulations are in effect in the municipality. It is the responsibility of the motorist to contact the governing body to determine the specifics of the actual ordinance. Posting of signs allows law enforcement to effectively enforce the municipal parking ordinances.

POLICY

The following rules **shall** apply for local governments requesting community parking restriction signs on highways under WisDOT jurisdiction:

1. The local government must pass a parking ordinance prior to requesting the sign(s).
2. The local government **shall** submit a written request to the WisDOT Regional Office for a permit to

install and maintain the signs. The permit may be in the form of a letter.

This request for a permit from the local government *should* contain the following items:

- a. Sign message in accordance with items 4 and 8 of this policy
- b. Sign offset (distance from edge of travel lane)
- c. Where sign is proposed to be located
- d. Type of post used
- e. Assurance that sign will be freestanding (not attached to other signs)
- f. Copy of local government parking ordinance.

Once the permit is granted, the local government is responsible for supplying, installing and maintaining these signs in conformance with the permit.

3. It **shall** be the responsibility of the local law enforcement personnel to enforce the ordinance or the sign(s).
4. The sign message shall meet the requirements of the WisDOT R7-66 municipal parking sign plate (see Figure 1). See item 8 for approved supplemental messages. The local government must obtain the approval of the appropriate WisDOT Regional Office for the location(s) of the sign(s).
5. The R7-66 sign shall only be used on conventional highways at or near the corporate limits of the community. This sign shall not be used at site-specific locations on conventional roadways, freeways, expressways or interchange ramps.
6. Municipal parking signs not meeting the layouts outlined in this policy will be allowed to remain in their place until the end of their useful life. At that time, they should be removed and replaced with signs conforming to this policy. Useful life ends when the sign message no longer meets legibility or condition standards. Municipal parking signs may be removed prior to the end of the signs' useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or projects make removal practical.
7. For townships, the signs should be placed at the boundary of built-up areas where the ordinance applies.
8. A maximum of three supplemental message **shall** be used on a sign. The six approved supplemental messages are:
 - a. NIGHT
 - b. SNOW EMERGENCY
 - c. 24 HR
 - d. X:XX AM – X:XX AM (example: 2:00 AM – 7:00 AM)
 - e. DATE – DATE (example: NOV 15 – MAR 15)
 - f. ODD / EVEN

Figure 1



2-2-45 Move Over or Slow Down Signs

January 2018

PURPOSE

The intent of this guideline is to restrict the usage of signs that inform the public about Moving Over or Slowing Down for Stopped Emergency Vehicles to locations that are most helpful to motorists.

Signs with the message "MOVE OVER OR SLOW DOWN FOR STOPPED VEHICLES WITH FLASHING LIGHTS" (R5-60) are installed on state highways as a reminder to motorists to slow down or move over for emergency/law enforcement vehicles that are on the roadway. These signs were installed in a partnership between Bureau of Traffic Operations and Bureau of Transportation Safety to educate motorists of this law. While signs can be a useful tool to help re-enforce a law, education and enforcement are also effective and

essential tools that must be used with highway signing. These signs are primarily focused to motorists entering the state and *may* be unfamiliar with the Move Over or Slow Down Law. As for a reminder tool, other, more effective educational efforts have been employed in lieu of signs. These educational efforts often consist of public service announcements through the media, reminders included in DMV vehicle registration notices and driver education. However, due to budgetary concerns and the concern about over signage, signs *should* only be installed in locations that are the most effective for motorists.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional Highways are defined as either divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways can be two lane or multilane facilities.

POLICY

1. Any requests to install "MOVE OVER OR SLOW DOWN FOR STOPPED VEHICLES WITH FLASHING LIGHTS" (R5-60) signs **shall** be reviewed by the statewide Traffic Incident Management Committee and approved by the State Traffic Engineer prior to installation.
2. "MOVE OVER OR SLOW DOWN FOR STOPPED VEHICLES WITH FLASHING LIGHTS" (R5-60) signs **shall** be installed in all rest areas and weigh stations serving freeways and expressways.
3. The following mainline locations have been approved for installation of "MOVE OVER OR SLOW DOWN FOR STOPPED VEHICLES WITH FLASHING LIGHTS" (R5-60). Signs **shall** be installed at these locations:

SW Region:

- IH 39 northbound in Rock County north of the state line
- IH 39 northbound in Dane County north of USH 51 in Madison
- IH 39 northbound in Columbia County north of IH 90-94
- IH 39 southbound in Columbia County south of IH 90-94
- IH 39 southbound in Dane County south of USH 12-18
- IH 90 eastbound in La Crosse County east of the state line
- IH 90 eastbound in Monroe County east of IH 94
- IH 90 westbound in Columbia County west of IH 39
- IH 90 westbound in Monroe County west of IH 94
- IH 94 eastbound in Dane County east of IH 39-90
- IH 94 westbound in Monroe County west of IH 90
- USH 18 westbound in Dane County west of Dairy Ridge Rd
- USH 151 northbound in Grant County north of the state line
- USH 151 northbound in Dane County north of IH 39-90-94

SE Region:

- IH 41 northbound in Washington County north of USH 45
- IH 43 northbound in Milwaukee County at Holt Ave
- IH 43 northbound in Ozaukee County north of STH 60
- IH 94 eastbound in Milwaukee County east of 84th St
- IH 94 westbound in Kenosha County west of the state line
- IH 94 westbound in Waukesha County west of the Milwaukee County line
- USH 12 westbound in Walworth County west of the state line
- STH 119 westbound in Milwaukee County east of IH 94

NE Region

- IH 41 southbound in Outagamie County south of the Brown County line
- IH 43 southbound in Brown County south of STH 172
- USH 10 westbound in Winnebago County west of IH 41
- USH 41 northbound in Brown County north of CTH B
- USH 41 southbound in Marinette County south of Marinette
- USH 41 southbound in Brown County south of CTH B

- STH 29 westbound in Brown County west of IH 41

NC Region

- IH 39 northbound in Portage County at Stevens Point
- IH 39 southbound in Marathon County south of Business 51
- IH 39 southbound in Portage County at Stevens Point
- USH 51 northbound in Marathon County north of STH 29
- USH 45 southbound in Vilas County south of the state line
- STH 29 eastbound in Marathon County east of USH 51
- STH 29 westbound in Marathon County west of USH 51
- STH 153 westbound in Marathon County east of IH 39

NW Region

- IH 94 eastbound in Saint Croix County east of the state line
- IH 94 eastbound in Eau Claire County east of USH 53
- IH 94 westbound in Dunn County west of STH 29
- USH 2 eastbound in Douglas County south of Superior
- USH 53 northbound in Chippewa County north of STH 29
- STH 29 eastbound in Chippewa County east of USH 53

2-2-50 Spacing of Reminder Signs

January 2007

EMERGENCY STOPPING ONLY

The R8-7 EMERGENCY STOPPING ONLY sign **shall** be used on expressways and freeways only. The R8-7 sign *should* be placed at random intervals of about 15 miles, generally being located just beyond the signing required after an interchange.

SLOWER TRAFFIC KEEP RIGHT

The R4-3 SLOWER TRAFFIC KEEP RIGHT sign *may* be used on multiple-lane roadways to reduce unnecessary waving. On conventional highways, it *should* be erected just beyond the beginning of a multiple-lane pavement and selected locations where there is a tendency on the part of the motorist to drive in the left-hand lane (or lanes) below the normal speed of traffic. On freeways and expressways, the sign **shall** be erected at random intervals of about 7 ½ miles, generally just beyond the signing required after an interchange. It *should* not be used on the approach to an interchange or through an interchange area. Successive signs **shall** be alternated between the median and the right-hand side of the roadway.

2-2-51 Except Right Turn Signals

March 2011

PURPOSE AND BACKGROUND

The RIGHT TURN NO STOP sign is occasionally used below a STOP sign for intersections where an engineering study indicates that right turns do not have to stop. Many of these intersections are in urban areas with high right turning traffic volumes and oftentimes have a lack of space to construct a pork chop island with a separated free flow right turn lane. FHWA has previously discouraged the usage of the RIGHT TURN NO STOP sign, and as a result the Department used it very sparingly after exhausting all other traffic control strategies.

The [MUTCD](#) now allows the usage of a supplemental plaque below a STOP sign at intersections that allow a right turn to free flow.

POLICY

The EXCEPT RIGHT TURN (R10-10-P sign) is approved for usage on WisDOT maintained roadways, provided the following policy criteria are met:

1. An engineering study of the intersection is performed and it is determined that the geometrics and traffic volumes make it possible for free-flowing right turns.
2. Existing locations should be reviewed periodically to see if geometric conditions can be changed (upcoming improvement project) or if the traffic volumes are still applicable. Discussion with local officials may result in developing other control strategies. At some locations, it may be possible to install right-turn channelization.
3. RIGHT TURN NO STOP (R1-51) signs should be replaced with the EXCEPT RIGHT TURN (R1-10-P)

signs as opportunities permit (improvement projects, knockdown replacement and replacement due to age).

2-2-53 Signing for Flashing Yellow Arrow Traffic Signals

December 2013

PURPOSE AND BACKGROUND

The [MUTCD](#) allows the usage of a flashing yellow left turn arrow that is intended to provide a safer, more efficient left turn for motorists. National studies have indicated that drivers have fewer crashes with the flashing yellow left-turn arrow than with the traditional yielding left-turn indication.

FHWA has indicated that flashing yellow arrow educational signing for motorists is normally not needed, since the obvious intent of the flashing yellow arrow is to yield to oncoming motorists. This is the reason why no signing for flashing yellow arrows is included in the MUTCD. However, since the flashing yellow arrow is new to Wisconsin, there has been concern expressed by WisDOT and other municipalities that the motorist will not realize that they need to turn with caution and potentially yield to oncoming motorists. Educational efforts involving the media have been utilized to address this concern. Another motorist education effort is the installation of temporary signing. This policy will address the installation of signing for flashing yellow arrow signals, both for a temporary educational effort and to address any problem areas.

QUALIFYING CRITERIA FOR SIGNING

The LEFT TURN YIELD ON FLASHING YELLOW ARROW (R10-50) sign has been designed for usage on WisDOT maintained roadways, provided the following policy criteria are met:

1. The LEFT TURN YIELD ON FLASHING YELLOW ARROW (R10-50) sign, at the discretion of the Region Traffic Engineer, may be used for all new flashing yellow arrow installations in problem areas or new areas, for a time of one year from the date of the signal installation. After the one year time, the signs should be removed and returned to the appropriate Region Sign Shop.
2. The LEFT TURN YIELD ON FLASHING YELLOW ARROW (R10-50) sign *may* remain in place at intersections with flashing yellow arrow signal indications, for longer time periods or indefinitely. Reasons for allowing the sign(s) to remain in place may be demonstrated problems with motorists failing to yield on the flashing yellow arrow indication or continued unfamiliarity of flashing yellow arrow signal in an area.

GUIDELINES FOR FIELD INSTALLATION OF SIGNS

1. Primary choice for mounting of the LEFT TURN YIELD ON FLASHING YELLOW ARROW (R10-50) sign is the far side overhead signal that has a flashing left yellow arrow indication.
2. Secondary choice for mounting of the LEFT TURN YIELD ON FLASHING YELLOW ARROW (R10-50) sign is the far side ground mounted signal that has a flashing left yellow arrow indication.
3. Third choice for mounting of the LEFT TURN YIELD ON FLASHING YELLOW ARROW (R10-50) sign is the near side ground mounted signal that has a flashing left yellow arrow indication.

2-2-54 Stop for School Bus Flashing Red Lights State Law Sign

September 2009

PURPOSE

Wisconsin State Statute [346.48](#) mandates that motorists approaching a school bus from the front or rear **shall** stop when the bus is displaying the flashing red lights. The exception to this is oncoming motorists would not have to stop if there is a physical separation in the median, as in the case of divided highways. Oftentimes, requests come to the WisDOT Region offices to install signs for areas where motorist compliance is problematic. Typically, these are areas where there are multiple school bus stops and the sight distance does not warrant the placement of the SCHOOL BUS STOP AHEAD (S3-1) warning sign. In the past, the STOP FOR SCHOOL BUS FLASHING RED LIGHTS STATE LAW *R59-51) sign has been installed for these problem areas. However, due to a lack of statewide guidance, these signs have been used inconsistently.

MUTCD Section [2B.54](#) allows the customization of regulatory signs to aid in the enforcement of other laws or regulations. Therefore, the STOP FOR SCHOOL BUS FLASHING RED LIGHTS STATE LAW (R59-51) sign has been designed to reinforce [Wisconsin State Statute 346.48](#) and aid law enforcement for problem areas. Listed below are criteria that *should* be followed when considering the placement of these signs.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade

separation at interchanges only.

Expressways are defined as divided or undivided roadway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional highways are defined as divided or undivided roadway facilities that have limited access with no grade separations at intersections. These highways *may* be two-lane or multi-lane facilities.

POLICY

Below are policy criteria that *should* be applied when considering installations of the STOP FOR SCHOOL BUS FLASHING RED LIGHTS STATE LAW (R-59-51) sign.

1. For installation of the STOP FOR SCHOOL BUS FLASHING RED LIGHTS STATE LAW (R59-51) sign on expressways, [TEOpS 2-3-55](#) *should* be followed.
2. If a specific school bus stop has a sight distance less than the minimum visibility distance for warning signs per the MUTCD, the SCHOOL BUS STOP AHEAD (S3-1) warning sign *should* be used.
3. The STOP FOR SCHOOL BUS FLASHING RED LIGHTS STATE LAW (R59-51) sign *may* be used for segments of conventional highways that have the following criteria:
 - a. Multiple stops on a segment of roadway
 - b. Documented compliance problems exist,
 - c. Sight distance is not a factor that would not allow the use of warning signs for most of the stops in the segment of roadway.
4. If the STOP FOR SCHOOL BUS FLASHING RED LIGHTS STATE LAW (R59-51) sign is warranted, it *should* be installed at the beginning of the segment and *may* be repeated every five miles if the segment is greater than 5 miles or after major intersections (at the discretion of the Region Traffic Engineer).
5. In considering the usage of this sign, the Regions are encouraged to obtain a school bus route map or other information supplied by the school district to identify the locations of the stops. The Region *should* contact the school districts annually to determine where stops are no longer made so that signing can be adjusted accordingly.



GENERAL

The MUTCD classifies the chevron as an alignment sign, but it is basically a delineator with a directional connotation, which is the aspect of the sign that relegates its use to horizontal curves. It is not to be used at roadway width transitions, lane drops, or approaches to narrow bridges. It is also not to be used singly, because that will not adequately develop the directional message. Another inappropriate use is in a cluster at the end of a T-intersection.

Chevrons (W1-8) signs *may* be used in combination with the large night arrow (W1-6) sign or without the large night arrow sign. [Table 2C-5](#) of the MUTCD provides guidance as to when chevron signs are used.

The MUTCD, [Table 2C-6](#) contains spacing criteria for installations of chevrons, which has been included as part of this policy.

GUIDANCE

The following guidelines apply to these signs:

1. It is desirable to position one chevron directly ahead of an approaching vehicle while the vehicle is on the approach tangent, and begin spacing in both directions from that point.
2. Extend to the point of curvature, and to the point of tangency; do not alter the spacing to meet these points, however.
3. A minimum of three signs **shall** be used, even if they extend beyond the point of curvature. Also, per the MUTCD, the spacing of chevron signs *should* be such that the road user has at least two in view, until the change in alignment eliminates the need for the signs.
4. Chevron signs **shall not** be placed on the far side of a T-intersection to warn drivers that a through movement is not possible.
5. Chevron signs **shall not** be used to mark obstructions within the roadway.
6. Follow the spacing table below, making adjustments for conflicts with driveways, signs, etc. The chevron spacing shown below are maximum distances between chevrons. Chevrons may be spaced closer to address curves with tighter radius measurements.

Chevron signs **shall** be mounted at a 4-foot minimum height (measured from the bottom of sign to the elevation of the near edge of traveled way). They **shall** be aimed toward traffic rather than located perpendicular to the curve.

The chevron sign *may* be used only where an emerging or demonstrated crash problem exists. On highways to be reconstructed it is unlikely that crashes will be expected to occur on the re-alignment. Therefore, chevron signs *should not* normally be specified on new construction, unless required by [Table 2C-5](#) of the MUTCD.

CHEVRON ALIGNMENT SIGN SPACING

| Posted Advisory Speed (mph) | Maximum Spacing (feet) |
|-----------------------------|------------------------|
| 15 mph or less | 40 |
| 20 | 80 |
| 25 | 80 |
| 30 | 80 |
| 35 | 120 |
| 40 | 120 |
| 45 | 120 |
| 50 | 160 |
| 55 | 160 |
| 60 | 160 |
| 65 | 200 |

7. Existing signs not installed at this spacing *should* be adjusted when opportunity permits, due to improvement projects, knockdowns or if problems are present.

2-3-14 Hill Blocks View Signs**June 2005****PURPOSE**

The MUTCD section [2C.18](#) says the Hill Blocks View sign (W7-6) *may* be used in advance of a crest vertical curve to advise road users to reduce speed as they approach and traverse the hill as only limited stopping sight distance is available. If used, it *should* be supplemented by an advisory speed (W13-1) plaque indicating the recommended speed for traveling over the hillcrest based on available stopping sight distance. See MUTCD section [2C.36](#) for visibility chart for various speeds. Advisory speed plaque speed is based on available visibility distance. This policy provides guidance on when these signs *may* be considered for usage of state-maintained highways.

TRUCK ENTRANCE signs have been commonly used for driveways with limited sight distance; however, their usage is exclusive to driveways or side streets with high truck traffic volumes.

POLICY

While guidance on crossroad and side road warning sign usage and criteria are provided in the MUTCD, less guidance is provided on driveways. This policy provides for the use of HILL BLOCKS VIEW sign where driveways are after a crest vertical curve. Signs such as BLIND ENTRANCE and HIDDEN DRIVEWAY are not in the MUTCD. However, the HILL BLOCKS VIEW sign is an approved sign in the MUTCD. It has been general practice not to provide warning signs for driveways. The HILL BLOCKS VIEW sign is intended for use in lieu of the BLIND ENTRANCE or HIDDEN DRIVEWAY signs, both of which are not approved in the MUTCD.

GUIDELINES

The following step-by-step criteria *should* be used to determine if a HILL BLOCKS VIEW sign is warranted for driveways:

1. First, the driveway must have inadequate sight distance per the visibility chart in the MUTCD section [2C.37](#) when determining the need for the sign due to a crest vertical curve. Vision problems due to horizontal curvature or vegetation **shall not** warrant use of this sign.
2. The volume of the driveway **shall** be a minimum of 40 ADT (25 in, 25 out). A typical one-family residence generates about 10 trips per day and therefore would not qualify for the sign. Note: a side road with 100 ADT or greater requires a type B1/B2 intersection as opposed to a type C/D intersection which would be used for under 100 ADT. 50 ADT provides for a driveway for a small business.
3. Verify that the volumes exceed 50 ADT at least once per week or 50 days per year.

NOTE: Crash history – if the driveway does not meet the volume criteria above, but a crash analysis indicates there is a crash history at the driveway location, a sign *may* be considered.

Location of the sign *should* be per MUTCD Table [2C-4](#).

2-3-18 Merge Sign Locations**March 2016****PURPOSE**

This policy will define merge sign locations on all freeways and expressways.

POLICY

Merge signs should be placed in accordance with Condition A, Table [2C-4](#) of the MUTCD. This distance shall be measured in an upstream direction, starting at the theoretical gore.

In some cases, particularly existing ramps at tight urban interchanges, this distance may not be achievable, due to substandard geometrics. In these cases, the merge signs will have to be installed where they can be accommodated.

2-3-19 Divided Highway Warning Signing**September 2009****GENERAL**

The MUTCD Sections [2C.22](#) and [2C.23](#) covers the usage of the divided highway warning signs (W6-1 and W6-2 signs). However, the MUTCD guidance is very general in nature and does not tie into specific factors such as posted speed and length of divided section. Oftentimes for shorter segments with lower speeds, the DIVIDED HIGHWAY AHEAD warning signs *may* be deleted. This policy will provide for a statewide policy for consistent

usage.

POLICY

Below is the statewide policy for the usage of divided highway signs.

1. The DIVIDED HIGHWAY AHEAD (W6-1) warning sign *should* be installed in advance of two-lane-to-four-lane transitions that are physically divided by a median. [Standard Detail Drawing 15C21-3](#) shows a typical installation of this sign.
2. The DIVIDED HIGHWAY AHEAD (W6-1) sign *should* only be used in transition to a section of highway that is divided, not a specific intersection.
3. The DIVIDED HIGHWAY AHEAD (W6-1) warning sign *should not* be used for locations where there is two-way traffic to single-lane divided.
4. If posted speeds are 45 mph or above, the DIVIDED HIGHWAY AHEAD sign *may* be used if the divided area is greater than 1,000 feet. The signs would be used at the beginning of the divided section only.
5. A DIVIDED HIGHWAY ENDS (W6-3) sign *should* be used at the end of the divided highway section, in accordance with [Standard Detail Drawing 15C21-3](#), to give warning and notice that traffic is now two lanes.

2-3-25 Single Diagonal Arrow Signs

February 2018

GENERAL

Section 2C-25 of the [Wisconsin MUTCD](#) allows the use of the Double Diagonal Arrow sign (W12-1D) to advise drivers that traffic is permitted to pass on either side of an obstruction. Section 2C-25 of the [Wisconsin MUTCD](#) further allows the use of a sign with a single diagonal arrow ([W12-1L/R](#)) to advise drivers that traffic is only permitted on one side of an obstruction. In practice, WisDOT has also utilized W12-1L/R signs to warn drivers of lane reduction situations that have experienced an above-average crash rate. This policy will establish guidelines for the use of W12-1L/R signs.

GUIDANCE

The following guidelines apply to these signs:

LANE REDUCTIONS

1. Single Diagonal Arrow signs *should* be used as a bank of signs, not as a single sign installation. A minimum of 3 signs *should* be used.
2. Signs *should* be installed along the entire length of the lane reduction taper, as space is available and geometrics allow. The signs *should not* extend beyond the beginning or end of the taper.
3. Single Diagonal Arrow signs are typically used on conventional roadways. On freeways and expressways, Type 5 pavement marking arrows (“pushover arrows”) are typically used for this purpose.
4. Follow the spacing table below, adjusting for conflicts with driveways, signs, etc. The spacings shown below are maximum distances between signs.

Single Diagonal Arrow signs *should* be mounted at a 4-foot minimum height (measured from the bottom of sign to the elevation of the near edge of traveled way). They **shall** be located perpendicular to the through traffic lanes.

The Single Diagonal Arrow sign *may* be used only where an emerging or demonstrated crash problem exists. On highways to be reconstructed it is unlikely that crashes will be expected to occur on the re-alignment. Therefore, Single Diagonal Arrow signs *should not* normally be specified on new construction, unless an existing geometric situation is not being rectified by the project.

SINGLE DIAGONAL ARROW SIGN SPACING

| Posted Speed (mph) | Maximum Spacing (feet) |
|--------------------|------------------------|
| 15 mph or less | 40 |
| 20 | 80 |
| 25 | 80 |
| 30 | 80 |
| 35 | 120 |
| 40 | 120 |
| 45 | 120 |
| 50 | 160 |
| 55 | 160 |
| 60 | 160 |

| | |
|----|-----|
| 65 | 200 |
| 70 | 200 |

- Existing signs not installed at this spacing *should* be adjusted when opportunity permits, due to improvement projects, knockdowns or if problems are present.

MEDIAN ISLANDS

- R4-7 "KEEP RIGHT" signs *should* be used to mark the beginning of medians. However, at some smaller median island locations, KEEP RIGHT signs would block the driver's view of other regulatory or warning signs or traffic signal faces. In these situations, Single Diagonal Arrow signs *may* be used to mark the beginning of medians.
- When used to mark the upstream end of a median island, Single Diagonal Arrow signs should be mounted at a 2-foot minimum height (measured from the bottom of sign to the elevation of the near edge of traveled way).

2-3-27 BUMP and ROUGH ROAD Signs

January 2013

PURPOSE

This policy provides guidance on the use of BUMP (W8-1) signs, BUMPS (W8-1A) signs, DIP (W8-2) signs and ROUGH ROAD (W8-8) signs.

DEFINITIONS

A sharp rise or depression is defined as a roadway deficiency that is sufficiently abrupt to create considerable discomfort to passengers, to cause shifting of the cargo, or to deflect a vehicle from its true course at normal roadway driving speeds.

A minor rise or depression is defined as a roadway deficiency that is noticeable enough to divers to cause a minor discomfort, but not enough of a deficiency to be a safety hazard.

POLICY

- For sharp rises or depressions in the profile of the roadway, the BUMP or DIP sign *should* be installed both in advance of the condition and at the location of the rise or depression. The BUMP or DIP sign installed at the location of the rise or depression **shall** have the diagonal downward arrow sign (W16-7L or W16-7R) installed below it. The BUMP or DIP sign installed in advance of the condition **shall** have the AHEAD (W16-9P) installed below it.
- For minor rises or depressions in the profile of the roadway, the BUMP or DIP sign *may* be installed both in advance of the condition and at the location of the rise or depression. The BUMP or DIP sign installed at the location of the rise or depression **shall** have the diagonal downward arrow (W16-7L or W16-7R) sign installed below it. The BUMP or DIP sign installed in advance of the condition **shall** have the AHEAD (W16-9P) sign installed below it. If the condition is the result of pavement buckling, BUMP signs **shall** be installed both in advance of the condition and at the location of the condition on higher-speed roadways (45 mph posted speed and above).
- For segments of roadways with multiple sharp rises or depressions, the ROUGH ROAD sign or BUMPS sign *should* be installed in advance of the segment. The advanced location of the ROUGH ROAD sign or BUMPS sign **shall** be supplemented with the NEXT XX MILES (W57-51) plaque. The BUMP or DIP sign *should* be installed at locations of rises or depressions. The BUMP or DIP sign installed at the location of the rise or depression **shall** have the diagonal downward arrow (W16-7L or W16-7R) sign installed below it.
- For segments of roadways with multiple minor rises or depressions, the ROUGH ROAD sign or BUMPS sign *may* be installed in advance of the segment. The advanced location of the ROUGH ROAD sign or BUMPS sign **shall** be supplemented with the NEXT XX MILES (W57-51) plaque. The BUMP or DIP sign *should* be installed at locations of rises or depressions. The BUMP or DIP sign installed at the location of the rise or depression **shall** have the diagonal downward arrow (W16-7L or W16-7R) sign installed below it.
- Type A flashing lights or orange flags *may* be used on the advanced sign assembly, depending on the severity of the bump or dip.
- Signs *should* have a yellow background. Orange background signs *should* only be used if the roadway deficiencies are construction related.

2-3-30 Speed Reduction Signs (Reduced Speed Ahead)**March 2016****PURPOSE**

This guidance is to establish the appropriate use and location of the speed reduction sign in relation to the speed limit sign for the lower speed zone. This policy pertains to signing on freeways, expressways and conventional highways.

BACKGROUND (AUTHORITY)

The MUTCD in Section [2C-38](#) covers the usage of the Reduced Speed Limit Ahead sign (W3-5 sign). The MUTCD Section [2C](#), Guidelines for Advanced Placement of Warning Signs, Table [2C-4](#), Condition B, addresses the placement of advanced warning signs with minimum distances. However, based upon experience and from the establishment of a “comfortable braking distance,” these distance guidelines have been increased per the chart contained herein.

POLICYGeneral Speed Reductions

A speed reduction (W3-5) sign **shall** be erected in advance of downward changes of the speed limit from 70, 65, 60 or 55 mph regardless of the amount of reduction, and from 50 mph or below for reductions of 15 mph or more. The speed reduction sign **shall not** be used for reductions of 10 mph or less for speeds of 50 mph or below.

School Speed Reductions

In accordance with Section [7B.16](#) of the MUTCD, a Reduced School Speed Limit Ahead Sign (S4-5) should be installed in advance for reductions of 15 mph or more (from posted speed limit to school speed limit).

- Sign Spacing in Advance of Reduced Speed Zone:** Signs **shall** be placed to provide adequate time for the driver to perceive, identify, decide and perform the speed reduction. The following table establishes the minimum distances to be used for the speed reduction signs. The table was developed by modifying the distance chart for Advanced Placement of Warning Signs, Table [2C-4](#), Condition B of the MUTCD, (deceleration to listed advisory speed). The modifications provide more time for the driver to respond, as opposed to the warning signs when a driver is required to decelerate to a specific speed, based on a road condition. The increased distance between the speed reduction sign and the speed limit sign provides additional time to decelerate. This is consistent with the guidance in the MUTCD, Section [2C-5](#) which indicates the time necessary for Perception, Identification/understanding, Emotion/decision making, and Volition/execution of decision (PIEV) is higher for signs that involve more driver judgment, as opposed to warning signs. In particular, the comfortable braking distance and therefore the execution distance is being increased to the following:

**SPEED REDUCTION SIGN DISTANCE IN ADVANCE OF SPEED LIMIT SIGN
MINIMUM DISTANCES (in feet)**

| From Speed Limit | To Speed Limit | | | | | | | | | |
|------------------------|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 65 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 15 |
| 70 ----- | 700 | 700 | 700 | | | | | | | |
| 65 ----- | | 700 | 700 | 700 | - | - | - | - | - | |
| 60 ----- | | 600 | 600 | 600 | - | - | - | - | - | |
| 55 ----- | - | | 500 | 500 | 500 | 550 | 600 | 600 | 600 | 600 |
| 50 ----- | - | - | - | - | | 550 | 550 | 600 | 600 | 600 |
| 45 ----- | - | - | - | - | | | 450 | 475 | 500 | 525 |
| 40 ----- | - | - | - | - | | | | 425 | 450 | 475 |
| 35 ----- | - | - | - | - | | | | | 375 | 400 |
| 30 ----- | - | - | - | - | | | | | | 325 |

- Sizes of Signs:** Size of signs **shall** be in accordance with [TEOpS 2-1-35](#).
- Double Marking:** Double marking (right and left side) **shall** be employed for any reduction from 70 mph or 65 mph and *may* be employed for other speed limit reductions, especially on divided or multi-lane highways and for added emphasis. If a double-marked REDUCED SPEED AHEAD sign assembly (R2-5A and W13-1W) is replaced on one side of the roadway with a W3-5 SPEED REDUCTION sign, the R2-5A and W13-1W sign on the other side of the roadway **shall** also be replaced with a W3-5 SPEED REDUCTION sign.
- Phase in Period:** Signs *should* be adjusted to conform to this guideline when opportunities arise, such as knockdowns or damage, when other work is occurring nearby, or projects make removal practical.

5. **Work Zone Traffic Control Speed Limit and Reduced Speed Ahead Signs:** The spacing shown in this policy does not apply to work zone traffic control speed limit changes. See the Work Zone Standard Detail Drawings for applicable requirements.

2-3-35 Advisory Speed on Curves

July 2012

PURPOSE

To establish uniformity and consistency when determining the proper advisory speed for turns and curves and subsequent installation of advisory speed plaques.

BACKGROUND

The MUTCD provides requirements for the proper use of horizontal alignment signing, Advisory Speed plaques, Truck Rollover Warning signs, Advisory Exit and Ramp Speed signs. They are contained in the following sections:

1. Horizontal Alignment signs – MUTCD Sections [2C.06](#) and [2C.07](#)
2. Truck Rollover Warning signs –MUTCD Section [2C.13](#)
3. Advisory Speed Plaques –MUTCD Section [2C.08](#)
4. Supplemental warning plaques – MUTCD Section [2C.53](#) and [2C.54](#)
5. Advisory Exit, Ramp and Curve speed signs – MUTCD Section [2C.14](#)
6. Horizontal Alignment Sign Usage –MUTCD Table [2C-5](#)

On state trunk highways it is required that all curves and turns less than posted or statutory speed be signed in advance, with curve warning signs for curves 35 mph or above, or turn warning signs for turns 30 mph or less. The MUTCD (Sections [2C.06](#) and [2C.07](#)) has instructions related to signing curves, turns, winding roads, etc. The MUTCD states in Section 2C.06 that if the roadway is less than 1000 ADT, an advisory speed plaque *should* be used to supplement the curve or turn warning sign where the posted speed varies from the curve speed by 10 mph or more.

The MUTCD Table [2C-5](#) states that advisory speed plaques are:

1. Recommended where the difference between the speed limit and advisory speed is 5 mph.
2. Required where the difference between speed limit and advisory speed is 10 mph or more.

| MUTCD Table 2C-5. Horizontal Alignment Sign Selection | | | | | |
|---|---|-------------|-------------|----------|----------------|
| Type of Horizontal Alignment Sign | Difference Between Speed Limit and Advisory Speed | | | | |
| | 5 mph | 10 mph | 15 mph | 20 mph | 25 mph or more |
| Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), and Combination Horizontal Alignment/Intersection (W1-10) (see Section 2C.07 to determine which sign to use) | Recommended | Required | Required | Required | Required |
| Advisory Speed Plaque (W13-1P) | Recommended | Required | Required | Required | Required |
| Chevrons (W1-8) and/or One Direction Large Arrow (W1-6) | Optional | Recommended | Required | Required | Required |
| Exit Speed (W13-2) and Ramp Speed (W13-3) on exit ramp | Optional | Optional | Recommended | Required | Required |

INTRODUCTION

The determination and posting of advisory speeds for changes in horizontal alignment is a universal practice throughout the nation. It was initially tried by the State of Missouri in 1937 followed shortly thereafter by a number of other state highway departments. The preeminent research was done by R. A. Moyer and D. S. Berry (1) published by the Highway Research Board in 1940 as a recommendation for signing changes in roadway alignment. Curve advisory speed posting was adopted as a suggested option in the [1948 Manual on Uniform Traffic Control Devices](#) (2).

The initial research by Moyer and Berry established the basic need, procedures and criteria for determining advisory speeds. The use of a ball-bank Indicator was recommended as an acceptable instrument for establishing a “safe speed” on a horizontal curve. Their recommendations were the following ranges of values:

Table 1. Recommended Criteria for Curve Advisory Speed Determination
(Source: Moyer and Berry, 1940, Ref. 1)

| Speeds (mph) | Ball Bank Reading | Side Friction Factor |
|--------------|-------------------|----------------------|
| ≤ 20 | 14° | 0.21 |
| 25 – 30 | 12° | 0.18 |
| ≥ 35 | 10° | 0.15 |

The Moyer/Berry research also indicated that the curve “safe speed” could be computed using the standard curve formula if the curve radii and super elevation were known using the above noted equivalent side friction factors. While they noted the advisory speed as being the “safe speed” for the curve, the advisory speed actually represented the comfortable speed that the curve could be driven without experiencing lateral acceleration discomfort.

This procedure and criteria for advisory speed determination has become nearly universally accepted in the highway engineering profession and typically is used by most transportation agencies. However, there has been concern that the ball-bank method of determining advisory speeds *may* be outdated and not the best procedure. The need to update the procedures and criteria has been noted by the highway community for a number of years. Recognizing the age of the research, minor variations have been made in the criteria and its application in some roadway jurisdictions (3).

Many motorists also have observed that advisory speed signing is overly conservative and many exceed the posted advisory speeds. Another factor is that current vehicles have suspension and steering systems that are significantly improved providing better stability, cornering capabilities and driving comfort compared with typical vehicles at the time of the initial research.

The following guidelines establish new values that satisfy the motorists’ needs. The current research has been reviewed with three methods addressed to determine an acceptable advisory speed. The recommended criteria have been adjusted to represent the current driving practices. While it is recognized that most roadways are posted with advisory speeds based on the older criteria, it appears logical to raise the values to provide realistic postings that are compatible with driving practices.

The provisions of the MUTCD encourage a restudy of the horizontal alignment signing. The MUTCD has a liberal compliance period of at least 10 years to implement the new horizontal alignment signing, so the engineering studies for curve advisory speeds can be done over a period of several years on a systematic basis with appropriate publicity so the public understands the revisions. Drivers will have to modify their driving habits so they do not incorrectly assume that posted advisory speeds can be driven at a higher speed. However, an adequate factor of safety is addressed in the new criteria so drivers even assuming a higher speed is acceptable *should not* be subjected to undue hazards. The older postings, while usually a lower speed, can remain in place until the new engineering study is completed and signs installed. It will be desirable to change all advisory speed plaques along a roadway at the same time to minimize motorist confusion.

DISCUSSION

There are several areas of concern/discussion:

- The ball-bank indicator method *may not* be current nor the best method for determining advisory speeds (5).
- The current practice results in advisory speeds that are too conservative and are far below the 85th percentile speed of drivers traversing the curves (5) (6) (7).
- Current vehicle suspension and cornering capabilities are substantially better than those of vehicles that were used to determine the older criteria (8). As a result, drivers today can comfortably drive curves at speeds higher than those that would have been comfortable with older vehicles.
- The criteria for curve advisory speeds *should* be comparable to the design criteria in the AASHTO *Policy on Geometric Design for Highways and Streets* (9).
- The curve advisory speed practices in some jurisdictions have deviated from an adequate and universally accepted criteria resulting in posted advisory speeds well below prevailing curve speeds (3)(6). This results in inconsistent curve advisory speed postings from one jurisdiction to another.
- The current criteria do not consider truck advisory speeds and truck roll-over considerations (10) (11).
- Some inconsistencies have been noted in comparing current ball bank criteria with side friction factors used for curve design (8).

The research generally documented that drivers are often exceeding the existing posted advisory speeds by 7

to 10 miles per hour. An increase of 2 degrees for ball-bank indicator readings and comparable side friction factors is equivalent to 8 to 10 miles per hour increase in advisory speeds. The application of an accelerometer that measures lateral acceleration provides a direct determination of side friction factors and accommodates new instrumentation for advisory speed determinations. Minor adjustments in the relationship between ball-bank readings and side friction factors makes the ball-bank procedure and accelerometer determinations comparable. The use of the horizontal curve design speed equation remains an acceptable procedure using the newly recommended side friction factors.

There appears to be no reason to limit the advisory speed determination methods but instead recognize that any of the three methods are acceptable:

- The traditional ball-bank indicator
- Design speed equation or
- Accelerometer.

There is a fourth method called the Compass Method by Texas Transportation Institute (TTI), but requires extensive field work (measuring points throughout the curve), so is not being considered for WisDOT. The expansion of acceptable determination methods and change in criteria *should* offset current procedural deviations with the new MUTCD requirements encouraging wider and universal application of acceptable advisory speeds. The recommended criteria for advisory speed determinations are as follows:

Table 2. Recommended Criteria for Curve Advisory Speed Determination
(Source: Adapted from Carlson and Mason 1999, Ref. 8)
Revised by WISDOT to include Truck Advisory data

| Speeds (mph) | Ball Bank Reading | Lateral Acceleration (g) |
|--------------------|-------------------|--------------------------|
| ≤ 20 | 16° | 0.28 |
| 25 – 30 | 14° | 0.24 |
| ≥ 35 | 12° | 0.21 |
| Truck (All Speeds) | 10 | 0.17 |

The new criteria are comparable to the current AASHTO design criteria. Some research has proposed higher values, but those values result in advisory speeds that exceed the observed speeds of drivers in curves, are above comfortable lateral acceleration levels, and reduce the margin of safety. Studies show that maximum side friction factors developed between passenger car tires and wet pavement in poor condition can be as low as approximately 0.35 at high speeds (9) (14).

For large trucks, there is a potential danger of overturning if the truck enters a curve at too high of a speed. For sharp curves, such as loop exit ramps, it *may* be necessary to post truck advisory speeds. Current research indicates that truck-overturning situations are limited and inconsistent when side friction factors are less than 0.35 (12). Theoretically, truck advisory speeds could be determined based on a side friction factor of 0.21, or a ball-bank reading of 12 degrees, and still provide a reasonable overturning safety factor below the 0.35 overturning threshold. But this assumes that the truck follows the exact radius of the curve, which is unlikely in actual practice. Most drivers make steering corrections as they traverse a curve, sometimes steering a radius larger than the actual curve radius, sometimes steering a radius sharper than the actual curve radius. It must be recognized that if the truck is steered on a radius of $\frac{2}{3}$ to $\frac{3}{4}$ of the actual curve radius, then the safety factor below the overturning threshold nearly disappears. As a result, it is recommended that the criteria for posting truck advisory speeds be based on a side friction factor of 0.17, or a ball-bank reading of 10 degrees, for all speed ranges to ensure a reasonable overturning safety factor. This would result in truck advisory speeds below the advisory speeds determined for passenger cars.

For New Construction Projects the following option *may* be used in lieu of the ball bank indicator method:

Method 1: Determining Advisory Speeds Using the Design Speed Equation

The design of highway curves is based on the relationship between design speed, radius of curvature, super elevation, and side friction (centripetal acceleration). The mathematical relationship between these variables is given by the equation (9):

$$V = \sqrt{15R(0.01e + f)}$$

Where:

- V = Design speed (mph)
- R = Curve radius (feet)
- e = Super elevation (%)
- f = Side friction factor

The same equation can be used to calculate the advisory speed for a curve, if the curve radius and super elevation are known. The side friction factor is the same as lateral acceleration (measured in “g’s”), and is based on driver comfort. For highway design, side friction factors are set by AASHTO geometric design policies, and are generally in the range of 0.08 to 0.30 depending on design speed. As previously discussed, recent studies have suggested that the values in the current design manual are overly conservative, and when this equation is used to determine the advisory speed for a curve, the lateral acceleration rates contained in Table 2 can be used. This equation *may* have to be solved iteratively because the value for the side friction factor, f , is different for different ranges of advisory speed, V . For example, suppose that a curve has a 200-foot radius and a super elevation of 4%. If it is initially assumed that the value of the lateral acceleration is 0.21 (applicable for passenger car advisory speeds of 35 mph or more), the calculated advisory speed is 27 mph. This means that the lateral acceleration value *should* have been 0.24 (applicable for advisory speeds of 25 to 30 mph), and the advisory speed is recalculated as 29 mph. Calculated advisory speeds *should* be rounded to the nearest 5 mph increment, so a 30 mph advisory speed would be used for this curve. The rounded passenger car advisory speeds calculated for various combinations of super elevation and curve radius are shown in Table 3.

Table 3. Rounded Passenger Car Advisory Speeds (mph) Based on Design Speed Equation

| Radius (ft) | Super elevation (%) | | | | |
|-------------|---------------------|----|----|----|----|
| | -2 | 2 | 4 | 6 | 8 |
| 100 | 20 | 20 | 20 | 20 | 20 |
| 200 | 25 | 30 | 30 | 30 | 30 |
| 400 | 35 | 35 | 40 | 40 | 40 |
| 600 | 40 | 45 | 45 | 50 | 50 |
| 800 | 50 | 55 | 55 | 55 | 60 |
| 1000 | 55 | 60 | 60 | 65 | 65 |

In some cases, the curve radius and super elevation can be taken from as-built plans for a roadway that has been constructed fairly recently. However, it must be considered that a roadway that has been in service for many years *may* have been resurfaced one or more times since original construction. As a result of resurfacing, the super elevation of the curve *may* have changed, and the original plans *may* no longer be representative of field conditions. In other cases, the original plans *may* no longer be available.

If aerial photography is available, the curve radius can be determined by comparing circular curve templates with the aerial photograph. In the field, the approximate curve radius can be determined by the chord and middle ordinate method of measurement. This is illustrated in Figure 2. To determine the curve radius, measure a chord of any convenient length (usually 100 feet), straight across from one point on the edge of the road to another point on the edge of the road within the curve (line AB in Figure 2) where the curvature is uniform. Also measure the middle ordinate from the center of the chord to the edge of the road (line CD in Figure 2). The radius of the curve can be calculated as:

$$R = \frac{l^2}{8h} + \frac{h}{2}$$

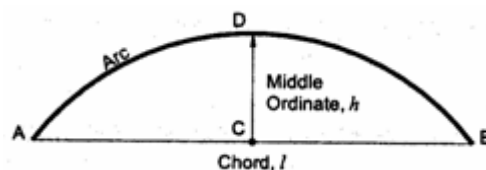
Where: R = Curve radius (feet)

l = Chord length (feet)

h = Middle ordinate (feet)

The precision of this calculation is obviously limited by the ability to accurately measure the middle ordinate which would be as small as 1.25 feet (assuming a chord of 100 feet) for a curve with a radius of 1000 feet.

Figure 2. Measurement of Curve Chord and Middle Ordinate



(Source: Northwestern University Center for Public Safety)

The super elevation can be measured in the field using a 4-foot carpenter's level. As illustrated in Figure 3, position the level across the lane. With one end of the level on the road surface, measure the vertical distance from the road surface to the other end of the level. The cross slope of the roadway can then be calculated as the vertical distance divided by the length of the level. The super elevation *should* be measured in several locations along the curve, since it *may* vary. Also, the super elevation *should* be measured separately for each lane of the roadway.

Figure 3. Measuring Super elevation with a Carpenter's Level
(Source: Northwestern University Center for Public Safety)



Another method for determining the super elevation in the field is to stop a vehicle equipped with a ball-bank indicator (discussed in the next section) on the curve and read the degrees of deflection on the ball-bank. The super elevation is calculated as:

$$e = (\tan D) \times 100\%$$

Where: e = Super elevation (%)

D = Degrees of deflection on ball-bank indicator

Again, this measurement *should* be made at several locations within the curve, and *should* be measured separately for each lane.

Method 2: Ball-Bank Indicator Method

Advisory speeds *may* be determined in the field using a vehicle equipped with a ball-bank indicator and an accurate speedometer. The simplicity of this technique has led to its widespread acceptance as a guide to determining advisory speeds for changes in horizontal alignment. Figure 4 shows a typical ball-bank indicator.

The ball-bank indicator consists of a curved glass tube, which is filled with a liquid. A weighted ball floats in the glass tube. The ball-bank indicator is mounted in a vehicle, and as the vehicle travels around a curve the ball floats outward in the curved glass tube. The movement of the ball is measured in degrees of deflection, and this reading is indicative of the combined effect of super elevation, lateral (centripetal) acceleration, and vehicle body roll. The amount of body roll varies somewhat for different types of vehicles, and *may* affect the ball-bank reading by up to 1°, but generally is insignificant if a standard passenger car is used for the test. Therefore, when using this technique, it is best to use a typical passenger car rather than a pickup truck, van, or sports utility vehicle.

Figure 4. Ball-bank Indicator



To ensure proper results, it is critical that the following steps be taken before starting test runs with the ball-bank indicator:

- Inflate all tires to uniform pressure as recommended by the vehicle manufacturer
- Calibrate the test vehicle's speedometer
- Zero the ball-bank indicator

The vehicle speedometer *should* be calibrated to ensure proper and consistent test results. This can be done by checking the vehicle speed with a radar or laser speed meter, or by timing the vehicle over a measured distance (such as milepost spacing). Alternatively, a moving radar unit can be used to measure speed while conducting the ball-bank test runs rather than relying on the vehicle's speedometer.

The ball-bank indicator must be mounted in the vehicle so that it displays a 0° reading when the vehicle is stopped on a level surface. The positioning of the ball-bank indicator *should* be checked before starting any test. This can be done by stopping the car so that its wheels straddle the centerline of a two-lane highway on a tangent alignment. In this position, the vehicle *should* be essentially level, and the ball-bank indicator *should* give a reading of 0°. It is essential that the driver and recorder be in the same position in the vehicle when the ball-bank indicator is set to a 0° reading as they will be when the test runs are made because a shift in the load in the vehicle can affect the ball-bank indicator reading.

Starting with a relatively low speed, the vehicle is driven through the curve at a constant speed following the curve alignment as closely as possible, and the reading on the ball-bank indicator is noted. On each test run, the driver *should* reach the test speed at a distance of at least ¼ mile in advance of the beginning of the curve, and maintain the same speed throughout the length of the curve. The path of the car *should* be maintained as nearly as possible in the center of the innermost lane (the lane closest to the inside edge of the curve) in the direction of travel. If there is more than one lane in the direction of travel, and these lanes have differing super elevation rates, drive in the lane with the lowest amount of super elevation. Because it is often difficult to drive the exact radius of the curve and keep the vehicle at a constant speed (cruise-control helps to maintain a constant speed), it *may* take several test runs in each direction to more accurately determine the ball-bank reading for any given speed. On each test run, the recorder must carefully observe the position of the ball throughout the length of the curve and record the deflection reading that occurs when the vehicle is as nearly as possible driving the exact radius of the curve.

If the reading on the ball-bank indicator for a test run does not exceed an acceptable level (as indicated by the recommended criteria in Table 2), then the speed of the vehicle is increased by 5 mph and the test is repeated. The vehicle speed is repeatedly increased in 5 mph increments until the ball-bank indicator reading exceeds an acceptable level. The curve advisory speed is set at the highest test speed that does not result in a ball-bank indicator reading greater than an acceptable level.

Figure 5 is an example of a data collection form that can be used to record the results of ball-bank indicator test runs. In the example in Figure 5, test runs were started at 25 mph, with ball-bank indicator reading of about 6°. This is well below the suggested criteria of 14° for a speed of 25 mph. The speeds of the test runs were gradually increased until the speed of 35 mph gave readings of 10° to 12°. These are the highest readings attained without exceeding and the suggested criteria of 12° for a speed of 35 mph or more. This study would result in posting an advisory speed of 35 mph for both directions of travel for this curve. Several alternative field data collection and supervisor approval forms are shown in the Appendix.

Figure 5. Sample Ball-Bank Indicator Data Collection Form

| BALL-BANK INDICATOR STUDY | | | | | | |
|---------------------------------|----------------|-------------|---------------------------------------|-----------------------------|-----------------|-----------------|
| LOCATION: STATE ROUTE 43 | | | | | | |
| COUNTY: DAVIS | | | SECTION: | | | |
| POSTED SPEED (MPH): 55 | | | PAVEMENT CONDITION: DRY | | | |
| DATE: | | | VEHICLE: 2008 CHEVROLET IMPALA | | | |
| DRIVER: SEYFRIED | | | RECORDER: PLINE | | | |
| REMARKS: | | | | | | |
| DIRECTION OF TRAVEL | PHOTO LOG MILE | | SPEED (MPH) | BALL-BANK READING (DEGREES) | | |
| | START CURVE | END CURVE | | RUN 1 | RUN 2 IF NEEDED | RUN 3 IF NEEDED |
| NORTH | 8.32 | 8.65 | 25 | 6 | 7 | 6 |
| | | | 30 | 9 | 10 | 10 |
| | | | 35 | 12 | 12 | 11 |
| | | | 40 | 15 | 13 | 14 |
| SOUTH | 8.65 | 8.32 | 25 | 6 | 6 | 5 |
| | | | 30 | 9 | 8 | 9 |
| | | | 35 | 11 | 10 | 11 |
| | | | 40 | 13 | 14 | 14 |
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Method 3: Accelerometer

An accelerometer is an electronic device which can measure the lateral (centripetal) acceleration experienced by a vehicle as it travels around a curve. Typically, method 1 and 2 are used. However, if the Region has an accelerometer, this method is acceptable to use as an alternative to the ball-bank indicator method.

Establishing Advisory Speeds

Using any of the three methods noted above *should* result in the same advisory speed for a curve. It is important to reiterate that the advisory speed criteria are based on driver comfort, not safety. A sufficiently skillful driver *may* be able to traverse a curve on dry pavement at a speed considerably higher than the advisory speed without exceeding the friction capabilities of the pavement. However, most drivers would choose not to drive at a higher speed because they would experience uncomfortable levels of lateral acceleration.

The MUTCD indicates that the “advisory speed **shall** be determined by an engineering study that follows established engineering practices” (Section [2C.08](#)). The Manual further defines an engineering study as “the comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, Standards, Guidance, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. An engineering study **shall** be performed by an engineer, or by an individual working under the supervision of an engineer or sign shop supervisor, through the application of procedures and criteria established in this policy. An engineering study **shall** be documented” (MUTCD Section [1A.13](#)).

Therefore, the establishment of advisory speeds must follow standard procedures developed and adopted by the engineering personnel of an agency. All field work used for determining the advisory speeds must be performed under the supervision of an engineer or sign shop supervisor. Finally, the data collected and analysis performed must be preserved in written documentation. The Appendix contains a sample curve advisory speed study supervisor approval form that can be used to document the field data collection.

The maximum comfortable operating speed on a curve can be determined using any of the three methods discussed above (design speed equation, ball-bank indicator, or accelerometer). The advisory speed for the curve *should* be set at the 5-mph increment nearest to this maximum comfortable speed. The advisory speed to be posted *should not* be arbitrarily reduced below the comfortable speed determined using these methods, because an unrealistically low advisory speed will lose credibility among drivers, and create inconsistencies that *may* lead drivers into traveling at too high a speed through other curves.

Advisory speed plaques are only used in conjunction with appropriate warning signs, and never alone. Turn, Curve, Reverse Turn, Reverse Curve, and Winding Road signs are used in locations where it is desirable to warn drivers of changes in the horizontal alignment of the roadway. The MUTCD indicates that the use of Turn or Reverse Turn signs *should* be limited to changes in alignment where the advisory speed is 30 mph or less. The Curve or Reverse Curve signs are intended for use where the advisory speed is greater than 30 mph.

Where a Reverse Curve warning sign or a Winding Road warning sign is used, the advisory speed *should* be based on the curve with the lowest comfortable operating speed. However, if one curve in the series has a dramatically lower comfortable speed, it would be desirable to place a separate warning sign with the appropriate advisory speed for that individual curve.

In some cases, there *may* be other factors that influence the selection of the advisory speed in addition to the comfortable operating speed on the curve. Available sight distance or deceleration distance (on an exit ramp) *may*, in some cases, require an advisory speed lower than the comfortable operating speed for the curve.

Truck Advisory Speeds

The appropriate warning signs for truck rollover concerns require more than just determination of truck advisory speeds. Large trucks, tank trailers and truck freight trailers have a high center of gravity and are susceptible to rollover crashes on a sharp curve. The loop ramps on freeway interchanges and direct freeway-to-freeway connections are sometimes subject to truck rollover problems. The potential for such crashes *may* increase because of radius of horizontal curvature, inadequate deceleration length or deficient specific signing. Truck rollover theoretically can occur when the lateral acceleration exceeds 0.30, but no calculated lateral acceleration less than 0.35 has been determined in any truck rollover collisions. A Ball Bank reading of 10 degrees (side friction = 0.17) be used to provide a reasonable factor of safety. This value is about half the critical side friction factor accommodating those occasions where the truck *may* exceed the posted truck advisory speed or the truck travels a curve radius that is less than the actual roadway curvature. These criteria will generally produce a truck advisory speed that is approximately 5 mph less than the advisory speeds determined for passenger cars, except for the lower speed ranges.

The MUTCD, Section [2C.13](#), Section [2C.14](#) and Table [2C-5](#) (Figure 1 of this policy), covers the use of the Truck Rollover Warning sign (W1-13), Advisory Exit Speed sign (W13-2), and the Advisory Ramp Speed sign (W13-3). The application of these signs **shall** be based on an engineering study that considers the roadway and operational characteristics that *may* contribute to a loss of vehicle control and potential truck rollovers. It is suggested that the engineering study for Truck Rollover Warning signs address the following considerations;

1. Speed data and advisory speed determinations.
2. Traffic characteristics.
3. Roadway geometrics.
4. Recommended traffic control devices.

It *should* be noted that any posted Advisory Speed for the Truck Rollover signing *should* reflect the truck advisory speed determination. The MUTCD provides a number of other devices that can be used in conjunction with the above signs to address truck rollover consideration such as:

- Chevron Alignment signs (W1-8)
- Combination Horizontal Alignment/Advisory Speed sign (W1-1a and W1-2a)
- One Direction Large Arrow sign (W1-6)
- Combination Horizontal Alignment/Advisory Exit and/or Advisory Ramp Speed Signs (W13-6 and W13-7).

See [TEOpS 2-3-36](#) for policies related to exit advisory speed signage.

Additionally, the warning can be enhanced with enlarged signing, a TRUCK header panel, or flashing beacons. The traffic engineering study *should* address the recommended signing for the specific field conditions.

POLICY

FIELD REVIEW OF CURVES AND TURNS

1. The setting of advisory speeds on existing curves and turns *should* be performed by the ball-bank indicator method for existing roadways utilizing Table 2 above.
2. The Accelerometer (Method 3) *may* be used as an alternative to the ball-bank indicator for Regions that

have this device.

3. For ramps that have problems with truck rollovers and/or have the tippy truck signs installed, the truck ball bank reading of 10 degrees *should* be used.
4. For new construction, the design speed chart (Table 3) noted above *may* be used where the super elevation and radius are known.

Curve signing determined on the basis of calculated values *should* always be verified in the field by the ball bank method.

SIGNING IMPLEMENTATION

1. For consistency of motorist expectation, signing field changes *should* be organized where entire routes are done at approximately the same time. Breakpoints *should* occur in the route at locations where the highway travels through a community that has a speed zone reduction.
2. Signing field changes *should* be incorporated into improvement projects as much as possible. Roadway segments on each side of the improvement project *should* terminate at a STH/STH or municipal limit breakpoint.
3. Table [2C-5](#) in the MUTCD (see Figure 1 of this policy) **shall** be utilized in the determining the proper treatment of horizontal alignment sign(s).
4. For advisory speed reductions of 25 mph or greater, chevrons (W1-8 signs) *should* be used. For these advisory speed reductions, a night arrow (W1-6 sign) *may* be used to supplement the chevrons for advisory speed reductions of 25 mph or greater.
5. For advisory speed reductions that are greater than 5 mph and less than 25 mph, the usage of the night arrow (W1-6 sign) is the first choice of sign that *should* be used. For these advisory speed reductions, chevrons (W1-8 signs) are typically used in locations where there are demonstrated problems.
6. For a Winding Road (W1-5 sign)/Advisory speed (W13-1 sign) application, where night arrows (W1-6 signs) and/or chevrons (W1-8 signs) are required on specific curves, the first curve in the series **shall** be signed with the night arrow and/or chevrons. Subsequent curves in the winding road series **shall** be signed with night arrows and /or chevrons if recommended/required by Table [2C-5](#) in the MUTCD (see Figure 1 of this policy).
7. For a Reverse Curve (W1-4 sign)/Advisory speed (W13-1 sign) application, the curves in the series **shall** be signed with night arrows and /or chevrons if recommended/required by Table [2C-5](#) in the MUTCD (see Figure 1 of this policy).
8. Turn warning signs **shall** be used where advisory speeds have been determined to be 30 mph or less.
9. Regulatory speed limit signs are normally not posted on ramps. For application of warning signs on service interchange ramps (non-freeway to freeway), relative to MUTCD Table [2C-5](#), a 10-mph reduction from the mainline posted speed should be used.
10. Each direction on the roadway should be evaluated independently of the other direction in the determination of the proper horizontal alignment signing.

PHASE IN COMPLIANCE

- In order to allow for resources to make the changes to the advisory speeds, the following **shall** apply:
- When signing is replaced with an improvement project, the advisory speeds **shall** be established based on the new policy. This can either be accomplished by one of the methods noted in this policy.
- For other sections of roadway, the changes **shall** be made for an entire segment of highway between two cities, towns or villages. Curve and turn advisories *should not* be changed for one isolated location; rather for an entire segment between communities or within a county.
- Phase in period – December 31, 2019 (MUTCD Compliance Date).

ACKNOWLEDGMENTS

NCUTCD – Regulatory and Warning Signs Technical Committee and Task Force and Bob Seyfried, Northwestern University Center for Public Safety.

REFERENCES

1. Guidelines for the Determination of Advisory Speeds (NCUTCD Task force from the Regulatory and Warning Signs Technical Committee.)
2. *Manual on Uniform Traffic Control Devices for Streets and Highways*, Public Road Administration, Washington, D.C., August 1948, page 39 and 53.
3. Paul J. Carlson and John M. Mason, "Relationship Between Ball Bank Indicator Readings, Lateral Acceleration Rates and Vehicle Body-Roll Rates", *Transportation Research Record 1658*. Washington DC: Transportation Research Board, January 1999.
4. *A Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials, Washington, D. C., 2004.
5. R. Milstead, X. Qin, B. Katz, J. Bonneson, M. Pratt, J. Miles, and P. Carlson, "Procedures for Setting Advisory Speeds on Curves, Federal Highway Administration, Washington D.C., 2011.

APPENDIX

SAMPLE FIELD DATA COLLECTION FORMS

1. Curve Advisory Speed Calculations
2. Ball-Bank Indicator Test Supervisor Approval
3. Ball-Bank Indicator Study Form
4. Ball-Bank Indicator Test Summation
5. Curve Advisory Speed Determination Field Data Sheet

Advisory Speed Approval

Jurisdiction: _____

Location: _____

From: _____ **to:** _____

Project No. /Title: _____

Advisory Speed Study Attached:

Ball Bank Indicators Study _____ **Date:** _____

Speed Formula Calculations _____ **Date:** _____

Accelerometer Readings _____ **Date:** _____

Completed By: _____ **Date:** _____

Study Approval:

Name: _____ **Title:** _____

Date: _____

**Curve Advisory Speed Calculations
Method # 1**

Sheet ___ of ___

Completed By: _____ Date: _____

Jurisdiction: _____

Location: _____

From: _____ To: _____

Project No. /Title: _____

$$V = \sqrt{15R(0.01e + f)}$$

| DIRECTION OF TRAVEL | CURVE BEGIN STA. | CURVE END STA. | CURVE RADIUS (ft) | SUPER-ELEVATION (%) | SIDE FRICTION | ADVISORY SPEED (mph) | WARNING SIGN |
|---------------------|------------------|----------------|-------------------|---------------------|---------------|----------------------|--------------|
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Remarks: _____

Study Approval:

Name: _____ Title: _____

Date: _____

| BALL-BANK INDICATOR STUDY | | | | | | |
|---------------------------|----------------|--------------|---------------------|-----------------------------|--------------------------|--------------------------|
| LOCATION: | | | | | | |
| COUNTY: | | | SECTION: | | | |
| POSTED SPEED (MPH): | | | PAVEMENT CONDITION: | | | |
| DATE: | | | VEHICLE: | | | |
| DRIVER: | | | RECORDER: | | | |
| REMARKS: | | | | | | |
| DIRECTION OF TRAVEL | PHOTO LOG MILE | | SPEED (MPH) | BALL-BANK READING (DEGREES) | | |
| | START CURVE | END CURVE | | RUN 1 | RUN 2 IF NEEDED | RUN 3 IF NEEDED |
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**BALL BANK INDICATOR TEST SUMMATION
(OPTIONAL)**

Jurisdiction: _____ Date: _____

Location: _____

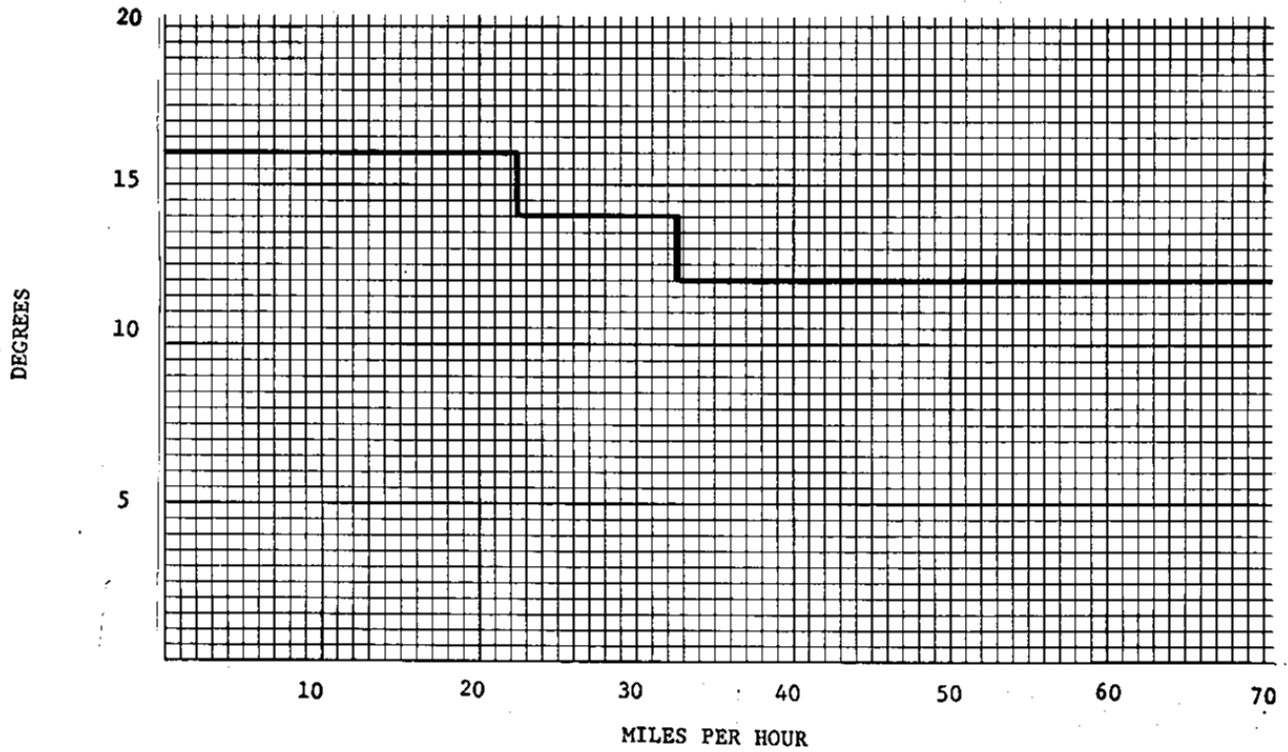
Weather: _____ Road Surface: _____

Driver: _____ Recorder: _____

Vehicle: _____ Posted Speed Limit: _____

Direction: _____ Begin Curve: _____ End Curve: _____

Show each vehicle test run as a dot on the graph



SUMMARY FOR A SECTION OF ROADWAY

| CURVE ADVISORY SPEED DETERMINATION FIELD DATA SHEET | | | | | | | | | | |
|--|-----------------|----|------------|-----------|----------------------------|-------------------|----------------------|-------------|--------------------|------|
| Highway: | | | | | County: | | | | | |
| Section: | | | | | Date: | | | | | |
| Posted Speed (mph): | | | | | Pavement Condition: | | | | | |
| Vehicle: | | | | | Driver/Recorder: | | | | | |
| Remarks: | | | | | | | | | | |
| BALL BANK READINGS: 12 degrees for speeds of 35 mph or more 14 degrees for speeds of 25 to 30 mph 16 degrees for speeds of 20 mph or less | | | | | | | | | | |
| Direction of Travel | Curve Direction | | Beg. Curve | End Curve | Tangent Length | Ball Bank Reading | Advisory Speed (mph) | | Curve Warning Sign | |
| | LT | RT | MP | MP | Miles | Degrees | Current | Recommended | Sign No. | Size |
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2-3-36 Ramp Warning Signs August 2009

PURPOSE

The MUTCD in Section [2C.36](#) sets forth standards for Exit, Ramp and Curve advisory speed signs, which *may* be used to advise motorists of the maximum recommended speed on a ramp. In usual practice, the speed and condition warned of is just beyond the gore of the ramp. Other guidance in 2C.36 indicates that where additional advisory speed indication is needed on the ramp well beyond the gore area, a standard warning sign with an ADVISORY SPEED plaque (W13-1) is to be used.

To provide for the uniformity of the application of the EXIT, RAMP, and CURVE advisory speed signs, the following use and application guidelines are prescribed where ramp speed control is determined to be necessary.

The MUTCD, Table [2C-4](#), provides advanced placement distances for EXIT, RAMP, and CURVE advisory speed signs along with other warning signs such as STOP AHEAD, YIELD AHEAD, SIGNAL AHEAD and ROUNDABOUT AHEAD. This is determined by the posted or 85th percentile speed and then using Table [2C-4](#) in the MUTCD to determine the appropriate sign placement distance. Oftentimes for ramps there is no posted speed and speed studies are not normally performed. Utilization of the posted speed on the mainline roadway instead can result in an unreasonable placement distance that is too far back and the sign *may* end up on the mainline roadway, especially for shorter exit ramps. Ultimately, this can lead to inconsistencies in sign placement. Guidance is necessary for the placement of these signs.

POLICY

STOP AHEAD (W3-1), YIELD AHEAD (W302), SIGNAL AHEAD (W3-3) AND ROUNDABOUT AHEAD (W2-6 and W2-6P) Signs

The following methods *may* be utilized to determine the appropriate placement of STOP AHEAD, YIELD AHEAD, SIGNAL AHEAD and ROUNDABOUT AHEAD warning signs on ramps. Table [2C-4](#) *should* be used for placement of the signs.

1. Assumption of a 10 mph reduction from the mainline speed for the placement of the signs.
2. For ramps of a short length (where utilization of [Table 2C-4](#) cannot be met), placement of the signs *should not* exceed a distance of 50 feet upstream of the EXIT gore sign (E5-1 or E5-1A).

EXIT Advisory Speed Sign (W13-2)

The EXIT SPEED sign will normally be used at:

1. Off-ramps on freeways and expressways when the ramp connects to a conventional state trunk highway or local crossroad.
2. Ramp connections between freeways where the guide signing establishes that the ramp is an exit. The EXIT DIRECTION sign will have an exit number panel. Ramps between freeways, which are not identified with an exit number on the EXIT DIRECTION sign *should* be signed with a CURVE or TURN sign with appropriate advisory speed when reduced speed is necessary.

The following methods *may* be utilized to determine the appropriate placement of EXIT ADVISORY SPEED signs. MUTCD Table [2C-4](#) *should* be used for placement of the signs.

1. Assumption of a 10 mph reduction from the mainline speed for the placement of the signs.
2. Utilization of a ball bank indicator or design speed equation, shown in [TEOpS 2-3-35](#), to determine the start of curvature and the appropriate exit speed.

Modified EXIT ADVISORY SPEED Signs (W13-2A and W13-2B)

The modified exit advisory speed signs (see Figures 1 and 2) *may* be used at the following locations, provided the following criteria are met:

1. For advisory speeds of 30 mph or less for off-ramps on freeways and expressways or ramp connections between freeways where the guide signing establishes that the ramp is an exit.
2. Existing locations where there are run-off-the-road crashes as a result of a sharp horizontal alignment. The signs *may* also be installed in new locations that are perceived to be potential problem areas. The usage of signs in new locations **shall** be approved by the Region Traffic Engineer.

RAMP ADVISORY SPEED Sign (W13-3)

The RAMP ADVISORY SPEED sign will normally be used at:

1. Ramps along freeways or expressways that provide access to safety rest areas, scales, scenic outlooks and tourist information centers where traffic must return directly to the freeway or expressway upon leaving the facility.
2. Ramps from local roads or conventional state trunk highways serving as connections to freeways or expressways, or to other conventional highways.

CURVE ADVISORY SPEED Sign (W13-5)

The CURVE ADVISORY SPEED sign (W13-5) **shall not** be used on WisDOT roadways. For curve delineation on ramps, the standard curve warning sign (W1-2L or W102R) with ADVISORY SPEED plaque (W13-1) *should*

be used. The standard curve warning sign with advisory speed plaque gives motorists more positive guidance as to the direction of the curve versus the W13-5 sign.

General Criteria

In accordance with directions prescribed in Section [2C.36](#), the EXIT SPEED or RAMP ADVISORY SPEED sign *should* be posted along the deceleration lane. Final locations *should* be carefully established which are devoid of visual conflicts with other signs or physical roadway elements, such as bridge columns. Practically, the sign locations *should* be midway along the deceleration lane, but moved closer to the beginning of the ramp taper for conditions requiring significant reductions in speed. The distance values of Table [2C-4](#), Condition B, for general warning sign placement suggest desirable minimum values, but will have to be modified in order to keep the sign “along the deceleration lane” and far enough away from the EXIT DIRECTION signs to avoid its being hidden or obscured. Approach speeds *may* be assumed to be the posted speed limit.

Figure 1. W13-2A Sign

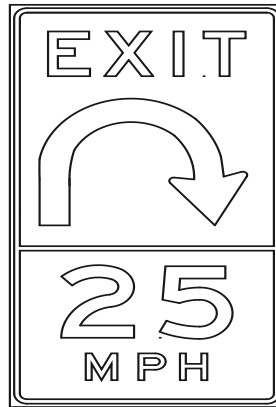
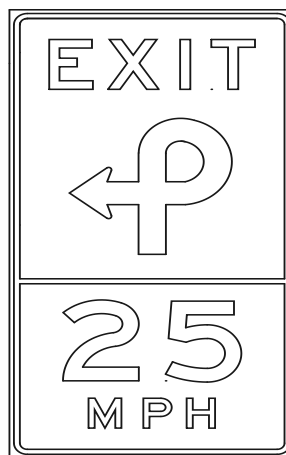


Figure 2. W13-2B Sign



2-3-38 NO PASSING ZONE Signs

April 1996

NO PASSING ZONE (W14-3) signs **shall** be placed at the beginning of all no passing zones whether for sight restrictions, narrow bridges, passing lanes, divided highway and approaches or intersections except as provided below. In making the pennant mandatory on state trunk highways in the early 1970s, it was the intent of the administration that they *should* be installed at all zones, including barrier lines at intersections. This is implied in a memo to all Regions on April 18, 1973.

Where a no passing zone related to sight conditions occurs at a stop sign-controlled or signal-controlled intersection, the zone will be broken for the intersection and resume on the other side. The continuation of the zone beyond the intersection does not require another W14-3 to be installed.

In communities where the state trunk highway is maintained by the Department, it is not necessary to install W14-3 signs at the beginning of no passing zones or barrier lines that occur within speed zones of 35 mph or less.

2-3-40 Trail Crossing Signs**September 2010****PURPOSE**

This policy provides guidance on the use of TRAIL CROSSING signs where emphasis is needed to alert motorists of recreational vehicles crossing highways. In order for a trail crossing to be signed under this policy, the trail itself must be federal, state, or locally authorized and open to the public.

TRAIL CROSSING signs covered under this policy include the following signs:

1. SNOWMOBILE CROSSING (W11-6) sign
2. BICYCLE CROSSING (W11-1) sign
3. EQUESTRIAN CROSSING (W11-7) sign
4. BRIDLE PATH sign (W11-56) sign
5. TRAIL CROSSING, symbol message (W11-15) sign*
6. TRAIL CROSSING, word message (W11-15a) sign**

*The TRAIL CROSSING symbol message (W11-15) sign is normally used to sign trails that have predominantly pedestrian and bicycle usage.

**The TRAIL CROSSING word message (W11-15a) sign is normally used to sign trails that have other groups using the trail in addition or besides pedestrian and bicycle usage.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separations at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

POLICY

1. Trail crossing signs are not permitted on freeways.
2. Trail crossing signs **shall** be installed for all 65 mph expressway trail crossings, whether there is a sight restriction or not. This only applies to non-intersection crossings on 65mph expressways (see Item 4 below).
3. Trail crossing signs *may* be placed on all other highways provided there is deficient sight distance per Section 2c.46 of the MUTCD. Sections [2C-49](#) and [50](#) of the MUTCD also give additional criteria when trail crossing signs *may* be desirable.
4. Trail crossing signs *may* also be used to alert motorists to unexpected entries of recreational vehicles, pedestrians or bicyclists in the roadway.
5. Trail crossing signs *should* only be used for non-intersection crossings. There *may* be extreme cases where there is a demonstrated crash history or site problems at intersections that would warrant trail crossing signs in addition to the crossroad or side road warning signing.
6. STOP signs (18" x 18") are required on the recreational trail per the [Wisconsin DNR trails handbook](#) and they are required per the MUTCD for any shared-use path where bicyclists are required to stop. The trail owner **shall** install the STOP signs on the recreational trail prior to the installation of the trail crossing warning signs on the roadway.
7. Because the trail STOP signs are in the STH right-of-way, the Region **shall** issue a permit, in form of a letter, to the trail owner for the placement of the STOP signs on the trail. The permit *should* make it clear that the trail owner is responsible for the initial installation and long-term maintenance of the signs.

2-3-41 Deer Crossing Signing**August 2009****GENERAL**

Deer crashes have been one of the highest crash types on state highways in recent years. There are a number of factors which *may* influence the deer crash rate, including herd population, herd migration, herd location, roadside vegetation management, roadway factors (speed limits, lighting, etc.), driver education, use of deer crossing deterrent devices (reflectors, scent boxes, vehicle whistles, wildlife underpasses, etc.), active warning devices such as motion detectors/warning light or static warning signs. Traditionally, static warning signs have been installed in areas with higher deer-vehicle crashes (DVCs). There has been much debate over the usage of static deer crossing signs and their effectiveness. Many transportation professionals recognize the fact that

warning signs are most effective *result in alteration of speed and/or path choice) when there is an obvious danger ahead (example would be curve or turn). The use of warning signs that alert drivers to sporadic or general possibilities *deer crossing and slow children moving signs) have been shown to not have a consistent impact on driver behavior. The widespread use or sign proliferation also reduces the effectiveness of the sign and leads to driver disregard. Several states and agencies have performed studies to assess the effectiveness of static deer crossing warning signs. The studies have concluded that the usage of static deer crossing warning signs do not generally reduce vehicle speeds (one measure of warning sign effectiveness). As a result, the studies have yielded no reduction in DVCs.

SUPPORTING DOCUMENTATION

Static sign studies have been performed by the following states and/or agencies:

1. *Assessing the Effectiveness of Deer Warning Signs*. Published by Kansas Department of Transportation and University of Kansas at Lawrence, April 2006,
2. *Wildlife—Vehicle Collision and Crossing Mitigation Measures: A Toolbox for the Montana Department of Transportation*. Published by Montana Department of Transportation and Montana State University, May 2007.
3. *An Ecological Landscape Study of Deer-Vehicle Collisions in Kent County, Michigan*. Published by Kent County Road Commission and White Water Associates, Inc., January 2004.
4. *Deer Crossing Signs and Technologies*. Published by Deer-Vehicle Crash Information Clearinghouse (DVCIC), Maintained by Texas Transportation Institute, www.deercrash.com
5. *Deer Signs Research Study*. Published by Minnesota Department of Transportation and University of Minnesota, www.lrrb.gen.mn.us/pdf/200413.pdf

Several dynamic types of deer crossing signs are currently being explored as potential countermeasures and are discussed in the studies listed above. These types of signs have been designed to activate when deer are detected near the roadway. Studies are taking place in Indiana, Minnesota, Montana, Pennsylvania, Utah and Washington. The development of methods to control car/deer collisions is continuing to evolve, and over time policies such as this will be subject to change. At present, due to funding limitations, WisDOT is not utilizing dynamic deer crossing warning sign systems. However, WisDOT is periodically reviewing studies from other states and municipalities as they progress. WisDOT will consider issuing a permit to an entity to pursue the usage of dynamic deer crossing signs.

One effective countermeasure pointed out in the Kansas study is the usage of public awareness techniques to educate the motoring public regarding the seasonal and time of day characteristics of deer-vehicle crashes. This could be accomplished effectively through the different types of media outlets.

POLICY

Based upon the findings of various studies mentioned above, WisDOT will implement the following policy for usage of static deer crossing warning signs:

1. No new static deer crossing warning signs will be installed on state highways.
2. Static deer crossing signs that are currently in place will be allowed to remain until the end of their useful life or when opportunities for removal are available. These opportunities would include sign knockdowns and improvement projects.

2-3-43 Parallel On-Ramp Lane Reduction Signing

July 2012

BACKGROUND AND PURPOSE

At some interchange locations, long parallel (acceleration) entrance ramps are constructed to allow vehicles ample distance to get up to the mainline travel speeds, thus helping to eliminate slowing down of the mainline traffic. Questions have arisen as to whether warning signs, such as the LANE ENDS symbol (W4-2 sign). The MUTCD, Section [2C-42](#) states that LANE ENDS signs *should not* be installed in advance of the downstream end of an acceleration lane. It *should* also be noted that the MUTCD, Section [2C-42](#) states that a LANE ENDS sign *may* be installed on a freeway entrance ramp. These would be cases where the signs would be beneficial by exercising engineering judgment in certain locations. In absence of specific guidance in the MUTCD, this policy will provide additional guidance as to where the LANE ENDS sign *may* be utilized for long parallel entrance ramps.

GUIDELINES

The following is guidance relating to the usage of the LANE ENDS (W4-2) sign on long parallel (acceleration)

ramps:

1. Issues with motorists not realizing that the entrance ramp is not a mainline or auxiliary exit lane. This could be exhibited by last-minute merge movements or braking.
2. Slowing down and last of mainline traffic caused by last-minute lane changes.
3. Crash issues relating to the last-minute, quick lane changes or braking.
4. The LANE ENDS (W4-2) sign *should not* be used on all parallel entrance ramps. Parallel entrance ramps should be evaluated on a case-by-case basis.
5. Parallel entrance ramps that have been previously signed *should* be evaluated as opportunities permit (improvement projects, routine sign replacements, knockdowns, etc.). This *should* be done prior to removing any signs. Any parallel entrance ramps not meeting the above guidance criteria *should* have the LANE ENDS (W4-2) sign removed.

2-3-45 Icy Bridge Deck Signing

April 1989

GENERAL

The Regional Traffic Engineer *may* use the BRIDGE MAY BE ICY (W8-64) sign on bridges which display problems caused by the formation of ice.

The use of the BRIDGE MAY BE ICY sign **shall** be based on Region discretion. The Region can be aided in this decision by checking with local maintenance and law enforcement officials to see if an ice problem exists at a bridge site. The Region can also analyze crash rates at the bridge site that are based on ice.

The WATCH FOR ICE ON BRIDGE sign **shall** no longer be used. The existing WATCH FOR ICE ON BRIDGE signs *should* be replaced as they wear out.

2-3-49 Determination of Sight Distance for Warning Signs

June 2015

PURPOSE

The MUTCD provides guidance for the installation of several types of vehicular and non-vehicular warning signs. Some of these signs include the SCHOOL BUS STOP AHEAD, SNOWMOBILE CROSSING, fire truck, side road and crossroad warning signs. The MUTCD states that many of these types of warning signs *should* be used where the road user's sight distance is restricted, or the condition, activity or entering traffic would be unexpected.

The May 25, 2011, MUTCD Section [2C.46](#), provides additional guidance regarding proper sight distance in determining the need for a warning sign. This table on minimum visibility distances references Table 9-6, pages 9-38 (intersection sight distance—left turn from stop) of the [AASHTO Standard Highway and Street Design Manual](#). This table provides an added factor of safety beyond the traditional stopping sight distances.

It *should* be noted that the minimum visibility table shown below is just for determination if the warning sign is needed. These are not sign placement criteria. Sign placement criteria is provided in MUTCD Table [2C-4](#).

| Minimum Visibility Distance | |
|---|--|
| <u>Posted or 85th Percentile Speed</u> | <u>Minimum Visibility Distance (ft.)</u> |
| 25 MPH | 280 |
| 30 MPH | 335 |
| 35 MPH | 390 |
| 40 MPH | 445 |
| 45 MPH | 500 |
| 50 MPH | 555 |
| 55 MPH | 610 |
| 60 MPH | 665 |
| 65 MPH | 720 |
| 70 MPH | 775 |

One question that has been commonly asked is "What are the acceptable field methods that can be utilized to determine the actual minimum visibility distance in order to provide accuracy and consistency?" Listed below are several guidelines that *may* be utilized to assist in this effort and to provide for a consistent application statewide.

GUIDELINES

Cone Method (Preferred)

1. A 28" height cone *should* be used as a target at the location of the hazard (i.e. snowmobile crossings, pedestrian crossings and school bus stops). In lieu of a 28" height cone, a mailbox or other alternative methods approved by the Region *may* be used as a target.
2. Set the Distance Measuring Instrument (DMI) when the entire cone is first visible and measure the distance to the cone.

Vehicle Visibility Method (Optional)

1. For the installation of side road and crossroad warning signs, park on the side road and determine where mainline vehicle is first visible. Measure the distance between the mainline vehicle and the side road vehicle to determine minimum visibility distance.
2. An optional method that *may* be used is to park at the intersection or crossing and count the seconds, starting when the mainline vehicle is first visible and equate the time to a distance. For example, at 60 mph, a vehicle travels approximately 88 feet per second. Therefore, at a minimum visibility distance of 665 feet, it would take 8 seconds for the vehicle to reach the intersection or crossing.

2-3-50 Horse Drawn Vehicles

January 2003

GENERAL

The use of highways by horse drawn vehicles is a common activity of some farming religious sects active in several regions of the state. These low-speed vehicles traveling on the roadway proper or on the shoulder introduces some hazards which are magnified because of the frailty of the horse drawn vehicles and the vulnerability of the occupants and the horse. In view of the potential for injury, HORSE DRAWN VEHICLE (W11-12) signs *should* be installed at locations which satisfy the following conditions:

1. The usage of the segment of the state trunk highway by horse drawn vehicles is on a frequent or recurring basis.
2. To the satisfaction of the region, the farmer(s) are using the state trunk highway only where other routes are not available or otherwise not safe or attractive. The Region *should* get input from the local highway and law enforcement officials and *should* make an effort to try and convince the religious sects to drive their horse drawn vehicles on the shoulder and not in the travel lane.
3. The Region *should* consider the shoulder width and configuration (i.e. rumble strips, etc.) and sight distance of the roadway in their decision on whether to sign the roadway.

Each segment being used *should* be identified by the Region and/or County Highway Safety Committee and HORSE DRAWN VEHICLE signs **shall** be posted at the beginning of the segment. The Region has the option of adding the NEXT XX MILES (W57-5 1) sign to the HORSE DRAWN VEHICLE sign. The HORSE DRAWN VEHICLE sign **shall** be placed after every major intersection, such as a STH or CTH intersection.

The Region *should* be alert for discontinuance of usage and remove the signs under that condition.

2-3-51 Pedestrian Crossing Warning Signs

February 2018

PURPOSE

The MUTCD provides general guidance for the installation of pedestrian related warning signs. These signs are considered to be the W11-2 (pedestrian crossing sign), W11-9 (wheelchair crossing sign) and the S1-1 (school crossing sign assembly).

There are some standards and guidance contained in the May 25, 2011 MUTCD. However, there are several undocumented state practices involving the application of these types of signs. There is a need to encompass the guidance and standards from all of these resources into a single document that will be able to assist the practitioner and provide for a consistent statewide application.

POLICY

Pedestrian Crossing Signs

1. Pedestrian crossing signs *should* be used where there are higher volumes of pedestrian activity and at mid-block crossings where crossings are unexpected or the visibility distance, as defined in MUTCD section [2C.46](#) is deficient. Pedestrian crossings signs *may* be used at unsignalized and non-stop control

- intersections.
2. The Pedestrian Crossing Sign with AHEAD plaque (W16-9P) *may* be used in sight deficient areas where pedestrians walk along the edge of the roadway.
 3. Crosswalk Locations
 - a. A Pedestrian Crossing Sign *may* be installed in locations without a crosswalk.
 - b. On state highways, crosswalks are maintained by the local unit of government by permit ([DT 2136 form](#)).
 - c. A crosswalk *may* be installed without a pedestrian crossing sign for roadways with posted speeds of 40 mph or less.
 - d. For roadways with posted speeds of 45 mph or higher, new marked crosswalks alone, without other measures to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, *should not* be installed across uncontrolled roadways (see MUTCD, Section [3B.19](#), paragraph 09).
 4. Pedestrian Crossing Signs located on WisDOT maintained roadways, **shall** be installed and maintained by WisDOT.
 5. Pedestrian Crossing Signs **shall not** be utilized at a signalized or stop controlled intersection. The Wheelchair Crossing Sign *may* be used at a signalized or stop controlled intersection.
 6. Pedestrian Crossing Signs *may* be used at an unsignalized right turn bypass. Another option at an unsignalized right turn bypass is to utilize the Yield Here to Pedestrians (R1-5 sign) at the crosswalk location.
 7. The Pedestrian Crossing Sign (W11-2) and arrow plaque (W16-7L/R) **shall** be placed at the point of crossing.
 8. For roadways with posted speeds of 45 mph or greater, the Pedestrian Crossing Sign (W11-2) with ahead plaque (W16-9P) **shall** be installed in advance of the crossing.
 9. For multiple pedestrian crossings that are close together on roadways with posted speeds that are lower than 45 mph, the Pedestrian Crossing Sign (W11-2) with ahead plaque (W16-9P) *may* be used in lieu of signs at the point of crossing.
 10. The W11-15 or W11-15a, Recreational Trail Crossing sign **shall** follow the parameters listed above similar to the W11-2 Pedestrian Crossing Sign.
 11. The W11-9 Wheelchair Crossing Sign **shall** follow the parameters listed above similar to the W11-2 Pedestrian Crossing Sign, with the exception that it *may* be used at signalized and stop controlled intersections.

School Crossing Signs

1. School Crossing Signs *may* be used at signalized controlled intersections.
2. Regardless of posted speed, the School Crossing Assembly (S1-1 sign with S16-7L/R plaque) **shall** be installed at every crossing. If two crossings are at one intersection (far side and near side), both crossings do not need to be signed.
3. For multiple School Crossings, the advance warning sign is not required in advance of every crossing.
4. Engineering Judgment should be utilized to determine if the advance sign is required in advance of each crossing in a series.
5. For placement of School Crossing signs, refer to [TEOpS 2-3-54](#).

2-3-54 School Area Signing

February 2018

PURPOSE

The MUTCD has expanded the usage of signing for school areas. This policy will summarize the standards and guidance contained in [Part 7](#) of the MUTCD and will address three specific applications of School Area signing on the state highway system. This policy pertains to signing on conventional highways and expressways.

BACKGROUND

[Part 7](#) of the MUTCD and [Wisconsin State Statute 118.08](#) provide support for the guidelines listed in this policy.

POLICY FOR SCHOOL AREA SIGNING

The installation of School Area signing on the State Highway System can be addressed with three different types of applications:

1. School Zone Signing. School Zones are school areas that would include buildings and/or grounds that

border the roadway, but would have no specific crossing. The grounds may or may not have fencing. "School grounds" refers to public and private schools and their surrounding grounds where any of grades K through 12 are regularly taught during the normal school year.

- a. The S1-1 School Warning sign **shall** be installed in advance of the school grounds at the prescribed warning sign distance outlined in MUTCD Table [2C-4](#).
 - b. The supplemental S16-9P AHEAD plaque **shall** be installed under the S1-1 School Warning sign.
 - c. The R2-6P FINES HIGHER plaque **shall** be installed under the School Zone assembly (S1-1 Sign with S16-9P plaque).
 - d. The END SCHOOL ZONE (S5-2 Sign) **shall** be installed at the end of all school zones and areas. If there is a regulatory speed limit at the end of the school zone or area, the END SCHOOL ZONE (S5-2) sign should be mounted under the R2-1 sign. The mounting height of the END SCHOOL ZONE sign mounted under a speed limit sign should be 4' to the bottom of the secondary sign or 5' to the bottom of the lowest plaque in urban areas where there are pedestrians or parked cars.
2. School Advance Crossing Signing. The School Advance Crossing Signing is used to warn motorists that they are approaching a crossing where school children are present. The crossing may be in the same roadway where the school is located or may be on a neighboring roadway, based on the school's master plan of the school routes.
- a. The S1-1 School Warning sign **shall** be installed in advance of the school grounds at the prescribed warning sign distance outlined in MUTCD Table [2C-4](#).
 - b. The supplemental S16-9P AHEAD plaque **shall** be installed under the S1-1 School Warning sign.
 - c. The R2-6P FINES HIGHER plaque **shall** be installed under the School Zone assembly (S1-1 Sign with S16-9P plaque). The mounting height should be 4' to the bottom of the lowest plaque or 5' to the bottom of the lowest plaque in urban areas where there are pedestrians or parked cars.
 - d. If the school crossing is located on a cross street in close proximity to the turning motorist, the S16-6P Advance Direction Arrow should be used in lieu of the S16-9P AHEAD plaque.
3. School Crossing Signing. The School Crossing signing is used at the location where the school children cross the roadway. Crosswalk marking is required whenever school crossing signs are used per the MUTCD. Crossing locations are established based on the school's route master plan as shown in the MUTCD, Section [7A.02](#).
- a. The S1-1 School Warning sign **shall** be installed at the crossing location.
 - b. The S16-7L/R Diagonal down arrow warning sign **shall** be installed under the S1-1 School Warning sign.

If the school crossing is located on the same roadway as the school property, then the school advance assembly can function in a dual purpose as the advanced sign for the school bordering the roadway and the advance sign for the school crossing. The school advanced sign does not need to be duplicated for this situation (See Figures 2 and 3).

POLICY FOR ADDITIONAL SIGNING FOR SCHOOL AREAS

Listed below are other signs covered in the MUTCD, [Part 7](#), that are installed on the state highway system.

1. School Bus Stop Ahead (S3-1) Sign
 - a. The word message SCHOOL BUS STOP AHEAD (S3-1 signs) shall no longer be used. The new sign is a School Bus / Children symbol that is fluorescent yellow green in color and is still the S3-1 sign code. The existing SCHOOL BUS STOP AHEAD word message signs in the field shall be replaced with the new symbol signs by no later than December 31, 2015.
 - b. In order to determine if a School Bus Stop *qualifies* for a sign, the Minimum Visibility Distance table in MUTCD Section [2C.36](#) *should* be used.
 - c. If a School Bus Stop *qualifies* for a sign (based on the Minimum Visibility Distance outlined above), MUTCD Table [2C-4](#) **shall** be used to determine field placement of the sign(s).
2. Reduced School Speed Limit Ahead (S4-5 Sign).
 - a. A Reduced School Speed Limit Ahead Sign (S4-5) **shall** be installed for reductions of 15 mph or more.

- b. The distance table in [TEOpS 2-3-30](#) should be used in determining the placement distance of the Reduced School Speed Limit Ahead Sign (S4-5) from the School Speed Limit (S4-51 Sign).
3. **School Speed Limit (S4-51 Sign).**
- [Wisconsin State Statute 346.57](#) places a Statutory Fixed Speed Limit of 15 mph on school crossings when children are present and the crossing is properly signed. Wisconsin State Statute 349.11 allows the Department of Local units of government the authority to modify this speed restriction on their respective maintained roadways. WisDOT recommends that the school speed limit be 10 mph less than the speed limit of the roadway. The School Speed Limit (S4-51 Sign) **shall** be installed at all school areas and crossings where the speed restriction is modified.
 - For school areas and crossings, the School Speed Limit (S4-51 Sign) should be installed in areas that are urban or have school children walking/crossing within the right-of-way.
 - For school areas and crossings in fringe or rural areas, the School Speed Limit (S4-51 Sign) *may* be installed. However, the signs are generally not installed in these areas, unless school children are walking or crossing within the right-of-way. If the signs are installed in these areas, they should be 10 mph less than the posted speed limit of the roadway.
4. **Flashing Beacons.**
- The local unit of government *may* be allowed by permit to install a flashing beacon on one of the school area signs in each direction of roadway travel. RRFB's (Rectangular rapid flash beacons) may be allowed by permit on the school crossing sign assembly (S1-1 and S16-7L/R) only, since this would be the location of the physical crossing. Policy criteria for flashing beacon usage is covered in [TEOpS 4-5-1](#) and the application/permit form ([DT 1877 form](#)).

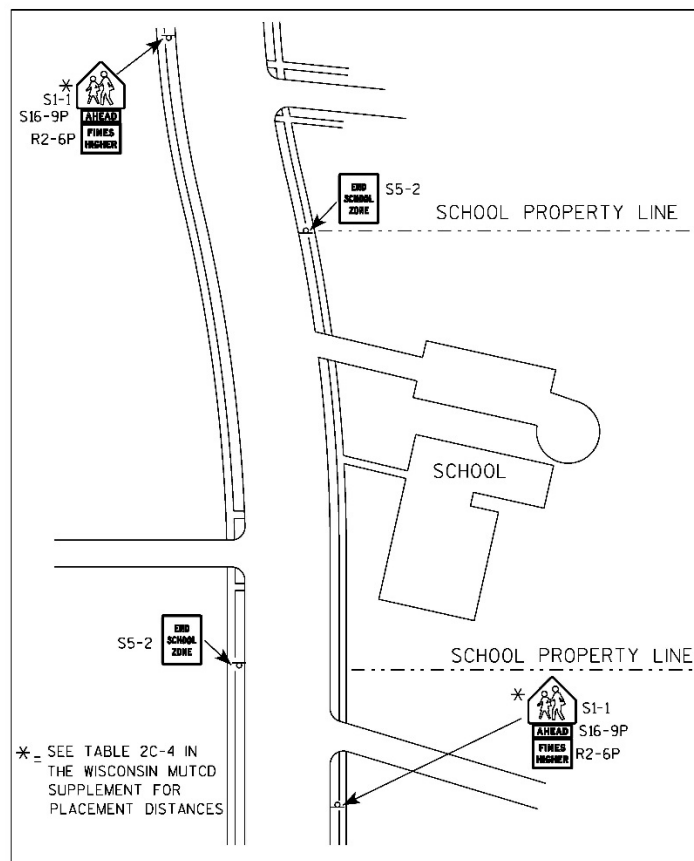


FIG. 1 RURAL SCHOOL WITHOUT CROSSING

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
FIELD CONDITIONS MAY DICTATE CHANGES IN
SIGN PLACEMENT.

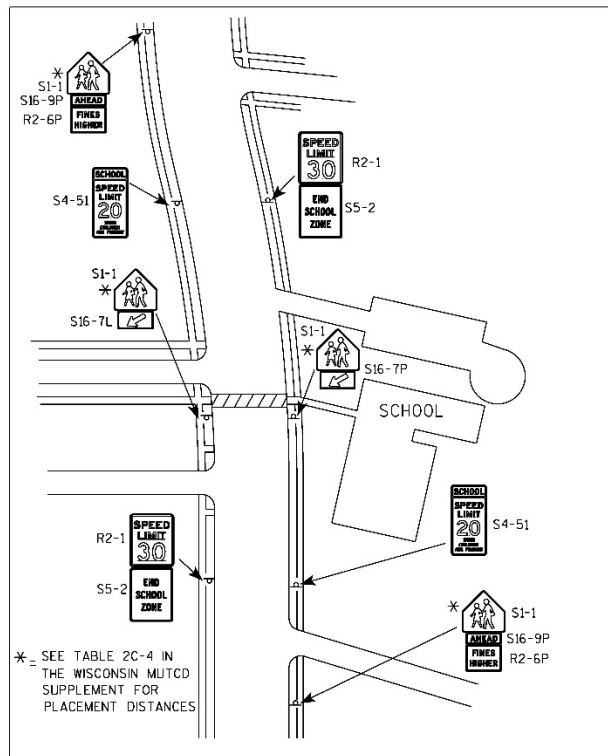


FIG. 2 URBAN SCHOOL CROSSING (WITHOUT REDUCED SCHOOL SPEED ZONE SIGNS)

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT. FIELD CONDITIONS MAY DICTATE CHANGES IN SIGN PLACEMENT.

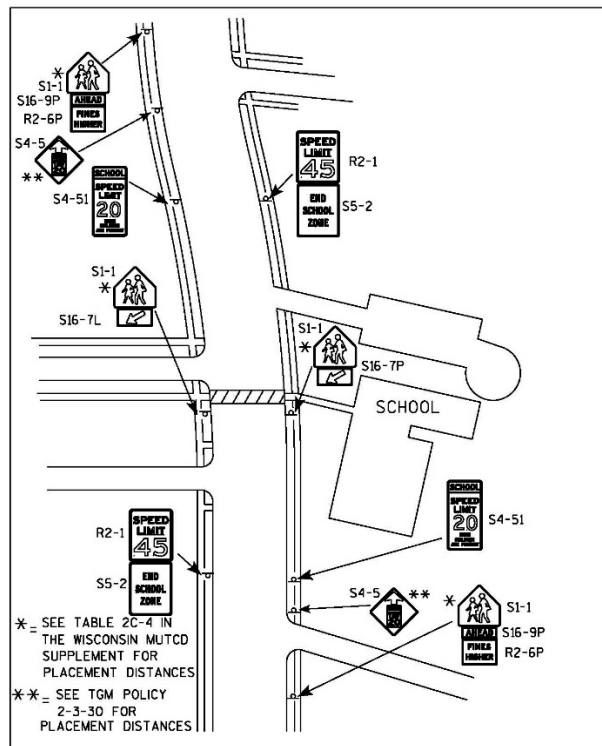


FIG. 3 URBAN SCHOOL CROSSING (WITH REDUCED SCHOOL SPEED ZONE SIGNS)

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT. FIELD CONDITIONS MAY DICTATE CHANGES IN SIGN PLACEMENT.

PURPOSE

The MUTCD Section [7B-13](#) states that school bus stop signs are not intended to be used at every school bus stop location. It *should* be used where terrain and roadway features limit the approach sight distance and where there is no opportunity to relocate the stop to another location with adequate visibility. However, with the expanding usage of 65 mph multilane expressways, there is a natural safety concern about school buses stopping on these routes. This concern stems from the fact that motorists typically do not expect to encounter school buses stopping on 65 mph highways and also because of the higher operating speeds of traffic. Therefore, inadequate sight distance is not exclusively a factor. As a result, the crash potential on 65 mph expressways between school buses and other vehicles is increased. The purpose of this policy is to provide a consistent statewide policy on the signing of school bus stops on 65 mph expressways. **This policy only applies to expressways having 65 mile per hour speed limits and having school bus traffic either on or beside the expressway.**

DEFINITIONS

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections. This definition of expressway includes both designated and non-designated expressways.

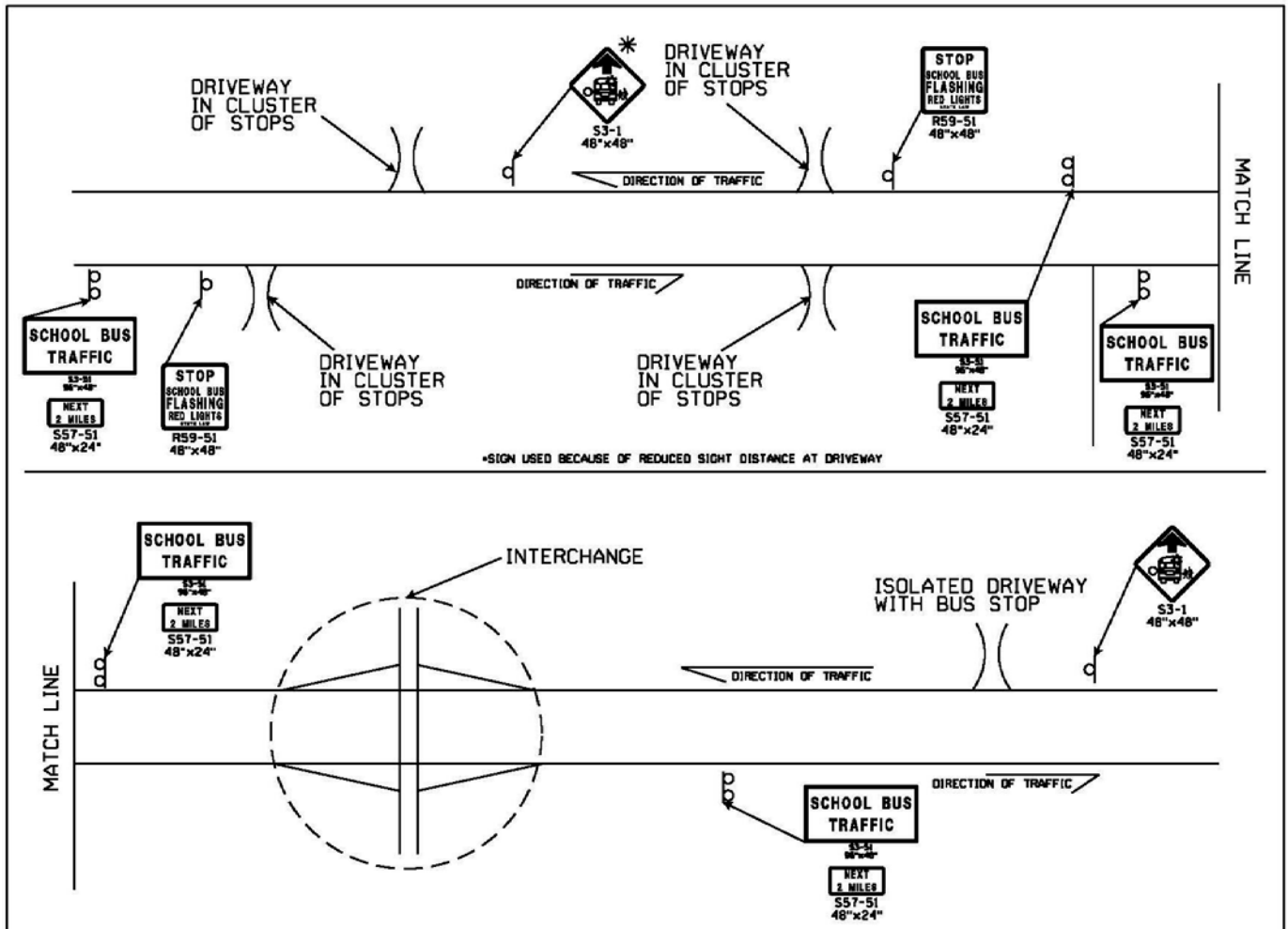
POLICY AND INSTALLATION GUIDELINES

For the application of this policy, the Region is encouraged to obtain a school bus route map or other information supplied by the school district to identify locations of the stops. The Region *should* contact school Districts each year as to where stops are no longer made so the signing can be adjusted accordingly, or where new stops are made. The Region *may* convey to the school officials that signs will be removed unless this information is provided. If the Region is not aware of stops, or the expectation of stops, the school bus stop signs will not be installed.

A map is provided by the Wisconsin Department of Public Instruction that shows all of the school district boundaries in the state. To order a copy of this map, the telephone number is 1-800-243-8782.

1. The "SCHOOL BUS TRAFFIC" (S3-51) sign, when required, *should* be placed on the right side of the roadway at the beginning of the segment of the expressway that includes the stops or driveways with potential stops. This sign is not intended to be used for isolated stops (see item #4 for isolated school bus stop signing). This sign **shall** be supplemented with the "NEXT __ MILES" (S57-51) sign. For this sign, the Region *may* permit the school district the option of supplementing it with one or two flashing yellow beacons mounted directly above the sign. The beacons **shall** be activated by 365 day timers to accurately define the periods of school bus activity. The school district will be solely responsible for the installation, operation and maintenance of the flashing beacons. All existing flashing beacons that have been installed, operated and maintained by the Regions can continue to be operated and maintained by the Regions.
2. The "STOP FOR SCHOOL BUS FLASHING RED LIGHTS STATE LAW" (R59-51) sign *should* be used at the beginning of the segment of the expressway that includes the stops or driveways with potential stops. This sign *should* be erected after the "SCHOOL BUS TRAFFIC" (S3-51) sign outlined in item 1 above.
3. The "SCHOOL BUS TRAFFIC" (S3-51) sign *should* be repeated after every interchange and *may* be repeated after every State Trunk Highway, County Trunk Highway or after higher volume local road intersections. These signs **shall** be placed on the right side of the roadway only. Higher volume local road intersections are those serving retail shopping, commercial activity, recreational activity or other activities with high concentrations of entering/leaving traffic or heavy slow moving vehicle traffic. The S3-51 sign would not be installed after at-grade intersections of lower volume local roads that are dead ends or only serve individual property owners. The "NEXT __ MILES" (S57-51) sign **shall** be used with these signs.
4. For individual school bus stops, within a cluster or isolated stops, the Region has the option of using the "SCHOOL BUS STOP AHEAD" (S3-1) warning sign at those selected stops. Criteria for this usage could be reduced sight distance, heavy volume of trucks, etc. The minimum site distance criteria for this facility is 720 feet, per the minimum visibility distance table for warning signs in the MUTCD [2C-36](#). If the Region elects to use these signs at selected stops, they *should* be placed a suggested minimum of 1000 feet in advance of the stop per the MUTCD [2C-05](#). Flags and double marking of these signs are also optional.

Figure 1.



2-3-60 Children at Play Signs

May 2011

GENERAL

Section [2C.03](#) of the MUTCD allows for the development of customized word messages on warning signs. These customized word messages *may* be developed to fulfill signing needs based on engineering study or engineering judgment. However, Section [2C.02](#) of the MUTCD states that the usage of warning signs *should* be kept to a minimum, as the unnecessary use of warning signs tends to breed disrespect for all signs. The over usage of signs *may* result in information overload for the motorist, which can impact safety.

BACKGROUND

Periodically, the Department receives requests to install the following types of Child Crossing Signs:

- Children at Play
- Watch For Children
- Slow Children

Usage of these types of signs has been discouraged by the Federal Highway Administration, Institute of Transportation Engineers, and many other States and Local Units of government for the following reasons:

1. Signs lose credibility with motorists when they appear too often.
2. Warning signs are most effective when they warn of consistent, not occasional conditions. Children are not likely to be consistently playing at a particular location in the street at all times (unlike at playgrounds or parks).
As a result, the signs mentioned above could lose their effectiveness.

3. These signs provide parents and children with a false sense of security that their children are safe when playing in or near the street.
4. Some before and after studies have indicated no reductions in vehicle speeds or crashes with the signs present.
5. Because these signs are typically warning signs, they are not enforceable.
6. In lieu of signing, more effective countermeasures *may* be employed to increase motorist visibility on the roadway. Some of these countermeasures could include:
 - a. Restricting parking or trimming vegetation to increase sight distance.
 - b. Education and awareness efforts.
 - c. Installation of traffic calming devices for urban low-speed areas.

POLICY FOR CHILD CROSSING SIGNS

1. No new Child Crossing Signs **shall** be installed on State Highways.
2. Existing Child Crossing Signs on State Highways *may* be allowed to remain until the end of their useful life. Other opportunities such as knockdown damage, improvement projects or change in conditions *may* make it possible to have the signs removed earlier.

2-3-64 Type I Object Markers under Keep Right Signs

December 2011

GENERAL AND BACKGROUND

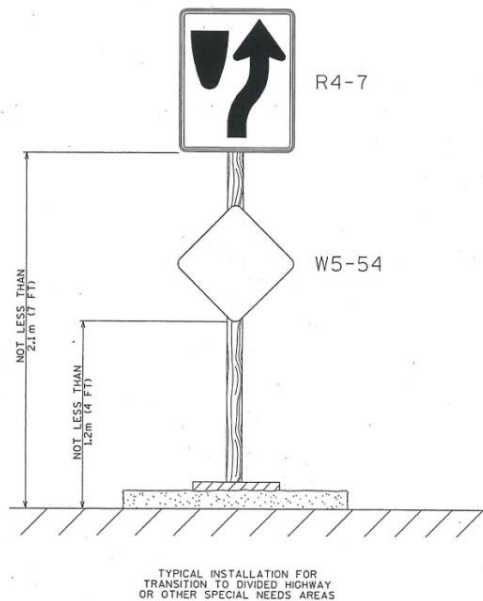
The MUTCD, Section [2C-64](#) allows the usage of a Type I Object Marker (W5-54 sign) to emphasize the approach end of a median island. This can give the median island additional visibility during nighttime, poor weather conditions or situations where the pavement markings or curb and gutter is covered by snow. The Object Marker can be especially helpful in higher speed areas (45 mph and above) and areas where medians start. Typically, many of these areas *may* have a Keep Right (R4-7) sign installed. An advantage of installing a secondary object marker (W5-54 sign) below the Keep Right will allow for increased visibility of the approach end of the median because the Object Marker (W5-54 sign) is mounted at 4 feet, which is more in the line of sight for a motorist. The Object Marker (W5-54 sign) is manufactured with fluorescent yellow sheeting, so it will reflect well at night and have better daytime conspicuity as well.

POLICY

1. The W5-54 sign **shall** be placed below the Keep Right (R4-7 sign) at all 45 mph or higher posted speed limits where the highway transitions from an undivided to divided roadway (See [Standard Detail Drawing 15C21-3](#)).
2. The W5-54 sign *should* be placed below the Keep Right (R4-7 sign) at the first median in a series of medians, where the posted speed is 45 mph or higher.
3. The W5-54 sign *may* be used (with or without the R4-7 sign) to emphasize approach ends of median islands for other areas that have exhibited problems with limited visibility or vehicle impacts.
4. The mounting height of the W5-54 sign **shall not** be less than 4 feet (see Figure 1).
5. The W5-54 sign *may* be placed on the back side of the post for the Keep Right (R4-7 sign), where additional emphasis is needed (typically areas with no curb and gutter). The W5-54 signs *should* be mounted back-to-back at the same mounting height.

IMPLEMENTATION

There is no formal phase-in period for installation of this signing. Signing field revisions *may* be accomplished through improvement projects or through the TMA process as Keep Right signs are routinely replaced. Signs *may* also be installed through the TMA process to address problem areas.



2-3-65 Rumble Strip Signing

January 2018

GENERAL

In an effort to reduce run off the road and head-on collisions, the Department has implemented the usage of continuous rumble strips on rural two-lane roadways, in accordance with [FDM 11-15-1](#). The rumble strips will be installed on the centerline location and the edgeline locations. The centerline and/or edgeline marking can either be applied within the rumble strip or to the side of the rumble strip.

The usage of centerline and shoulder rumble strips has proven to be quite effective since they were installed on STH 142, Kenosha County in 2006 as a test location. A 2005 NCHRP Report (Synthesis 339) has shown several states where crashes were reduced as a result of centerline rumble strips. However, the NCHRP report did indicate some potential concerns with the application of the centerline rumble strips. Motorists are not normally accustomed to continuous rumbles, especially on the centerline. There is the concern that upon running over a centerline rumble, a motorist could “react to the left” and thus move to the left of the centerline. There are also concerns from ambulance drivers that the driving over a centerline rumble would potentially cause monitors to malfunction.

Because the centerline rumbles are more unexpected to the motorist than edgeline rumbles, and in response to the concerns outlined above from the NCHRP report, WisDOT previously installed the Centerline Rumble Strip (W8-70 sign) on roadway segments having the centerline rumbles as an interim measure to assist in the education of motorists. Since that time, additional rural two-lane roadway segments have received centerline rumble strips, and motorists have become more accustomed to them. Therefore, these signs are no longer necessary.

The policy below will address the installation of centerline rumble strip warning signs on WisDOT maintained roadways.

POLICY

1. The Centerline Rumble Strip (W8-70 sign) with a supplemental mileage plaque (W57-51 sign) **shall not** be installed.
2. Centerline Rumble Strip (W8-70 sign) with a mileage plaque (W57-51 sign) that have previously been installed on projects will be allowed to remain until the end of their useful life or when opportunities arise such as knockdown or damage or projects make removal practical.

GENERAL AND BACKGROUND

Federal Aviation Regulations require aircraft, except when necessary for takeoff and landing, to maintain a minimum altitude of 1000' in congested areas, and 500' in other-than congested areas. Exceptions are also granted for certain restricted category aircraft, such as crop-dusting airplanes. These exceptions may cause airplanes to fly at a low altitude over the roadway, causing potential hazard or concern for motorists.

In the past, various signs have been installed to alert motorists to these low-flying aircraft. This policy will clarify when these signs *may* be installed, and establish a statewide standard sign for these locations.

POLICY

Low flying plane warning signs *may* be installed at locations where planes regularly fly at altitudes below 500' over or in the immediate vicinity of the roadway. Examples of these locations include airports with runways adjacent to the highway and fields with regular crop-dusting activities. FAA and Bureau of Aeronautics comments *may* also be taken into consideration.

Standard sign plate W11-57 has been developed for use at these locations. This sign *should* be installed per Condition B: Deceleration to the listed advisory speed (0 mph) in Table 2C.4 of the MUTCD. No sign is necessary at the crossing itself.

IMPLEMENTATION

There is no formal phase-in period for installation of this signing. Existing signs will be allowed to remain in place until the end of their useful life. Useful life ends when the sign message no longer meets legibility or condition standards. Existing signs *may* be replaced prior to the end of their useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or when projects make replacement practical.



Traffic Engineering, Operations & Safety Manual

Chapter 2 Signing

Section 4 Guide Signs - Conventional

2-4-19.1 Business Route Marking

April 1997

The Business Route Marker is an auxiliary marker used to identify Business Routes which have been established pursuant to either [Section 84.02\(4\) or 84.02\(6\)](#) of the Statutes. The latter section terms them Alternate Routes, but they **shall** be signed as Business Routes.

Business route establishment begins with a locally initiated request to the Regional office. The Region **shall** require that the request come from a municipal official or body of the local community, not an association or chamber of commerce, etc. The Region **shall** request information on the appropriateness of the route, the unity of community regarding the location and service provided, the structural and geometric adequacy of the route, the adequacy of the traffic control, and such other factors as *may* be pertinent.

If the Region office finds the establishment to be in the interests of the motoring public it **shall** make a favorable recommendation to the State Traffic Engineer, who **shall** have the authority for approval.

When the approved route falls completely upon the existing state trunk highway and connecting highway system the Department will initially install and subsequently maintain all route marking.

When all or any portion of the approved route is on local streets or highways, including county trunk highways, the Department will agree to install the initial markers, but subsequent maintenance of the markers will be the responsibility of the community. The Department will however maintain those markers at the beginnings of the route which face traffic on the regular state trunk highway route.

Failure of the city or village to properly maintain the signs or to comply with other conditions of the approval will be cause for the Department to withdraw approval and remove the signs. Regional offices will be responsible for periodically inspecting the condition of all signs to ensure that they are kept in good condition.

If a business route is proposed related to a U.S. Highway designation the route has to have the approval of AASHTO. Please contact the central office Bureau of Traffic Operations for instructions regarding this approval.

2-4-33 Trailblazer Assemblies

April 1997

It *may* be desirable to provide trailblazing at key locations to enable unfamiliar motorists to find their way to certain major state trunk highways, particularly freeways. The Regions *should* analyze these needs and install or authorize the necessary signing. It is recommended that the trailblazing needs be discussed with the local officials and agreement reached as to the need for signing, the amount of signing and the details of locating and installing the signs. The Department *may* erect and maintain necessary signs on the STH system and on connecting highways, and *may* sell the signs to the local authority for installation on local streets. Locations on local streets *should* have Department approval. The Region is expected to inspect the signing periodically, regardless of who maintains it, and work out arrangements for correcting any deficiencies.

2-4-40 Historical Marker Guide Signs

January 2018

GENERAL

All historical markers which have been approved by the State Historical Marker Committee and marked by the State Historical Society **shall** be signed in accordance with these guidelines.

1. Marker Adjacent to Any Highway. HISTORICAL MARKER ½ MILE (D5-63) signs, as appropriate, *should* be erected approximately one-half mile in advance of the marker. Distances other than ½ mile *may* be substituted where site conditions prevent using the distance of ½ mile. HISTORICAL MARKER (LEFT, OR RIGHT ARROW) (D5-64) signs **shall** be erected at the entrance to the marker.

A wayside with a historical marker *should* have a HISTORICAL MARKER (DB569E) sign installed below the WAYSIDE signs.

2. Marker Remote from the State Trunk Highway System. The historical marker must be located not more than 2 miles from the state trunk highway. The point where traffic must leave the state trunk highway to get to the marker **shall** be a route giving access to the marker by the most direct route. A HISTORICAL MARKER (LEFT OR RIGHT ARROW) sign would be installed in advance of the appropriate intersecting

roadway (See [TEOpS 2-4-41](#)). Signing for both directions of traffic *may* be provided at one location or signing *may* be provided for one direction of traffic at one location and for the other direction at another location. In either case, only a maximum of 4 signs per each marker *may* be erected on the state trunk highway. No signing *may* be used to direct traffic from one state trunk highway to a historical marker on another state trunk highway Route. The sign HISTORICAL MARKER (LEFT OR RIGHT ARROW), **shall not** be placed until the required signing (Paragraph 1) on the local road has been installed by the maintaining authority.

All signs on the state trunk highway are furnished, erected and maintained by the Wisconsin Department of Transportation and all signs located on connecting streets or local streets are the responsibility of the maintaining authority.

2-4-41 Advance Supplemental Guide Signs

November 2016

PURPOSE

The Department places signs to various traffic generating facilities on the state highway system. In the past, several of these facilities have been signed with advance guide signs (...½ Mile or Road To...½ Mile) located ¼ to 1 mile in advance of the required turn, and directional guide signs (Name of Facility with arrow) located 0-1000' from the turn. This practice has been inconsistent across the state. This policy will clarify when to install advance guide signs, and where both advance and directional guide signs *should* be located. This policy will not define which facilities *may* be signed for. Refer to [TEOpS 2-15-3](#) for further information.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional Highways are defined as either divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways can be two lane or multilane facilities.

Traffic Generators are defined as any facility, activity, or special point of interest which attracts large numbers of people, the majority of whom are unfamiliar with the local area and/or access route.

POLICY

Facilities Adjacent to Any Highway

These facilities have a driveway directly off of a State or US Highway. These facilities *may* be located on conventional highways or expressways. Facilities adjacent to a highway that qualify for traffic signage are typically publicly owned and operated locations serving the motoring public. Examples of these facilities include Waysides and Historical Markers.

Advance guide signs for qualifying facilities *should* be installed approximately one-half mile in advance of the driveway. Other distances *may* be substituted where site conditions prevent using the distance of ½ mile.

Directional guide signs **shall** be installed at the entrance to the facility.

Facilities Remote from the State Trunk Highway System

These facilities do not have driveways on a State or US Highway; therefore, the motorist would be required to turn off of the highway onto a county or local road to access the facility. Many types of facilities *may* qualify for this type of signing.

Advance guide signs (Road To...1/2 Mile) *should not* be installed for these facilities.

Directional guide signs for qualifying facilities *should* be installed approximately 500' in advance of the appropriate intersecting roadway. This distance *may* be adjusted based on field conditions, but *should not* be less than 200' in rural areas or 100' in urban areas. A word message (Next Right, Second Left, etc.) *may* be used in place of an arrow where necessary.

IMPLEMENTATION

There is no formal phase-in period for installation of this signing. Existing signs will be allowed to remain in place until the end of their useful life. Useful life ends when the sign message no longer meets legibility or condition standards. Existing signs *may* be replaced prior to the end of their useful life when opportunities arise

such as knockdown or damage, when other work is occurring nearby, or when projects make replacement practical.

2-4-44 Conventional Roads on Approaches to Interchanges

July 2012

BACKGROUND AND PURPOSE

The MUTCD Section [2D-45](#) states that guide signing **shall** be utilized for multi-lane conventional roads approaching an interchange. The guide signs **shall** incorporate the destination, route shield and cardinal direction arrow.

“Enhanced” guide signs that incorporate the destination, route shield and cardinal direction arrow are referred to as Entrance Direction signs in the MUTCD. However, it *should* be noted that the MUTCD does not require the usage of Entrance Direction signs at all multi-lane conventional roads approaching an interchange. Entrance Direction signs can get quite large and costly to install and maintain. This *may* be especially true if there are right-of-way restrictions that require the usage of overhead guide signs.

However, there are applications on certain interchange crossroads where the enhanced type of Entrance Direction signs are valuable, specifically for arterial interchange crossroads with higher traffic volumes. Guide signing for collector/distributor types of interchange crossroads can, in most cases, be accomplished by traditional means with independent route assemblies (J-series) and destination/direction (D1-series) signs.

This policy will differentiate between the different types of guide signing for interchange crossroads (both single and multi-lane) and provide guidance as to the types of guide signing that *should* be used.

DEFINITIONS

Arterial interchange crossroads are defined as roadways used primarily by through traffic, usually on a continuous route or a highway designated as part of an arterial system.

Collector/distributor interchange crossroads are defined as roadways that in rural areas connect small towns and local highways to arterials highways and in urban area provides land access and traffic circulation within residential, commercial, and business areas and connects local highways to the arterial highways.

POLICY

Single-lane Crossroad Approaches to Interchange (See Figure 1)

1. Traditional route assemblies (J-series) *should* be used.
2. Destination/Direction signs (D1-series) *should* be used.

Multi-lane **Arterial** Crossroad Approach to Interchange (See Figure 2)

1. The junction assembly (J1-series) *should* be the first sign used in the series.
2. The advanced Entrance Direction (D1-72 sign) *should* follow the junction assembly.
3. The Entrance Direction sign (D1-71) *should* be used to designate the direction of travel (left, right or ahead).
4. An advance left turn assembly (J2-series) *should* be used to provide guidance for the second ramp. The primary location of the advance left turn assembly *should* be in the median. The advance left turn assembly *may* be placed on the right side as an optional location.
5. An Entrance Direction sign (D1-70) *should* be used to provide guidance for the second ramp.

Multi-lane **Collector/Distributor** Crossroad Approach to Interchange (See Figure 3)

1. The junction assembly (J1-series) *should* be the first sign used in the series.
2. Advanced route assemblies (J2-series) *should* follow the junction assembly. The left movement *may* utilize an up arrow or the word USE LEFT LANE. The left lane portion of the advanced route assembly *may* be mounted in the median.
3. The traditional destination/direction sign (D1-series) *should* be used to designate the destination and direction of travel.
4. A route turn assembly (J3-series) *should* be installed for the first ramp.
5. An advance left turn assembly (J2-series) *should* be used to provide guidance for the second ramp.

The primary location of the advance left turn assembly *should* be in the median. The advance left turn assembly *may* be placed on the right side as an optional location.

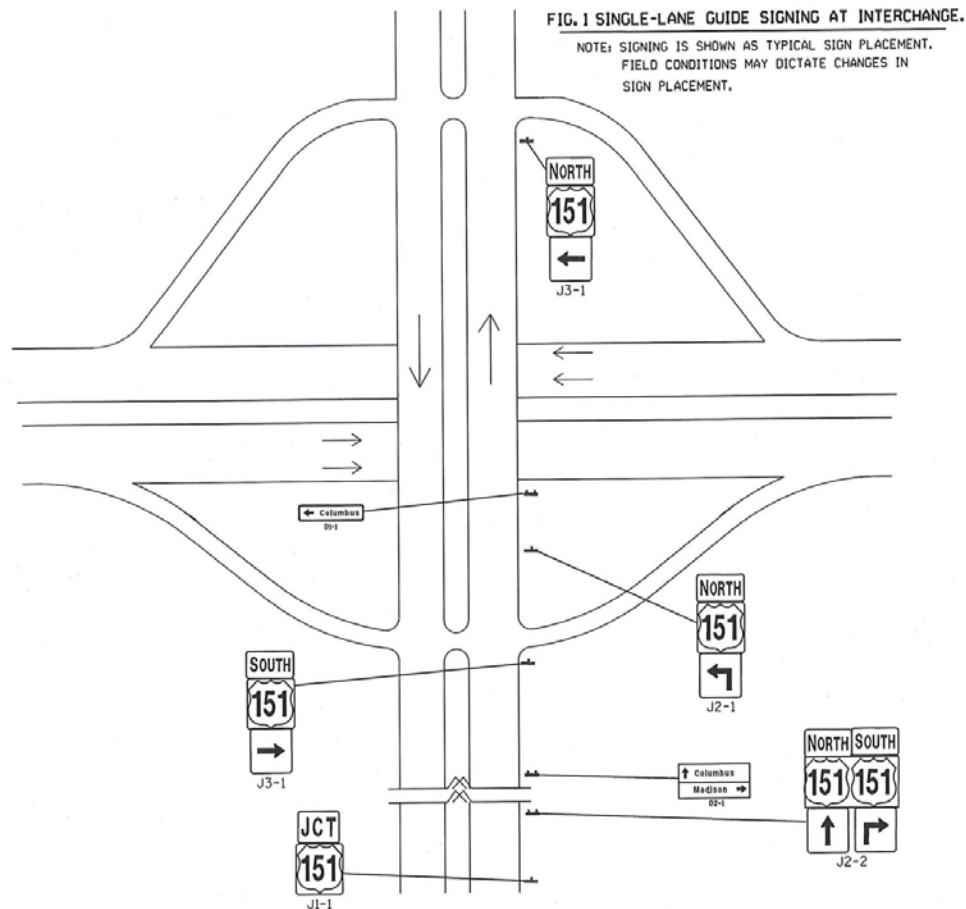
6. A route turn assembly (J3-series) *should* be installed for the second ramp.

Overhead Signing Options for Multi-lane Arterial Crossroad Approach to Interchange (See Figures 4-5)

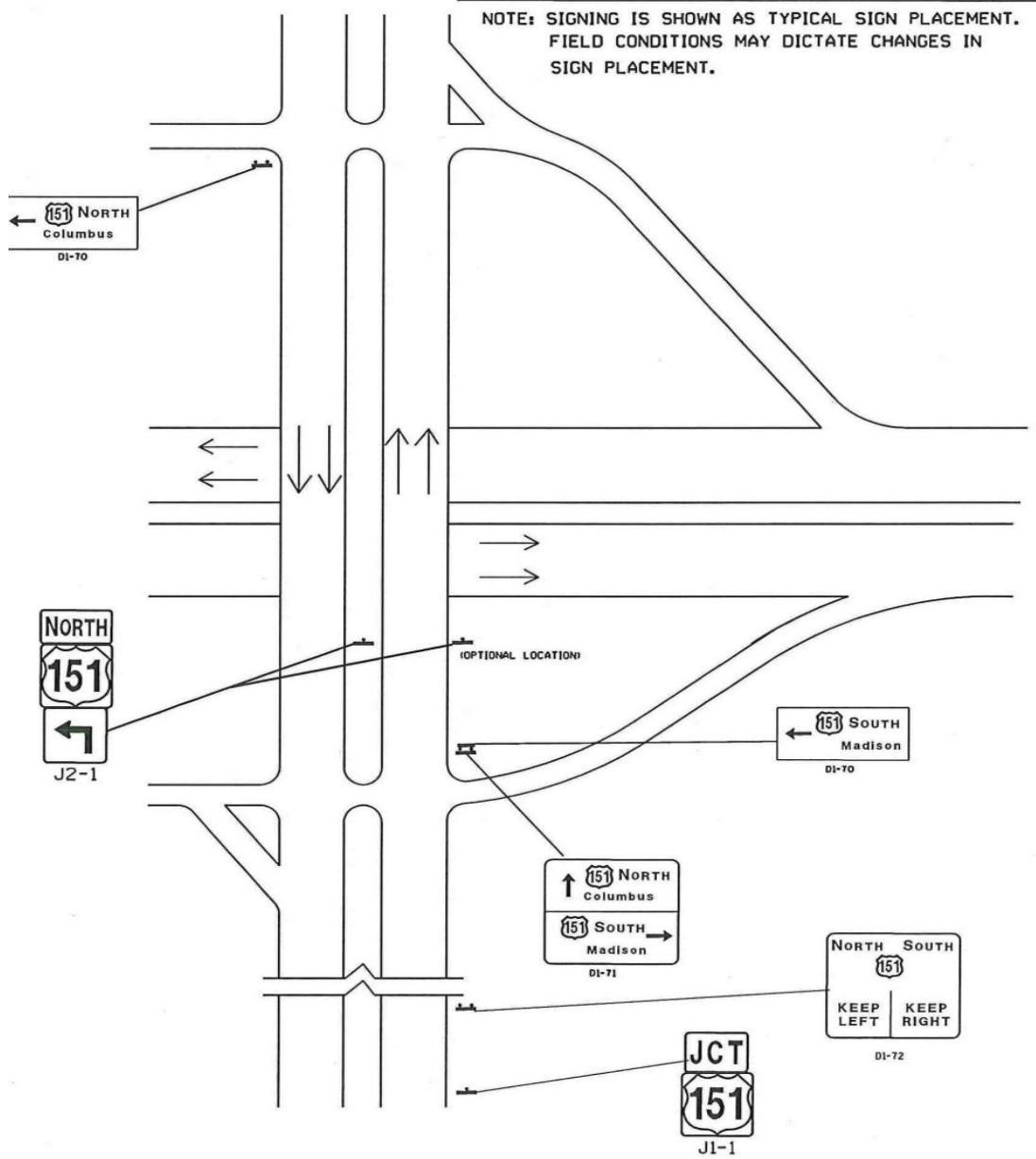
Overhead guide signs *may* be used in lieu of the ground mounted Entrance Direction signs for some multi-lane arterial crossroad approaches to interchanges. Qualifying factors for overhead guide signs would be limited right-of-way that would prohibit the installation of ground mounted guide signs, high traffic volumes, dual/triple left turn lanes and look-ahead mandatory left-turn lanes.

IMPLEMENTATION

FHWA has mandated a compliance date of December 31, 2019 for completion of these signing revisions. Signing field revisions *should* be accomplished through improvement projects as much as possible. The TMA process *may* also be used to revise signing, if the sign revisions are feasible (do not require the installation of Type I or overhead guide signs).



**FIG. 2 MULTI-LANE CROSS-ROAD GUIDE SIGNING AT INTERCHANGE.
(ARTERIAL CROSSROAD)**



**FIG. 3 MULTI-LANE GUIDE SIGNING AT INTERCHANGE.
(COLLECTOR/DISTRIBUTOR CROSSROAD)**

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
FIELD CONDITIONS MAY DICTATE CHANGES IN
SIGN PLACEMENT.

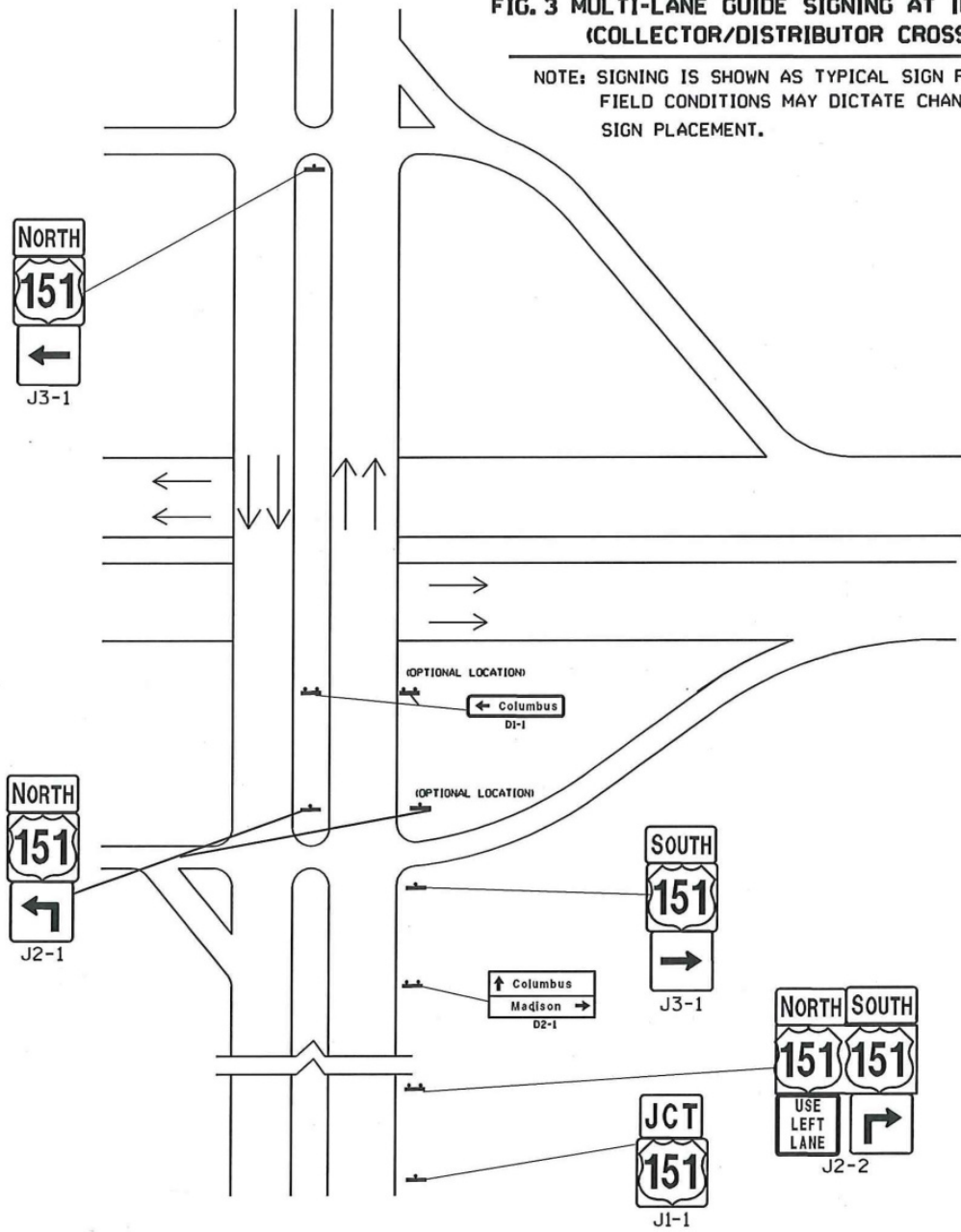


FIG. 4 OVERHEAD GUIDE SIGNING MULTI-LANE CROSSROAD AT INTERCHANGE.
(ARTERIAL CROSSROAD)

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
FIELD CONDITIONS MAY DICTATE CHANGES IN
SIGN PLACEMENT.

NOTE:
SIGNS ON RAMP ARE ANNOTATED
ON OTHER SHEETS.

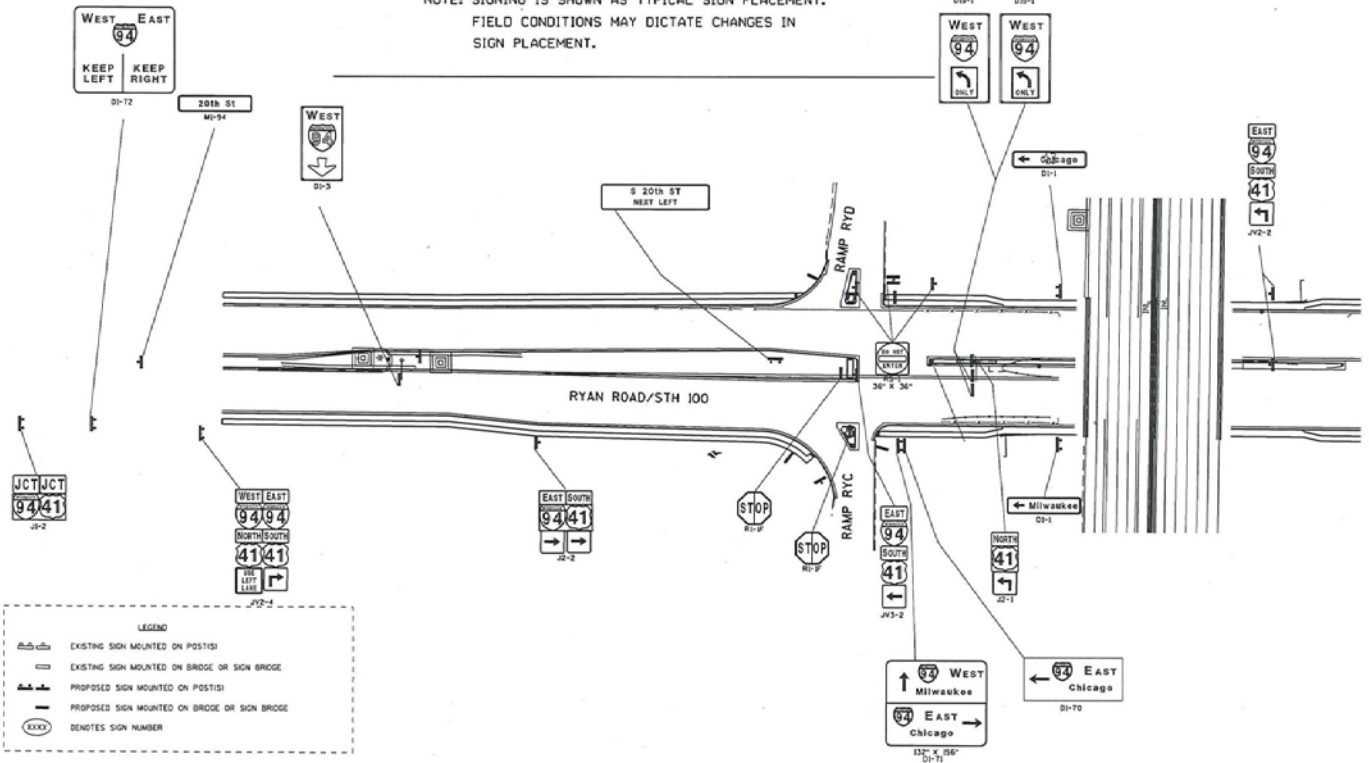
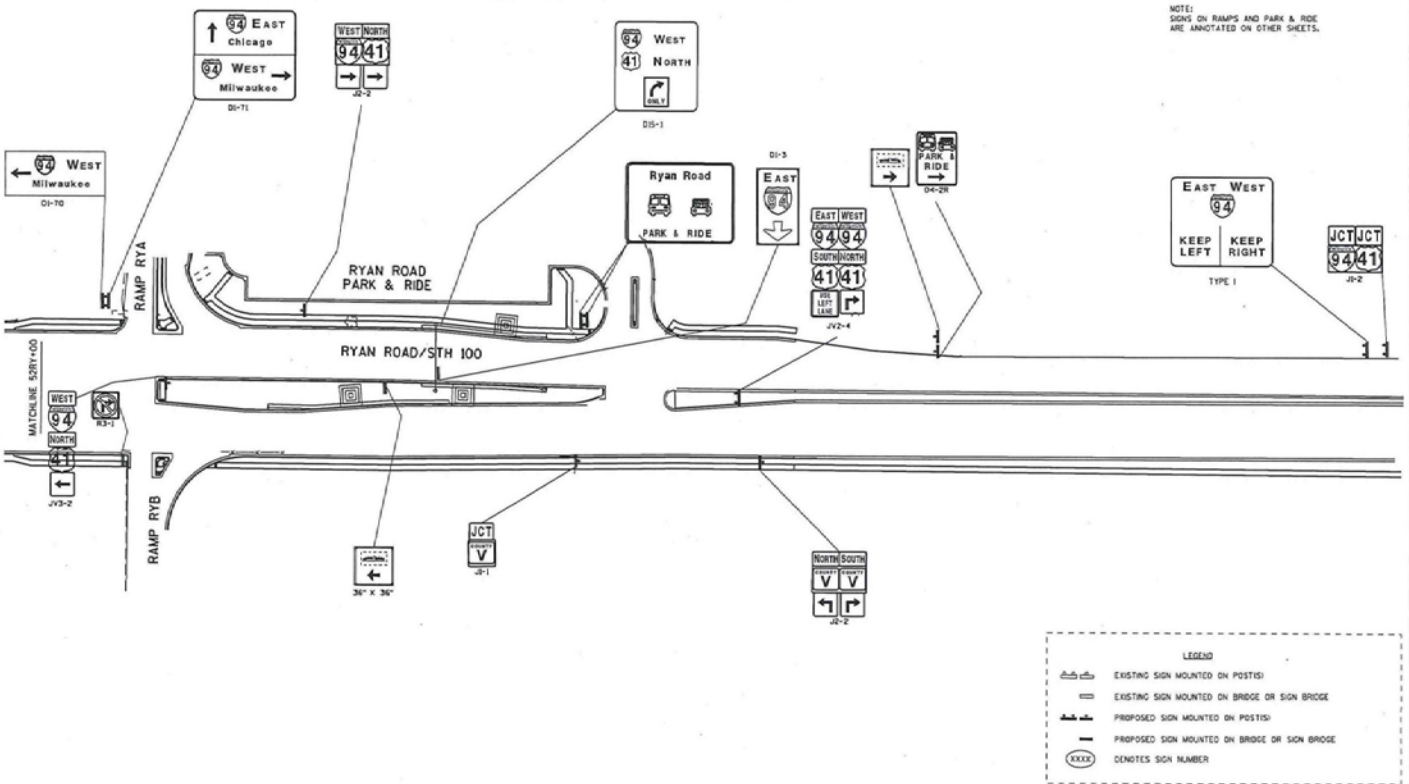


FIG. 5 OVERHEAD GUIDE SIGNING MULTI-LANE CROSSROAD AT INTERCHANGE.
(ARTERIAL CROSSROAD)

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
FIELD CONDITIONS MAY DICTATE CHANGES IN
SIGN PLACEMENT.

NOTE:
SIGNS ON RAMP AND PARK & RIDE
ARE ANNOTATED ON OTHER SHEETS.



2-4-45.1 Emergency Hospital Signing**January 2018****PURPOSE**

The purpose of the official Hospital sign is to designate hospitals with emergency care facilities. It is not intended for designating hospitals that cannot accept emergencies.

Signs (STANDARD SIGN D9-2 "H" symbol with appropriate arrow) will be furnished and maintained by the Department, on the state trunk highway system (if the state trunk highway does not lead directly past the hospital) for public and private hospitals meeting the American Medical Association (AMA) criteria. Thus signs would be warranted on a freeway or a state trunk highway that bypasses a community having a qualifying hospital. When a highway bypasses a municipality having a hospital, the Department will erect signs at appropriate locations on the bypass where motorists can best be directed into the municipality to the hospital.

Hospital signs and trailblazers on connecting streets and on local streets will not be furnished, erected, or maintained by the Department. At that point any further trailblazing is the responsibility of the local unit of government having maintenance jurisdiction over the highway carrying the route to the hospital.

No signing will be done on the state trunk highway system until signs have been erected on the local portion of the route to the hospital.

H signs *may* be erected only after being authorized by the Central Office, when the criteria in the following guidelines are met.

The following are guidelines for hospital signing:

1. A sign may be warranted for a public or private hospital which has continuous emergency care capability as defined by the American Medical Association and which is in their categorized report. Attached to the policy is a listing of hospitals that have been approved by the American Medical Association for Emergency Care Facilities. Hospitals included on this list may be signed provided they meet the rest of the criteria outlined in this policy.
2. A sign may be warranted on a freeway when the hospital is within a community contiguous to or near the freeway, or not more than 15 miles from the freeway.
3. A sign may also be warranted on a major highway which is not a freeway but which bypasses a community having a qualifying hospital.
4. On a freeway or other highway that bypasses a community having a hospital, a sign will be erected:
 - a. Only at the point or points giving access to the most direct route to the hospital.
 - b. Only once for traffic in each direction on a given highway.
5. Hospital signs will not be erected on State Trunk Highways leading directly into communities having hospitals except as those highways are HOSPITAL routes as described in item 6.
6. Hospital signs and trailblazers will be erected and maintained on the State Trunk Highway System by the Department but not until it receives assurance from the hospital administration that any Hospital Route Signs required on local roads and streets have been erected.
7. The name of the hospital will be utilized only in those cases where there is more than one hospital on the route, each of which appears on the list of hospitals, which have approved emergency facilities, and each of which is approximately the same distance from the point at which the routes to the hospitals diverge. The hospital name sign will be utilized only at that divergence point, and not with other trailblazers between the beginning of the signed hospital route and the point of divergence, nor between the point of divergence and the hospital itself.

The Department will remove signs from the state trunk highways when notified that a facility does not meet the criteria for an Emergency Care Facility, and are not included on the attached lists.

| City | Region | Hospital |
|-------------|--------|---|
| Antigo | NC | Langlade Hospital - An Aspirus Partner |
| Berlin | NC | Berlin Memorial Hospital |
| Eagle River | NC | Ministry Eagle River Memorial Hospital |
| Friendship | NC | Moundview Memorial Hospital & Clinics, Inc. |
| Marshfield | NC | Ministry Saint Joseph's Hospital |
| Merrill | NC | Ministry Good Samaritan Health Center |
| Park Falls | NC | Flambeau Hospital |
| Rhineland | NC | Ministry Saint Mary's Hospital |

| | | |
|-------------------|----|--|
| Shawano | NC | Shawano Medical Center |
| Stevens Point | NC | Ministry Saint Michael's Hospital |
| Tomahawk | NC | Ministry Sacred Heart Hospital |
| Waupaca | NC | Riverside Medical Center |
| Wausau | NC | Aspirus Wausau Hospital |
| Weston | NC | Ministry Saint Clare's Hospital |
| Wild Rose | NC | Wild Rose Community Memorial Hospital |
| Wisconsin Rapids | NC | Riverview Hospital Association |
| Woodruff | NC | Howard Young Medical Center |
| Appleton | NE | Appleton Medical Center |
| Appleton | NE | St. Elizabeth Hospital |
| Chilton | NE | Calumet Medical Center |
| Fond du Lac | NE | Agnesian HealthCare / St. Agnes Hospital |
| Green Bay | NE | Aurora BayCare Medical Center in Green Bay |
| Green Bay | NE | Bellin Hospital |
| Green Bay | NE | St. Mary's Hospital Medical Center |
| Green Bay | NE | Green Bay - St. Vincent Hospital |
| Manitowoc | NE | Holy Family Memorial Inc. |
| Marinette | NE | Bay Area Medical Center |
| Neenah | NE | Children's Hospital of Wisconsin - Fox Valley |
| Neenah | NE | Theda Clark Medical Center |
| New London | NE | New London Family Medical Center |
| Oconto | NE | Bellin Health Oconto Hospital |
| Oconto Falls | NE | Community Memorial Hospital |
| Oshkosh | NE | Aurora Medical Center in Oshkosh |
| Oshkosh | NE | Mercy Medical Center |
| Ripon | NE | Ripon Medical Center Inc. |
| Sheboygan | NE | Aurora Sheboygan Memorial Medical Center |
| Sheboygan | NE | St. Nicholas Hospital |
| Sturgeon Bay | NE | Ministry Door County Medical Center |
| Two Rivers | NE | Aurora Medical Center of Manitowoc County |
| Amery | NW | Amery Regional Medical Center |
| Ashland | NW | Memorial Medical Center |
| Baldwin | NW | Western Wisconsin Health |
| Barron | NW | Mayo Clinic Health System - Northland in Barron |
| Black River Falls | NW | Black River Memorial Hospital |
| Bloomer | NW | Mayo Clinic Health System - Chippewa Valley in Bloomer |
| Chippewa Falls | NW | St. Joseph's Hospital |
| Cumberland | NW | Cumberland Healthcare |
| Durand | NW | Chippewa Valley Hospital |
| Eau Claire | NW | Mayo Clinic Health System in Eau Claire |
| Eau Claire | NW | Oakleaf Surgical Hospital |
| Eau Claire | NW | Sacred Heart Hospital |
| Grantsburg | NW | Burnett Medical Center |
| Hayward | NW | Hayward Area Memorial Hospital |
| Hudson | NW | Hudson Hospital & Clinics |
| Ladysmith | NW | Rusk County Memorial Hospital |
| Medford | NW | Aspirus Medford Hospital & Clinics, Inc. |
| Menomonie | NW | Mayo Clinic Health System - Red Cedar, Inc. |
| Neillsville | NW | Memorial Medical Center |
| New Richmond | NW | Westfields Hospital |
| Osceola | NW | Osceola Medical Center |
| Osseo | NW | Mayo Clinic Health System - Oakridge in Osseo |
| Rice Lake | NW | Lakeview Medical Center |
| River Falls | NW | River Falls Area Hospital |
| Shell Lake | NW | Indianhead Medical Center / Shell Lake |
| Spooner | NW | Spooner Health System |
| St. Croix Falls | NW | St. Croix Regional Medical Center |
| Stanley | NW | Ministry Our Lady of Victory Hospital |
| Superior | NW | St. Mary's Hospital of Superior |
| Whitehall | NW | Gundersen Tri-County Hospital & Clinics |
| Brookfield | SE | Wheaton Franciscan - Elmbrook Memorial Campus |
| Burlington | SE | Aurora Memorial Hospital of Burlington |

| | | |
|------------------|----|--|
| Elkhorn | SE | Aurora Lakeland Medical Center in Elkhorn |
| Franklin | SE | Midwest Orthopedic Specialty Hospital |
| Franklin | SE | Wheaton Franciscan Healthcare - Franklin |
| Glendale | SE | Orthopaedic Hospital of Wisconsin |
| Grafton | SE | Aurora Medical Center in Grafton |
| Hartford | SE | Aurora Medical Center in Hartford |
| Kenosha | SE | Aurora Medical Center in Kenosha |
| Kenosha | SE | Kenosha - UHS, Inc. |
| Lake Geneva | SE | Mercy Walworth Hospital and Medical Center |
| Menomonee Falls | SE | Community Memorial Hospital of Menomonee Falls, Inc. |
| Mequon | SE | Columbia Center |
| Mequon | SE | Columbia St Mary's Inc. - Ozaukee Campus |
| Milwaukee | SE | Aurora Sinai Medical Center |
| Milwaukee | SE | Aurora St. Luke's Medical Center / South Shore |
| Milwaukee | SE | Children's Hospital of Wisconsin |
| Milwaukee | SE | Columbia St. Mary's Hospital Milwaukee |
| Milwaukee | SE | Froedtert Memorial Lutheran Hospital Inc. |
| Milwaukee | SE | Wheaton Franciscan Healthcare - St. Francis |
| Milwaukee | SE | Wheaton Franciscan - St. Joseph Campus |
| Oconomowoc | SE | Oconomowoc Memorial Hospital |
| Racine | SE | Wheaton Franciscan Healthcare - All Saints, Inc. |
| Summit | SE | Aurora Medical Center in Summit |
| Waukesha | SE | Waukesha Memorial Hospital |
| Wauwatosa | SE | Midwest Spine and Orthopedic Hospital and Wisconsin Heart Hospital |
| West Allis | SE | Aurora West Allis Medical Center |
| West Bend | SE | St. Joseph's Community Hospital of West Bend Inc. |
| Baraboo | SW | St. Clare Hospital & Health Services |
| Beaver Dam | SW | Beaver Dam Community Hospitals Inc. |
| Beloit | SW | Beloit Health System |
| Boscobel | SW | Gundersen Boscobel Area Hospital and Clinics |
| Columbus | SW | Columbus Community Hospital |
| Darlington | SW | Memorial Hospital of Lafayette Co. |
| Dodgeville | SW | Upland Hills Health Inc. |
| Edgerton | SW | Edgerton Hospital & Health Services |
| Fort Atkinson | SW | Fort HealthCare |
| Hillsboro | SW | Gundersen St. Joseph's Hospital & Clinics |
| Janesville | SW | Mercy Hospital and Trauma Center |
| Janesville | SW | St. Mary's Janesville Hospital |
| La Crosse | SW | Gundersen Lutheran Medical Center |
| La Crosse | SW | Mayo Clinic Health System - Franciscan Healthcare in La Crosse |
| Lancaster | SW | Grant Regional Health Center |
| Madison | SW | Meriter-Unity Point Health |
| Madison | SW | St. Mary's Hospital |
| Madison | SW | UW Hospital & Clinics |
| Mauston | SW | Mile Bluff Medical Center |
| Monroe | SW | Monroe Clinic |
| Platteville | SW | Southwest Health Center |
| Portage | SW | Divine Savior Healthcare |
| Prairie du Chien | SW | Prairie du Chien Memorial Hospital |
| Prairie du Sac | SW | Sauk Prairie Healthcare |
| Reedsburg | SW | Reedsburg Area Medical Center |
| Richland Center | SW | The Richland Hospital Inc. |
| Sparta | SW | Mayo Clinic Health System - Franciscan Healthcare in Sparta |
| Stoughton | SW | Stoughton Hospital Association |
| Tomah | SW | Tomah Memorial Hospital |
| Viroqua | SW | Vernon Memorial Healthcare |
| Watertown | SW | UW Health Partners Watertown Regional Medical Center |
| Waupun | SW | Waupun Memorial Hospital |

PURPOSE

The purpose of emergency medical services signing is to provide direction for the motorist to the closest emergency medical care facility or hospital. The MUTCD, Section [21.02](#) allows the usage of emergency medical care signing to facilities other than hospitals provided they meet certain criteria. The MUTCD also encourages states to develop guidelines for the usage of the Emergency Medical Services Sign. The Emergency Medical Care sign (D9-13C sign or E10-63 or E10-64 sign) provides direction to designated facilities other than hospitals that provide 24-hour emergency care.

Signs (Standard sign D9-13C with appropriate arrow or E10-63 or E10-64 sign) will be furnished and maintained by the Department on the state trunk highway system (if the state trunk highway does not lead directly past the emergency care facility) for emergency medical care facilities that meet the criteria specified in Section B of this policy. When a highway bypasses a municipality that has a qualifying emergency medical care facility, the Department will erect signs at appropriate locations on the bypass where motorists can best be directed into the municipality to the emergency medical care facility.

Signs and trailblazers on connecting streets and on local streets will not be furnished, erected, or maintained by the Department. At that point any further trailblazing is the responsibility of the local unit of government having maintenance jurisdiction over the highway carrying the route to the emergency medical care facility.

Signs *may* be erected only after being authorized by the Bureau of Traffic Operations, when the criteria in the following guidelines are met.

POLICY

The following are guidelines for emergency medical care facility signing:

1. A sign *may* be warranted for a public or private emergency medical care facility which has continuous emergency care capability as defined by the American Medical Association (AMA) and which is AMA Board Certified. Attached to the policy is a listing of emergency medical care facilities that are Board Certified by the AMA. Emergency Medical Care facilities included on this list *may* be signed provided they meet the rest of the criteria outlined in this policy.
2. The following criteria **shall** be used to determine if an Emergency Medical Care facility qualifies for signing:
 - a. Continuous 24-hour, 7 days per week emergency care capability.
 - b. Emergency department facilities with a physician trained in emergency medical procedures on duty (or emergency care nurse on duty within the emergency department with a physician on call).
 - c. Board certified by the American Medical Association and a licensed medical care facility by the State of Wisconsin.
 - d. Equipped for radio voice communications with ambulances and other hospitals.
3. A sign *may* be warranted on a freeway when the emergency medical care facility is within a community contiguous to or near the freeway, or not more than 15 miles from the freeway.
4. A sign *may* also be warranted on a major highway which is not a freeway but which bypasses a community having a qualifying emergency medical care facility.
5. On a freeway or other highway that bypasses a community having an emergency medical care facility, a sign will be erected:
 - a. Only at the point or points giving access to the most direct route to the facility.
 - b. Only once for traffic in each direction on a given highway.
6. Emergency Medical Care signs *should not* be erected on the same State Trunk Highway within the same community having a qualifying hospital that is already signed. An exception can be made if the emergency medical care facility is closer to the state trunk highway as described in Item 8.
7. Signs and trailblazers *may* be erected and maintained on the State Trunk Highway System by the Department but not until after trailblazer signs on local roads and streets have been erected.
8. If a new hospital is signed on the same highway in a community that has emergency medical care

facility signing, the existing emergency medical care facility signs **shall** be removed. An exception can be made if the emergency medical care facility is closer than the hospital at the same intersection or interchange. In this case, both facilities could be signed.

9. The name of the emergency care facility will not be utilized on the signing unless there is more than one facility on the route, each of which appears on the list of approved emergency medical care facilities, and each of which is approximately the same distance from the point at which the routes to the facilities diverge. The emergency medical care facility name sign will be utilized only at that divergence point, and not with other trailblazers between the beginning of the signed route and the point of divergence, nor between the point of divergence and the emergency medical care facility itself.

The Department will remove signs from the state trunk highways when notified that a facility does not meet the criteria for an Emergency Care Facility, and are not included on the attached list.

Summary of AMA Board Certified Emergency Medical Care Facilities

Updated October 2015

| Hospital | Address | City | Region | Remarks |
|----------------------------------|--------------------|-------------|--------|---------|
| St. Mary's Care Center | Reiner Rd. | Sun Prairie | SW | |
| Mercy Hospital and Trauma Center | 3400 Deerfield Dr. | Janesville | SW | |
| Pro Health Care | 240 Maple Ave. | Mukwonago | SE | |

2-4-48 Signing for Unincorporated Communities

May 2015

PURPOSE

The purpose of this policy is to establish standards for the use of signs identifying or directing to unincorporated communities.

DEFINITIONS

Unincorporated communities are defined as historically named and recognized communities without official boundaries or government, generally located within a township, which often will have a different name.

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate highways are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

POLICY

Identifying Unincorporated Communities

Signs *may* be installed on conventional state trunk highways as near as possible to the generally recognized entrance to an unincorporated community, subject to WisDOT general signing criteria and the following guidelines.

1. The unincorporated community must be located and identified by name on the official State Highway Map.
2. If an unincorporated community is not shown on the official State Highway Map, the community *may* contact the WisDOT Surveying and Mapping Section to officially request map placement. Some specific criteria for inclusion on the official State Highway map include:
 - a. There must be adequate space on the map to display the community name and symbol.
 - b. The community *should* have a reasonable permanent population (a minimum of 50 people) within a reasonable geographic proximity (1/4 miles in each direction of a common intersection or 1/2 mile in diameter).
 - c. The community *should* have either a dependable motorist service (such as a service or repair garage) or a major attraction (such as a consolidated school or major industry) or a recognized point of interest to which tourists might be directed to
3. Signs *may* be installed for an unincorporated community, in advance of a map printing, provided the community has been approved by the Surveying and Mapping Section to be on the official State

Highway Map.

4. The request for signs request must come from residents and/or business owners within the unincorporated community and be approved in writing by the governing body of the township or municipality surrounding the unincorporated community.
5. Signs identifying unincorporated communities **shall not** be permitted on freeways or expressways.
6. These signs **shall** be made according to the unincorporated version of the DOT standard sign code I2-3.

Directing to Unincorporated Communities

Signs *may* be installed on expressways or conventional state trunk highways directing to an unincorporated community, subject to WisDOT general signing criteria and the following guidelines:

1. The unincorporated community must be located and identified on the official State Highway Map.
2. The unincorporated community must be located within five miles of the State Highway intersection.
3. When the unincorporated community is located on a roadway other than a State Trunk Highway, signs identifying the community on that roadway must be in place prior to allowing any sign on a state highway directing to the community.
4. The sign(s) request must come from residents and/or business owners within the unincorporated community and be approved in writing by the governing body of the township or municipality surrounding the unincorporated community.
5. Signs directing to unincorporated communities **shall not** be permitted on freeways. Such signs *may* be permitted on expressway approaches to an at-grade intersection. They **shall not** be permitted on the expressway approaches to an interchange exit.
6. These signs **shall** be made according to the DOT standard sign code D1-1.

Existing unincorporated community signs that do not meet the WisDOT general signing criteria and above guidelines *may* remain until the end of their useful life. Useful life is defined as undamaged and legible to drivers. Once such non-conforming signs have reached the end of their useful life, they **shall** be removed and **shall not** be replaced.

2-4-48.1 Neighborhood Watch Signing

August 2009

PURPOSE

[Wisconsin State Statute 66.0429](#) allows cities or villages to place Neighborhood Watch signs upon the highway right-of-way within its corporate limits. Per Statute, the program is required to be authorized by the law enforcement agency of the city or village and must be approved by the city council or village board. Furthermore, State Statute 66.0429 (2) states that the sign must be of a uniform design approved by the Department of Transportation. Often times the Department is requested to provide a detail of the official sign.

Communities that have adopted such a program often request signing on the state highway system. The Department controls traffic signs on highways maintained by the state. Local governments do not have the authority to erect signs on those highways except when written permission is provided by the Department.

DEFINITIONS

Freeways are defined as arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional highways are defined as divided undivided roadway facilities that have limited access with no grade separations at intersections. These highways *may* be two lane or multilane facilities.

POLICY

The Department *may* permit local governments to place signs on highways under WisDOT jurisdiction subject to the requirements included here:

1. The city or village must have a neighborhood watch program in place that is authorized by the law

- enforcement agency of the city or village and approved by the city council or village board.
2. Requests for a permit to allow these signs must be in writing to the WisDOT Regional Office and *should* contain the following information:
 - a. Locations where signs are to be installed, including State highway route number and distance to the nearest public roadway intersection
 - b. Sign offset (distance from edge of travel lane) and type of post to be used
 - c. Assurance that sign will be free standing (not attached to other signs)
 - d. Documentation of city or village program.
 3. The local government **shall** be responsible for supplying, installing, and maintaining the signs in conformance with the permit. The local government **shall** furnish their identification sticker on the sign.
 4. The *recommended* sign for cities and villages is the NEIGHBORHOOD WATCH COMMUNITY sign (D12-50) (See Figure 1). There is a space for a 12" x 12" logo.
 5. Acceptable logo designs are (See Figure 2):
 - a. "Eye" style logo.
 - b. Criminal logo.
 6. There is no sunset date for signs already installed that do not conform to this policy. Rather, communities are encouraged to follow this consistent sign design.
 7. The city or village must obtain the approval of the appropriate Regional office for location(s) of the signs(s).
 8. Signs are only allowed at the corporate limits upon entering a community.
 9. Per intent of [State Statute 60.23 \(17m\)](#) neighborhood watch signs **shall not** be allowed for townships on the state highway system. They *may* be placed on township maintained roadways and county roadways, if approved by the County Board.
 10. For signs off the State Highway System, per State Statute 66.0429, WisDOT is required to approve the sign design.
 11. Neighborhood Watch signs **shall not** be allowed on freeways, including ramps and 65 mph expressways.
 12. Signs will be removed if official Neighborhood Watch program for the community no longer exists.

Figure 1

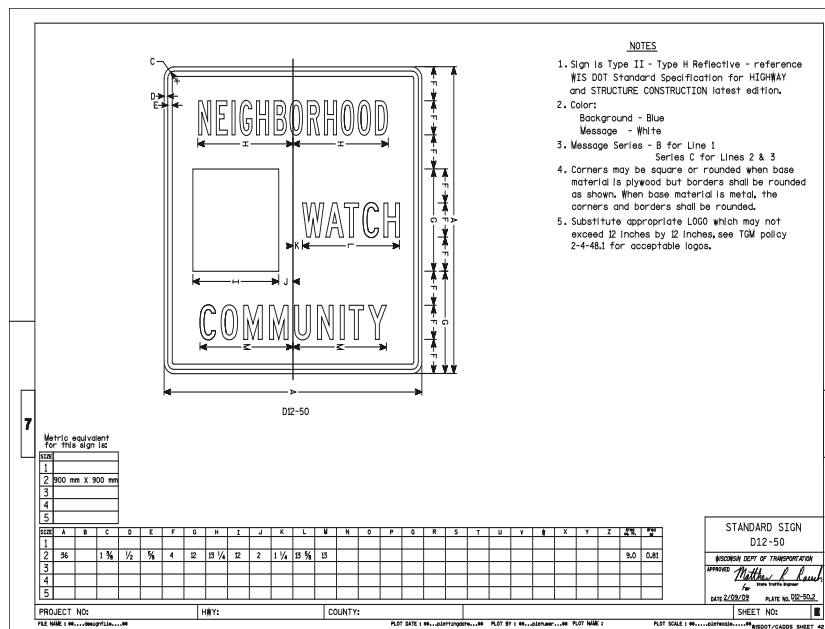


Figure 2 (Acceptable Logo Designs)



2-4-49 Street Name Signs

January 2015

PURPOSE

The MUTCD, Section [2D.43](#) states that street name signs *should* be installed at intersections. Standards and guidance are contained in Section [2D.43](#) of the MUTCD regarding letter sizes, colors and retroreflectivity of the street name signs.

Traditionally, local units of government have installed ground mounted street name signs at intersections of WisDOT maintained roadways. These ground mounted street name signs are installed and maintained by the local unit of government, in accordance with the MUTCD.

The MUTCD, Section [2D.43](#) also provides guidance and standards on the design of overhead street name signs at intersections. These types of overhead street name signs are commonly mounted on overhead traffic signal structures at the intersection. The overhead street name signs provide a lot of value in that they are larger and easier for the motorist to see (especially in urban environments where there are a lot of other competing signs, two or more travel lanes in each direction and closely spaced intersections). Now that the usage of traffic signal monotube arms have replaced the more traditional trombone arm traffic signal structure in Wisconsin, the attachment of overhead street name signs to the traffic signal structure has become much more practical.

The following policy criteria applies to both ground mounted and overhead street name signs that are installed on WisDOT roadways.

POLICY

Ground Mounted Street Name Signs

1. Local units of government are allowed to install ground mounted street name signs on WisDOT roadways. No permit is required for ground mounted street name signs.
2. Ground mounted street name signs **shall not** be installed on WisDOT maintained sign posts. Ground mounted street name signs **shall** be placed on their own supports and *should* be placed in the opposite quadrant as the STOP sign, typically on the left side so they do not obstruct the motorist's view of the STOP sign or any other signs.
3. The local unit of government **shall** pay for all costs associated with the manufacture, installation and maintenance of ground mounted street name signs.

Overhead Street Name Signs

1. WisDOT will install and maintain overhead street name signs on WisDOT maintained traffic signal monotube structures only.
2. In accordance with [TEOpS 2-4-50](#), WisDOT **shall** also install advance crossroad name signs on divided roadways with posted speeds of 45 mph or greater and 2-lane conventional highways with posted speeds of 55 mph that are on the national Highway System. The Region has the option to additionally install advance crossroad name signing on divided roadways with posted speeds of less than 45 mph.
3. For overhead street name signs mounted on traffic signal monotube arms, in addition to the overall sign size restrictions, the sign **shall** not exceed a lateral mounting distance of 15 feet from the upright (distance from upright to center of sign). See [SDD 9E-8](#) (sheets a-d) for the placement of overhead street name signs on traffic signal monotubes.
4. For WisDOT maintained overhead street name signs, only the standard M1-94H or M1-94S sign with white letters on green background will be allowed.
5. For existing overhead street name signs that have already been permitted on WisDOT maintained traffic

signal monotube structures, WisDOT *may* assume the maintenance of the signs (permission needed from local unit of government), provided the signs meet WisDOT design standards. Otherwise, the signs would be grandfathered until they wear out and then replaced by signs that meet WisDOT design standards and maintained by WisDOT at that point.

6. For existing WisDOT maintained urban traffic signal monotube structures that do not currently have street name signs attached to them, the overhead street name signs *may* be installed as part of an improvement project. If the local unit of government wishes to have overhead street name signs installed prior to an improvement projects, they will need to incur the installation costs. Maintenance of the signs will be by WisDOT.

Sign Design and Manufacture

1. Due to wind loading restrictions on overhead traffic signal monotubes, overhead sign sizes *should not* exceed 18" in height or 108" in length. If larger street name signs are needed (i.e. longer street names or different street names in each direction), then the monotube wind loading calculations **shall** be calculated to ensure adequate wind loading (see [Traffic Signal Design Manual 6-1-11](#)).
2. For overhead street name signs, 12" initial upper case/9" lower case *should* be used for the street name. If overall sign size is a concern, 8" initial upper case/6" lower case letter heights *may* be used.
3. For all ground mounted street name signs, only blue, brown, white or green backgrounds **shall** be used. The legend for ground mounted street name signs **shall** be white for blue, brown or green background signs. The legend **shall** be black for white background signs. Overhead street name signs on WisDOT maintained traffic signal monotube structures **shall** be white letters on green background.
4. Pictographs in the form of a community symbol or highway route shield *may* be used on either non-WisDOT maintained overhead street name signs or any ground mounted street name signs. The height and width of the pictograph **shall not** exceed the height of the upper case letter of the principle legend on the sign. Pictographs **shall not** contain commercial advertising.
5. For new overhead and ground mounted street name signs, the mixture of initial upper case / lower case lettering **shall** be used. Existing street name signs with all capital letters are allowed to remain until they wear out or are replaced in projects.
6. Ground mounted street name signs *should* have a minimum letter heights of 6" initial upper case / 4 ½" lower case for 2 lane conventional highways (all posted speeds) and multi-lane conventional highways (posted speeds 40 mph or less). Ground mounted street name signs on multi-lane conventional highways with posted speeds greater than 40 mph *should* have minimum letter heights of 8" initial upper case / 6" lower case. 4" initial upper case / 3" lower case letters *may* be used on local two-lane streets with posted speed limits of 25 mph or less.
7. Supplementary lettering to indicate the direction (North, South, East or West) or the type of street (St, Ave, or Rd) *may* be used. For ground mounted street name signs, minimum supplementary letter heights of 3" upper case / 2 ¼" lower case letters *should* be used. For overhead street name signs with 12" initial upper case/9" lower case letter heights for the street name, supplementary letter heights of 6" initial upper case / 4 ½" lower case letters **shall** be used. If using 8" initial upper case/6" lower case letter heights for the street name, 4" initial upper case/3" lower case supplementary letters **shall** be used. If used, route shields on overhead street name signs **shall** be the same height as the upper case letters of the street name.

2-4-50 Advance Crossroad Name Signs

May 2011

PURPOSE

This guideline provides information on the appropriate use of advance crossroad name signs. These signs are used on certain urban and rural roadways to identify and provide advance notice on the approach to intersections to allow safe reaction times and to orient unfamiliar motorists to their destinations.

These signs are provided for as optional street name signs in the MUTCD Section [2D.44](#). When an intersection warning sign (W2-1 through W2-6) is installed for the intersection, a similar function *may* be achieved with a supplemental advance street name plaque. Use of the advance cross road sign is preferred over the advance street name plaque. WisDOT has authority under [ss. 86.19](#) to place these signs to guide and warn traffic.

POLICY

Advance crossroad name signs *should* be used selectively for at grade intersections. Two primary criteria exist for determining whether crossroad name signs *should* be used: the character of the highway and the character of the intersecting roadway. The use of signs *should* reflect both considerations.

1. Criteria related to the State Highway:
 - a. Advance Crossroad Name Signs **shall** be used for at grade intersections of all urban and rural 4 lane divided highways with posted speeds 45 mph and greater.
 - b. Use of Advance Crossroad Name Signs is optional on 4 lane urban and rural divided highways with posted speeds less than 45 mph. Problem situations on these types of highways *may* warrant this signing.
 - c. Advance Crossroad Name Signs **shall** be used on all 2 lane conventional highways that are on the National Highway System which have a posted speed limit of 55 mph.
 - d. The use of Advance Crossroad Name Signs **shall** be optional on all other 2 lane conventional highways that do not meet the criteria listed above in item 1c. Problem situations on this type of highway *may* warrant this signing.
2. Criteria related to the intersecting roadway:
 - a. Advance crossroad name signs *should* be used for Intersecting roads that serve retail shopping, commercial activity, or other activities with high concentrations of entering or leaving traffic, or heavy slow moving vehicle traffic.
 - b. Advance crossroad name signs are normally not used for intersections with another state highway or a county trunk highway. Those intersections *should* have junction signing in place and are referenced with highway numbers or letters rather than road names.
 - c. Advance crossroad name signs *should not* be used for intersections with roads that are dead ends or only serve an individual property owner.
3. Sign placement and details:
 - a. Directional arrows **shall** be used on all signs. For intersecting crossroads with different road names to the left and right, a D1-1 or D1-2 sign would be used. A D1-61 sign with two arrows would be used for intersecting roadways having the same name in both directions. In some locations, such as freeway off ramps with intersecting roadways having the same name in both directions, it may be beneficial to list the cardinal directions on the sign (D1-60 sign).
 - b. In urban or semi-urban areas, there *may* be cases where there are closely spaced intersections or median cut-outs where the usage of directional arrows could cause potential motorist confusing with turning at the wrong location. For these locations, in lieu of signs with directional arrows, an option would be to utilize sign with the word text of NEXT INTERSECTION (D1-63 sign), SECOND INTERSECTION (D1-64 sign) or NEXT SIGNAL (D1-65 sign).
 - c. Advance Crossroad Name Signs *should* be placed on the right side of the roadway. On divided highways, where there is a left turn only situation, the sign *should* be placed in the median. When there are three or more travel lanes in each direction, signs *should* be installed on the right side of the roadway and the median side of the roadway.
 - d. Placement of signs *should* follow the MUTCD Table [2C-4](#), condition B, deceleration to condition of 0 mph). The distance of these signs from the intersection *may* vary due to the presence of other signing in the area; however, it *should not* be less than 500 feet for speeds 45 mph and above.
 - e. Additional Advance Crossroad Name Sign size criteria for bypasses are contained in [TEOpS 2-15-53](#) Bypass Signing.
 - f. Lettering sizes for Advance Crossroad Name Signs **shall** be as follows:
 - i. High Speed Roadways (45 mph or above): 4 ½" lower case/6" upper case for conventional state trunk highways and 6" lower case/8" upper case for expressway crossroads; 4 ½" lower case/6" upper case or 6" lower case/ 8" upper case for 4 lane divided or undivided highways.
 - ii. Low Speed Roadways (less than 45 mph): 4 ½" lower case/6" upper case.

2-4-51 Rustic Road Signs**February 2018****GENERAL**

The [Wisconsin Administrative Code Trans-RR 1](#) contains all of the rules for the application procedures and sign installation/maintenance criteria for Rustic Road Signing. The Wisconsin Department of Transportation has organized a Rustic Roads Board that maintains all of the rules in Wisconsin Administrative Code Trans-RR1. In addition to these rules, there is a need to also provide clear guidance on the minimum signing that is required to conform to the rules of the Rustic Roads Board. The goal of this guidance is to provide for a statewide consistent method of signing and clearly define what the signing the Department is responsible for and what signing the Local maintaining authority is responsible for.

POLICY

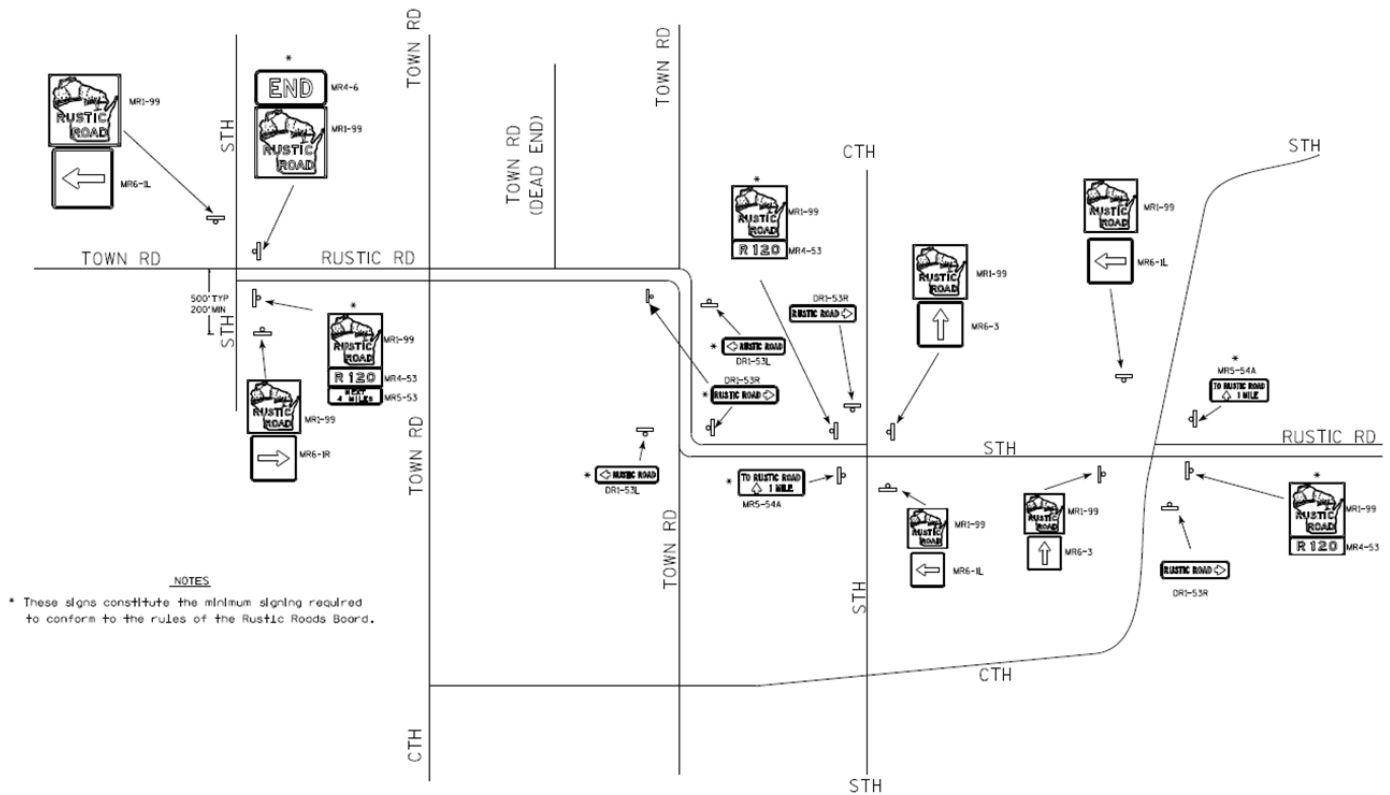
Below are the guidelines for the installation and maintenance of Rustic Road Signing:

1. A minimum amount of signing *should* be used in order to avoid additional sign clutter at intersections, which can lead to safety issues. Figure 1 shows examples of the minimum amount of signing required to conform to the rules of the Rustic Roads Board.
 - a. JR-1 assemblies (RR Marker, Rustic Road Number, Mileage) **shall** be used at all Rustic Road termini. The mileage listed **shall** be the entire length of that Rustic Road designation, regardless of any splits or loops, rounded to the nearest mile.
 - b. JR-2 assemblies (RR Marker, Rustic Road Number) **shall** be used at interior intersections with State or US Highways
 - c. DR1-53 (Rustic Road w/arrow(s)) signs **shall** be used at any turns or splits along the Rustic Road route.
 - d. J4 assemblies (End, RR Marker) **shall** be used at all Rustic Road termini.
 - e. J13 assemblies (RR Marker, arrow) *should* be used on State or US Highway approaches to Rustic Roads. For County Highways designated as Rustic Roads, this *may* be accomplished by combining Rustic Road signing with the Route Assemblies (J1/J12 and J13) for the County Highway.
 - f. DR1-53 signs *should* be used on County Highway approaches to Rustic Roads.
 - g. Gaps in Rustic Road routes *should* be signed with MR5-54 (To Rustic Road w/arrow & mileage) signs.
 - h. No signing is typically necessary on local road approaches to Rustic Roads.

There is no formal phase-in period for installation of this signing. Existing signs will be allowed to remain in place until the end of their useful life. Useful life ends when the sign message no longer meets legibility or condition standards. Existing signs *may* be replaced prior to the end of their useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or when projects make replacement practical.

2. The Department **shall** pay for the installation and maintenance of all Rustic Road signing. Major Rustic road signing efforts *should* be done in the fourth quarter of the calendar year. Minor sign replacement *may* occur throughout the year, as feasible.
3. As signs on the local system wear out and need to be replaced, the local unit of government *should* provide a list of signs needing replacement to the Department.

Figure 1



2-4-52 Heritage Directional Signs

December 2013

PURPOSE

In 1994, WisDOT and Wisconsin Department of Tourism enacted the Heritage Directional Signing program through a Cooperative Agreement between the two agencies. The Department of Tourism had the responsibility to work with the application process for businesses requesting signs and maintained a brochure of the eligible businesses. Tourism furnished the signs to WisDOT and the Department of Tourism covered installation and long term maintenance of the signs.

In August of 2013, the Department of Tourism indicated that they were no longer maintaining the Heritage Signing program and instead have focused on other means to promote this tourism effort. As a result, no new Heritage Direction signs will be installed on state highways from this time forward. This guideline provides information on the signing phase-out plan that was approved by Dept. of Tourism and WisDOT.

GUIDELINES

Listed below are guidelines for the installation and removal of Heritage Directional signing on WisDOT roadways, M1-85, M1-85C and M1-85d, which were agreed upon by the Department of Tourism and WisDOT:

1. New Heritage Direction signs **shall not** be installed on WisDOT roadways.
2. Existing Heritage Direction signs *may* be allowed to remain in place until the end of their useful life. Other opportunities such as knockdown damage, improvement projects or change in conditions *may* make it possible to have the signs removed earlier.
3. If WisDOT staff receives a call from a business requesting a replacement Heritage Directional sign, refer the name and contact information to the State Signing Engineer, who in turn will work with the requestor and Tourism to find a potential alternative signing program (SIS, TODS, White Arrow boards).
4. If WisDOT removes a Heritage Directional sign, the Region *should* let the State Signing Engineer know, who will subsequently let Tourism know.

PURPOSE

Section [2H.07](#) of the MUTCD provides information on the appropriate use of Auto Tour Signs. These signs are used on certain urban and rural roadways to identify special routes that have certain cultural, historical or educational significance. These types of routes have been approved by the Wisconsin legislature and are included in the Wisconsin State Statutes. Examples of these routes are: The Rock River Trail, the Wild Rivers Trail, Lake Michigan Circle Tour, Lake Superior Circle Tour, Great River Road, and Green Bay Ethnic Trail.

This policy expands upon the language in the MUTCD by providing additional guidelines and standards on the usage of Auto Tour signs on WisDOT maintained roadways.

DEFINITIONS

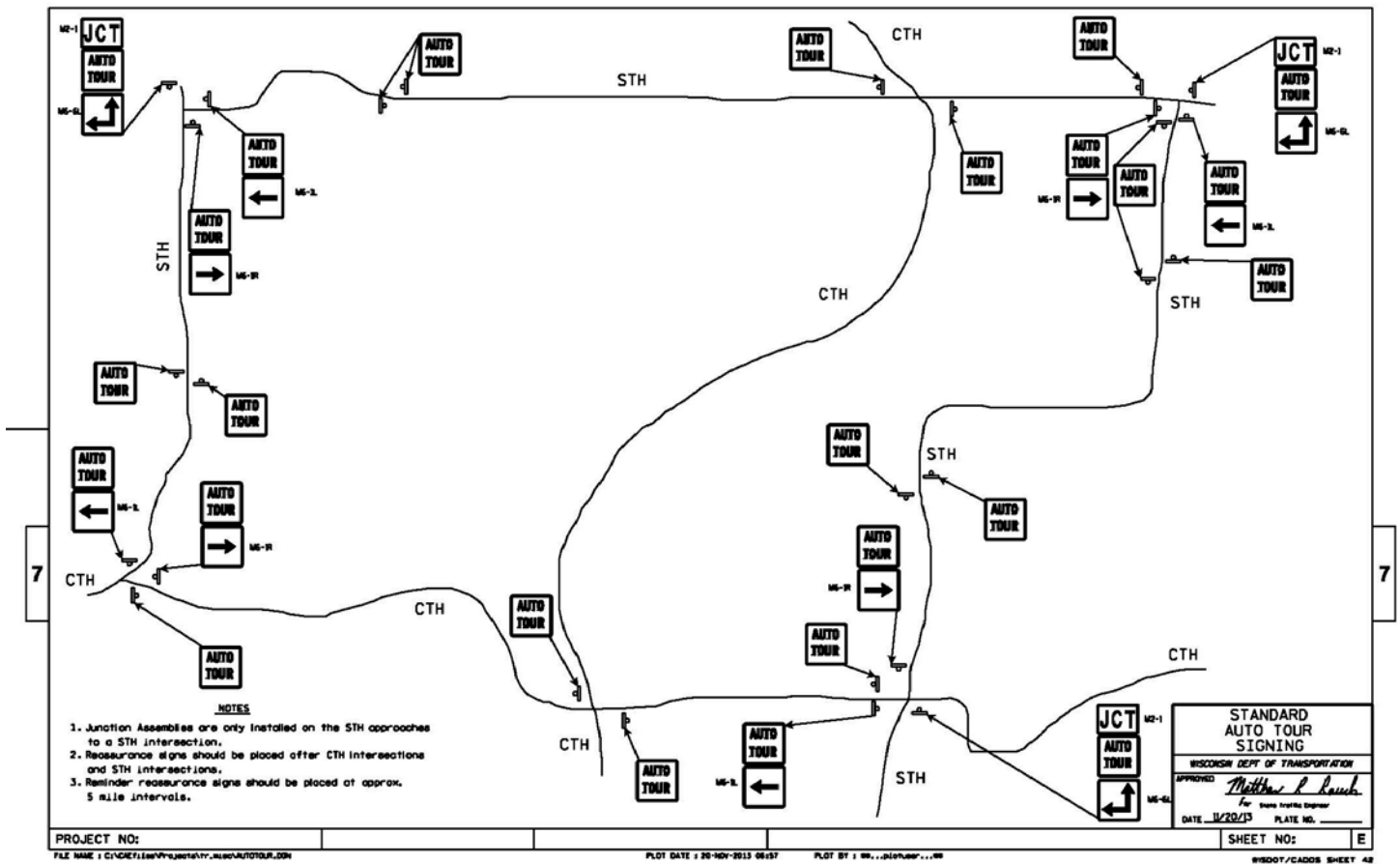
Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial controlled access and generally with grade separations at major intersections.

Conventional highways are defined as either divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways can be two-lane or multi-lane facilities.

POLICY

1. Auto Tour route signing is not intended to sign to a specific destination. Particular destinations tying into an Auto Tour route are typically listed on a website, brochure or other means.
2. Auto Tour route signs **shall not** be installed on freeways or expressways except as to provide continuity between discontinuous segments of conventional roadways that are designated as auto tour routes, for which the freeway or expressway provides the only connection between segments.
3. Auto Tour signing **shall** have the approval of the local unit(s) of government prior to signing on the state system.
4. A minimum amount of signing *should* be used in order to avoid additional sign clutter at intersections, which can lead to safety issues. Signs *should* also be close enough that the route can be easily followed without additional direction.
5. Design and Layout of Auto Tour Signing **shall** be approved by the Bureau of Traffic Operations.
6. For Auto Tour signs having the M1-92 or M1-98 sign code, the requesting groups **shall** pay all costs associated with installation and maintenance of Auto Tour signs. As signs on the local system wear out and need to be replaced, the local unit of government *may* request replacement signs from the Department at the local unit's expense.
7. For Auto Tour signs having the M1-7, M1-91, M1-93, M1-96, or M1-97 sign code, WisDOT **shall** pay for all cost associated with the installation and maintenance of the signs.



2-4-55 Stream/River/Lake Signs

September 2001

PURPOSE

Guide signs noting stream, river, and lake crossings have traditionally been installed on WisDOT roadways to assist motorists. When used in a controlled manner, these signs have benefits because they can help an unfamiliar motorist find their location when using a map and can also be informative on pointing out the location of important bodies of water for tourists or sporting use. However, in the past, usage of these signs has been uncontrolled, resulting in sign installations for everything from dry ditches to bodies of water not on the state map or recognized by the Wisconsin Department of Natural Resources. The intent of this policy is to establish control and statewide consistency on the usage of these signs.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial controlled access, and generally by means of grade separation at major intersections.

INSTALLATION GUIDELINES

Stream, river and lake crossing guide signs *may* be used provided the following criteria are met:

1. For freeways and expressways. The body of water to be signed has a name shown on the current official State of Wisconsin Highway Map that is published by the Wisconsin Department of Transportation. Any bodies of water not having a name shown on this map **shall not** be signed for.
2. For conventional highways. The body of water to be signed has a name shown on the current official State of Wisconsin Highway Map or the current official County Highway Maps that are published by the Wisconsin Department of Transportation. Any bodies of water not having a name shown on these maps **shall not** be signed for.

3. Any existing stream, river, or lake crossing signs that are in place and do not meet the criteria listed in items 1 or 2 above, will be allowed to remain in place until the end of their useful life. Once the signs have reached their useful life, they **shall** be removed and not be replaced. Useful life is defined as the sign being legible for its intended usage.

2-4-60 Township Boundary and Land Use Zoning Signs

August 2000

PURPOSE

In the past, there have been requests by both urban and rural townships to have township boundary signs and land use zoning signs erected on WisDOT system roadways in order to identify themselves to motorists. In 1997, Assembly Bill 114 created a procedure that allows certain towns to become “urban towns” in order to specify the towns that are eligible to invoke this procedure and to define the authority granted to towns that become urban towns. As of the date of this policy, Assembly Bill 114 **did not pass**.

The intent of this policy is to establish a statewide policy and to control the clutter of signs on WisDOT system roadways by not allowing the use of these signs.

POLICY

Township Boundary signs and/or Township Land Use Zoning signs *should not* be installed on WisDOT system roadways, or right of ways, either individually or as part of a sign assembly. Zoning requirements are easily obtainable from local governments, thus making this signing unnecessary because these signs do not serve to guide or orient the average motorist. Similarly, township boundary signs do not have sufficient orientation value to warrant installation on the state highway or right-of-way system, since townships are not even shown on the state map.

In some cases, Township Boundary signs *may* be allowed by the Department for urbanized townships only. Requests for signing for urbanized township signs will be reviewed by the Department on a case-by-case basis and a permit *may* be granted.

Any existing Township Boundary signs or Township Land Use Zoning signs located on WisDOT system roadways that have not been permitted **shall** be removed no later than July 1, 2001.

2-4-65 Amenity Signs

April 2001

PURPOSE

The intent of this guideline is to establish standards for the use of signs which provide information about services provided at roadside facilities, including waysides and historical markers. The guideline is intended reduce the number of certain informational signs and messages in order to retain or improve the impact of other guidance and warning signs. The guideline also reflects the need to focus signing efforts and resources on the signs of highest value for safety and mobility.

Amenity signs, often referred to as “fingerboard” signs, have been installed in the past to give information about services available in the site. These signs were typically mounted below the advance signs to the facility.

The amenity signs covered under this policy include the DB5-69, DG5-69, and DN5-69 series:

- Toilet Sign (DB5-69A, DG5-69A, and DN5-69A)
- Boat Landing Sign (DB5-69B, DG5-69B, and DN5-69B)
- Drinking Water Sign (DB5-69C, DG5-69C, and DN5-69C)
- Picnic Tables Sign (DB5-69D, DG5-69D, and DN5-69D)
- Historical Marker Sign (DB5-69E)
- Memorial Marker Sign (DB5-69F)

Motorists are accustomed to expecting certain amenities at waysides which reduces the value of some amenity signs. Signs are appropriate for other amenities that motorists are not accustomed to, or are not part of the standard expectation for the roadside facility.

POLICY

1. Toilet, Drinking Water, and Picnic Table signs shall not be installed on state highways. Those Toilet, Drinking Water, and Picnic Tables signs previously installed on state highways will be allowed to remain in place until the end of their useful life, when they should be removed and not replaced. Useful life ends when the sign message no longer meets legibility or condition standards. These signs may be removed

prior to the end of the signs useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or projects that make removal practical.

2. Boat Landing, Historical Marker, and Memorial Marker signs should continue to be installed on state highways. These signs should be mounted below the advance sign to the facility.



Traffic Engineering, Operations & Safety Manual

Chapter 2 Signing

Section 6 Guide Signs—Freeway

2-6-19 Exit Numbers

March 2016

The following is a listing of freeway exit numbers in Wisconsin. Changes or additions *should* be reported to the Signs and Markings Implementation Section to keep this listing current.

| County | Direction of Travel | Interchange with | Exit No. |
|---------------|---------------------|--|----------|
| USH 10 | | | |
| Wood | E B and WB | STH 13 North and CTH A - Marshfield | 187 |
| Portage | EB and WB | STH 13 South and STH 34 South – Junction City and Wis Rapids | 204 |
| Portage | EB | STH 34 North, CTH P and CTH HH – Knowlton and Stevens Point | 208 |
| Portage | WB | STH 34 North, CTH P and CTH HH – Knowlton and Junction City | 208 |
| Portage | WB | IH 39 and USH 51 North - Wausau | 213 |
| Portage | EB and WB | CTH J | 230 |
| Portage | EB | Amherst Jct. and Lake Road | 237 |
| Portage | EB and WB | CTH B West – Plover and Amherst | 238 |
| Portage | EB and WB | CTH A and CTH B East - Amherst | 240 |
| Waupaca | EB | STH 49 North and STH 54 West - Waupaca | 250 |
| Waupaca | WB | STH 49 North and STH 54 West - Waupaca and Wis. Rapids | 250 |
| Waupaca | EB and WB | STH 22 South and CTH K - Waupaca and Wild Rose | 252 |
| Waupaca | EB and WB | Churchill St | 253 |
| Waupaca | EB and WB | STH 22 North, STH 54 East, CTH A, and CTH K North - Waupaca | 254 |
| Waupaca | EB and WB | STH 110 North and CTH A - Weyauwega | 260A |
| Waupaca | WB | CTH F - Weyauwega | 260B |
| Waupaca | EB and WB | STH 49 and STH 110 – Berlin and Fremont | 264 |
| Waupaca | EB and WB | STH 96, STH 110, CTH II - Fremont | 267 |
| Winnebago | EB and WB | USH 45 North – New London | 273 |
| Winnebago | EB and WB | USH 45 South – Oshkosh | 276 |
| Winnebago | EB and WB | STH 76 and USH 41 North – Oshkosh and Shiocton | 284 |
| Winnebago | WB | STH 76 – Oshkosh and Shiocton | 284 |
| Winnebago | EB and WB | CTH CB | 286 |
| Winnebago | EB and WB | USH 41 South - Oshkosh | 287A |
| Winnebago | WB | USH 41 North - Green Bay | 287B |
| Winnebago | EB and WB | CTH P - Racine St | 289A |
| Winnebago | EB and WB | CTH AP - Midway Rd | 289B |
| Winnebago | EB and WB | STH 47 - Appleton Ro | 290 |
| Winnebago | EB | Oneida St | 291 |
| USH 12 | | | |
| Sauk | EB and WB | CTH BD – Fern Dell Rd | 212 |
| Sauk | EB and WB | N Reedsburg Rd | 214 |
| Sauk | EB and WB | STH 33 WB – Pit Rd | 215 |
| Dane | EB and WB | Parmenter St | 249 |
| Dane | EB and WB | CTH M – Airport Rd and Century Ave | 250 |
| Dane | WB | Parmenter St | 251B |
| Dane | EB and WB | USH 14 West | 251A |
| Dane | EB and WB | Greenway Blvd. | 252 |
| Dane | EB and WB | Old Sauk Rd | 253 |
| Dane | EB and WB | CTH M and S - Mineral Point Rd | 254 |
| Dane | EB and WB | Gammon Rd | 255 |
| Dane | EB and WB | Whitney Way | 257 |
| Dane | EB and WB | USH 18 West and USH 151 South - Verona Rd and Midvale Blvd. | 258 |
| Dane | WB | Seminole Hwy. | 258A |
| Dane | EB and WB | Todd Dr. | 259 |
| Dane | EB | CTH D South - Fish Hatchery Rd | 260A |
| Dane | EB | CTH D North - Fish Hatchery Rd | 260B |
| Dane | WB | CTH D - Fish Hatchery Rd | 260B-A |
| Dane | EB | USH 14 East | 261A |
| Dane | EB | USH 151 North - Park St. | 261B |
| Dane | WB | USH 151 North - Park St and USH 14 East | 261B-A |
| Dane | EB and WB | Rimrock Rd | 262 |

| | | | |
|----------|-----------|-------------------------------|--------|
| Dane | EB and WB | John Nolen Dr. | 263 |
| Dane | EB and WB | South Towne Dr. | 264 |
| Dane | EB and WB | Monona Dr. | 265 |
| Dane | EB and WB | USH 51 - Stoughton Rd | 266 |
| Dane | EB | IH 90 East and IH 39 South | 267A |
| Dane | EB | IH 90 West and IH 39 North | 267B |
| Dane | EB and WB | CTH N | 272 |
| Walworth | EB and WB | IH 43 and CTH NN | 321 |
| Walworth | EB and WB | STH 120 North | 328 |
| Walworth | EB | STH 50 East | 330A |
| Walworth | EB | STH 50 West and STH 120 South | 330B |
| Walworth | WB | STH 50 and STH 120 South | 330A-B |
| Walworth | EB and WB | Pell Lake Dr. | 335 |

USH 14

| | | | |
|------|-----------|-----------|-----|
| Dane | EB | STH 138 | 140 |
| Dane | EB and WB | CTH MM | 139 |
| Dane | EB and WB | Mc Coy Rd | 133 |

STH 16

| | | | |
|----------|-----------|---|-----|
| Waukesha | EB and WB | CTH P North - Brown St. and Grifford Rd | 176 |
| Waukesha | EB and WB | CTH P South - Sawyer Rd | 178 |
| Waukesha | EB and WB | CTH C | 179 |
| Waukesha | EB and WB | STH 83 | 181 |
| Waukesha | EB | CTH E and KC - North Ave. and Merton Ave. | 182 |
| Waukesha | WB | CTH KC and E - North Ave. and Merton Ave. | 183 |
| Waukesha | EB and WB | CTH JK and KE - Jungbluth Rd. and North Shore Dr. | 184 |
| Waukesha | EB and WB | CTH KF - Ryan St. | 186 |
| Waukesha | EB and WB | STH 190 - Capitol Dr. | 187 |
| Waukesha | EB and WB | CTH JJ - Main St. | 188 |

STH 26

| | | | |
|-----------|-----------|------------------------|----|
| Rock | NB and SB | Harmony Town Hall Road | 6 |
| Rock | NB and SB | STH 59 and CTH M | 8 |
| Jefferson | NB and SB | Business 26 and CTH Y | 39 |
| Jefferson | NB | STH 19 | 43 |
| Dodge | SB | STH 19 | 43 |
| Dodge | NB and SB | STH 16 EB | 45 |

STH 29

| | | | |
|----------|-----------|-------------------------------------|------|
| Dunn | WB | WB IH 94 | 60A |
| Dunn | WB | EB IH 94 | 60B |
| Dunn | EB and WB | USH 12 and STH 40 | 61 |
| Chippewa | EB and WB | CTH T | 68 |
| Chippewa | EB and WB | 90 th St and Business 29 | 72 |
| Chippewa | EB and WB | US 53 South | 75A |
| Chippewa | EB and WB | US 53 North | 75B |
| Chippewa | | Seymour Cray and Business 29 | 79 |
| Chippewa | EB and WB | CTH X | 80 |
| Chippewa | EB and WB | CTH J | 81 |
| Chippewa | EB and WB | CTH X | 87 |
| Chippewa | EB and WB | STH 27 | 91 |
| Chippewa | EB and WB | CTH D | 97 |
| Chippewa | EB and WB | CTH H | 101 |
| Clark | EB and WB | STH 73 and CTH M | 108 |
| Clark | EB and WB | STH 73 and CTH T | 118 |
| Clark | EB and WB | CTH X – Cardinal Ave | 122 |
| Clark | EB and WB | CTH E | 127 |
| Clark | EB | Sprue St/ Highline Ave | 131 |
| Marathon | EB and WB | STH 13 | 132 |
| Marathon | WB | Maple Rd/Spruce St | 134 |
| Marathon | EB and WB | STH 97 | 145 |
| Marathon | EB and WB | CTH H | 150 |
| Marathon | EB and WB | STH 107 | 156 |
| Marathon | EB and WB | 72 nd Ave | 162 |
| Marathon | EB and WB | STH 52 | 164A |

| | | | |
|----------|-----------|---|------|
| Marathon | EB and WB | USH 51 North | 164B |
| Marathon | EB | USH 51 South | none |
| Marathon | WB | USH 51 North | none |
| Marathon | EB and WB | Business 51 | 171 |
| Marathon | EB and WB | CTH X | 173 |
| Marathon | EB and WB | CTH J | 177 |
| Marathon | EB and WB | CTH Q | 181 |
| Marathon | EB and WB | CTH Y | 185 |
| Shawano | EB and WB | USH 45 North and CTH M and Business 29 | 195 |
| Shawano | WB | CTH Q and Business 29 | 196 |
| Shawano | EB and WB | USH 45 South | 198 |
| Shawano | EB and WB | STH 22 | 225 |
| Shawano | EB | STH 47 North and STH 55 North and CTH K | 227 |
| Shawano | WB | STH 47 North and STH 55 North and CTH K and Business 29 | 227 |
| Shawano | EB and WB | STH 47 South and STH 117 | 234 |
| Shawano | EB and WB | STH 55 South and STH 160 | 242 |
| Brown | EB and WB | STH 32 and CTH Y | 249 |
| Brown | EB and WB | CTH FF | 255 |

INTERSTATE 39
(SEE USH 51- INTERSTATE HIGHWAY 39)
(ALSO SEE INTERSTATE 90 FOR I39/I90/I94)

STH 175

| | | | |
|-----------|-----------|---|-----|
| Milwaukee | NB and SB | IH 94-Eastbound | 38A |
| Milwaukee | NB and SB | IH 94-Westbound | 38B |
| Milwaukee | SB | USH 18 (Wisconsin Ave.) and Wells St. | 38C |
| Milwaukee | NB | USH 18 - Wisconsin Ave. and Bluemound Rd. | 38C |
| Milwaukee | SB | Vliet St. and State St. | 39A |
| Milwaukee | NB | State St. and Vliet St. | 39A |
| Milwaukee | NB | Washington Blvd. | 39B |
| Milwaukee | NB | Lloyd St. | 40A |
| Milwaukee | NB | USH 41 - Lisbon Ave. | 40B |

INTERSTATE HIGHWAY 41

| | | | |
|-------------|-----------|--|-------|
| Milwaukee | NB | STH 175 - Appleton Ave. | none |
| Milwaukee | SB | USH 41 - Appleton | 47A |
| Milwaukee | NB and SB | CTH PP - Good Hope Rd | 47B |
| Milwaukee | NB | STH 145 North and 124 th St | 48 |
| Waukesha | SB | STH 145 - Fond du Lac Ave. | 48 |
| Waukesha | NB | STH 100 East - Main St. | 50A |
| Waukesha | NB | CTH F West - Main St. | 50B |
| Waukesha | SB | CTH F and STH 100 East - Main St. | 50A-B |
| Waukesha | NB | Pilgrim Rd - Northbound | 51A |
| Waukesha | NB | Pilgrim Rd - Southbound | 51B |
| Waukesha | SB | Pilgrim Rd | 51A-B |
| Waukesha | NB | CTH Q - County Line Rd | 52 |
| Washington | SB | CTH Q - County Line Rd | 52 |
| Washington | NB and SB | STH 167 East - Mequon Rd and CTH Y Lannon Rd | 54 |
| Washington | NB and SB | STH 167 West - Holy Hill Rd | 57 |
| Washington | NB | USH 45 North | 59 |
| Washington | NB and SB | STH 145 | 60 |
| Washington | NB | STH 60 East | 64A |
| Washington | NB | STH 60 West | 64B |
| Washington | SB | STH 60 | 64A-B |
| Washington | NB and SB | STH 144 | 66 |
| Washington | NB and SB | CTH K | 68 |
| Washington | NB and SB | STH 33 | 72 |
| Washington | NB and SB | CTH D | 76 |
| Dodge | NB and SB | STH 28 | 81 |
| Dodge | NB and SB | STH 67 | 85 |
| Dodge | NB and SB | STH 49 and CTH KK | 87 |
| Fond du Lac | NB and SB | CTH B | 92 |
| Fond du Lac | NB and SB | USH 151 | 95 |
| Fond du Lac | NB and SB | CTH VV - Hickory St. | 97 |
| Fond du Lac | NB and SB | CTH D and Military Road | 98 |
| Fond du Lac | NB and SB | STH 23 - Johnson St. | 99 |

| | | | |
|-------------|-----------|--|------|
| Fond du Lac | NB and SB | CTH OO - Winnebago St. | 101 |
| Fond du Lac | NB and SB | CTH N | 106 |
| Winnebago | NB and SB | STH 26 | 113 |
| Winnebago | NB and SB | STH 44 and STH 91-Ripon Rd and South Park Ave. | 116 |
| Winnebago | NB and SB | 9th Ave. | 117 |
| Winnebago | NB and SB | STH 21 - Omro Rd and Oshkosh Ave. | 119 |
| Winnebago | NB and SB | USH 45 and TO USH 10 West - Algoma Blvd. | 120 |
| Winnebago | NB and SB | STH 76 - Jackson St. | 124 |
| Winnebago | NB and SB | Breezewood Lane/Bell St. | 129 |
| Winnebago | NB and SB | STH 114 and CTH JJ - Winneconne Ave. | 131 |
| Winnebago | NB and SB | Main St. and Oakridge Rd | 132 |
| Winnebago | NB and SB | CTH II - Winchester Rd | 133 |
| Winnebago | NB and SB | USH 10 East and STH 441 North | 134 |
| Winnebago | NB and SB | CTH BB - Prospect Ave. | 136 |
| Outagamie | NB and SB | STH 125 - College Ave. | 137 |
| Outagamie | NB and SB | STH 96 - Wisconsin Ave. | 138 |
| Outagamie | NB and SB | STH 15 and CTH 00 - Northland Ave. | 139 |
| Outagamie | NB and SB | STH 47 - Richmond St. | 142 |
| Outagamie | NB and SB | CTH E - Ballard Rd | 144 |
| Outagamie | NB and SB | STH 441 South | 145 |
| Outagamie | NB and SB | CTH N | 146 |
| Outagamie | NB and SB | STH 55 | 148 |
| Outagamie | NB and SB | CTH J | 150 |
| Outagamie | NB and SB | CTH U | 154 |
| Brown | NB and SB | CTH S | 157 |
| Brown | NB and SB | CTH F - Scheuring Road | 161 |
| Brown | NB and SB | CTH G - Main Ave. | 163A |
| Brown | NB | Ashland Ave. | 163B |
| Brown | NB and SB | CTH AAA - Oneida Street and Waube Lane | 164A |
| Brown | NB and SB | STH 172 | 164B |
| Brown | NB and SB | CTH VK - Lombardi Ave. | 167 |
| Brown | NB and SB | STH 54 and STH 32 South - Mason St. | 168A |
| Brown | NB and SB | STH 29 West and STH 32 North | 168B |
| Brown | NB and SB | STH 29 East Shawano Ave. | 168C |
| Brown | NB and SB | USH 141 South - Velp Ave. | 170A |
| Brown | NB and SB | IH 43 | 170B |

USH 41

| | | | |
|--------|-----------|---------------------------|-----|
| Brown | NB and SB | CTH M - Lineville Road | 173 |
| Brown | NB and SB | CTH B - Sunset Beach Road | 176 |
| Oconto | NB and SB | Brown Road | 179 |
| Oconto | NB and SB | CTH S | 182 |
| Oconto | NB and SB | CTH D - Sampson Road | 185 |
| Oconto | NB and SB | USH 141 | 187 |
| Oconto | NB | Business 41 | 197 |
| Oconto | NB and SB | STH 22 | 198 |
| Oconto | SB | Business 41 | 200 |

INTERSTATE HIGHWAY 43

| | | | |
|-----------|-----------|----------------------------|-----|
| Marinette | NB and SB | CTH Y | 212 |
| Marinette | NB and SB | Schacht Road | 216 |
| Rock | SB | IH 90 East and IH 39 South | 1A |
| Rock | SB | IH 90 West and IH 39 North | 1B |
| Rock | NB and SB | CTH X and Hart Road | 2 |
| Rock | NB and SB | STH 140 | 6 |
| Walworth | NB and SB | USH 14 | 15 |
| Walworth | NB and SB | CTH X | 17 |
| Walworth | NB and SB | STH 50 | 21 |
| Walworth | NB and SB | STH 67 | 25 |
| Walworth | NB and SB | USH 12 East | 27A |
| Walworth | NB and SB | USH 12 West | 27B |
| Walworth | NB and SB | STH 11 | 29 |
| Walworth | NB and SB | Bowers Road | 33 |
| Walworth | NB and SB | STH 120 | 36 |
| Walworth | NB and SB | STH 20 | 38 |
| Waukesha | NB and SB | STH 83 | 43 |
| Waukesha | NB and SB | STH 164 | 50 |

| | | | |
|-----------|-----------|---|-------|
| Waukesha | NB and SB | CTH Y - Racine Ave. | 54 |
| Waukesha | NB and SB | Moorland Road | 57 |
| Waukesha | NB | Layton Avenue | 59 |
| Milwaukee | SB | USH 45 and STH 100 - South | 60 |
| Milwaukee | NB | IH 894 West | 61 |
| Milwaukee | NB | Michigan St and 10 th St | 72A |
| Milwaukee | SB | IH 794 East - Lakefront | 72B |
| Milwaukee | NB | IH 794 East - Lakefront | 310C |
| Milwaukee | NB | Kilbourn Avenue | 72C |
| Milwaukee | SB | IH94 West Madison | 72D |
| Milwaukee | SB | Highland Avenue and 11 th St | 72E |
| Milwaukee | NB and SB | Fond du Lac Ave and McKinley Ave | 73A |
| Milwaukee | NB and SB | North Avenue | 73B |
| Milwaukee | NB and SB | Locust Avenue | 74 |
| Milwaukee | NB and SB | Keefe Avenue and Atkinson Avenue | 75 |
| Milwaukee | NB | STH 190 East - Capitol Dr | 76A |
| Milwaukee | NB | STH 57 - Green Bay Ave and STH 190 West - Capitol Dr. | 76B |
| Milwaukee | SB | STH 57 - Green Bay Ave and STH 190 - Capitol Dr. | 76A-B |
| Milwaukee | NB | Hampton Avenue - Eastbound | 77A |
| Milwaukee | NB | Hampton Avenue - Westbound | 77B |
| Milwaukee | NB and SB | Silver Spring Drive | 78 |
| Milwaukee | NB and SB | Good Hope Road | 80 |
| Milwaukee | NB | Brown Deer Road - Eastbound | 82A |
| Milwaukee | SB | STH 32 East - Brown Deer Road | 82A |
| Milwaukee | NB and SB | STH 100 West - Brown Deer Road | 82B |
| Milwaukee | NB | CTH W - Port Washington Road | 83 |

Interchanges where IH 43 and IH 894 are concurrent are numbered as interchanges on IH 894

| | | | |
|------------------------------|-----------|---|--------|
| Ozaukee | NB and SB | STH 167 - Mequon Road | 85 |
| Ozaukee | NB and SB | CTH C | 89 |
| Ozaukee | NB and SB | STH 60 and CTH Q | 92 |
| Ozaukee | NB and SB | STH 32 North and CTH V South | 93 |
| Ozaukee | NB and SB | STH 33 | 96 |
| Ozaukee | NB | STH 57 | 97 |
| Ozaukee | NB and SB | CTH H West and STH 32 South | 100 |
| Ozaukee | NB and SB | CTH D | 107 |
| Sheboygan | NB and SB | STH 32 North and CTH LL | 113 |
| Sheboygan | NB and SB | CTH AA - Foster Rd | 116 |
| Sheboygan | NB and SB | CTH V and CTH OK | 120 |
| Sheboygan | NB and SB | STH 28 | 123 |
| Sheboygan | NB and SB | STH 23 East | 126A |
| Sheboygan | NB and SB | STH 23 West | 126B |
| Sheboygan | NB and SB | STH 42 | 128 |
| Manitowoc | NB and SB | CTH XX | 137 |
| Manitowoc | NB and SB | CTH C | 144 |
| Manitowoc | NB and SB | USH 151 and STH 42 South | 149 |
| Manitowoc | NB and SB | USH 10 East and STH 42 North and CTH JJ | 152 |
| Manitowoc | NB and SB | USH 10 West and STH 310 | 154 |
| Manitowoc | NB and SB | CTH V | 157 |
| Manitowoc | NB and SB | CTH K | 160 |
| Manitowoc | NB and SB | STH 147 and CTH Z | 164 |
| Brown | NB and SB | STH 96 - CTH KB | 171 |
| Brown | NB and SB | USH 141 and CTH MM | 178 |
| Brown | NB and SB | STH 172 | 180 |
| Brown | NB and SB | CTH JJ - Eaton Rd | 181 |
| Brown | NB and SB | CTH V - Mason St. | 183 |
| Brown | NB and SB | STH 54 and STH 57 - University Ave. | 185 |
| Brown | NB and SB | Webster Avenue and East Shore Drive | 187 |
| Brown | NB and SB | Atkinson Dr. | 189 |
| Brown | NB | USH 41 and USH 141 | 192A-B |
| <u>USH 45 (IH 41)</u> | | | |
| Milwaukee | SB | IH 94 - Eastbound | 38A |
| Milwaukee | SB | IH 94 - Westbound | 38B |
| Milwaukee | SB | Bluemound Rd | 39 |
| Milwaukee | NB | Bluemound Rd | 39 |

| | | | |
|-----------|-----------|---------------------------------------|-------|
| Milwaukee | NB and SB | Watertown Plank Rd | 40A-B |
| Milwaukee | NB and SB | Mayfair Rd and North Ave. - Eastbound | 42A |
| Milwaukee | NB and SB | North Ave. - Westbound | 42B |
| Milwaukee | NB and SB | Burleigh St. | 43 |
| Milwaukee | NB and SB | Capitol Dr. | 44 |
| Milwaukee | NB and SB | Hampton Ave. | 45 |
| Milwaukee | NB and SB | Silver Spring Dr. | 46 |
| Milwaukee | NB | STH 175 West - Appleton Ave. | 47A |
| Milwaukee | SB | STH 175 East - Appleton Ave. | 47A |

Interchanges where USH 45 / IH 41 and USH 41 are concurrent are numbered as interchanges on USH 41/ IH 41

| | | | |
|------------|-----------|-------------------------------------|----|
| Washington | NB and SB | STH 145 - Fond du Lac Ave. | 60 |
| Washington | NB and SB | STH 60 | 63 |
| Washington | NB and SB | CTH PV - Pleasant Valley Rd | 65 |
| Washington | NB and SB | Paradise Dr. | 68 |
| Washington | NB and SB | STH 33 and STH 144 - Washington St. | 71 |
| Washington | NB and SB | CTH D | 73 |

USH 51 and INTERSTATE HIGHWAY 39

| | | | |
|-----------|-----------|---|-------|
| Columbia | SB | IH 90/94 and STH 78 South | 84 |
| Columbia | NB and SB | Cascade Mountain Rd | 85 |
| Columbia | NB and SB | STH 33 | 87 |
| Columbia | NB | STH 16 East | 89A |
| Columbia | NB | STH 16 West 127 and To STH 127 | 89B |
| Columbia | SB | STH 16 and To STH 127 | 89B-A |
| Columbia | NB and SB | USH 51 South | 92 |
| Marquette | NB and SB | STH 23 West - CTH P | 100 |
| Marquette | NB | CTH D | 104 |
| Marquette | NB and SB | STH 23 East - STH 82 | 106 |
| Marquette | NB and SB | CTH J and E | 113 |
| Waushara | NB and SB | STH 21 | 124 |
| Waushara | NB and SB | CTH V | 131 |
| Waushara | NB and SB | STH 73 | 136 |
| Portage | NB and SB | CTH D | 139 |
| Portage | NB and SB | CTH W | 143 |
| Portage | NB and SB | STH 54 - Bus. 51 | 151 |
| Portage | NB and SB | CTH B | 153 |
| Portage | NB and SB | CTH HH | 156 |
| Portage | NB | USH 10 East | 158A |
| Portage | NB | STH 66 West | 158B |
| Portage | SB | USH 10 East and STH 66 West | 158 |
| Portage | NB and SB | STH 66 East | 159 |
| Portage | NB and SB | Business 51 | 161 |
| Portage | NB and SB | Casimir Road | 163 |
| Portage | NB and SB | USH 10 West | 165 |
| Portage | NB and SB | CTH DB | 171 |
| Marathon | NB and SB | STH 34 | 175 |
| Marathon | NB and SB | STH 153 | 179 |
| Marathon | NB and SB | Kronenwetter and Mosinee (Maple Ridge Rd) | 181 |
| Marathon | NB and SB | Bus. 51 | 185 |
| Marathon | NB and SB | STH 29 East | 187 |
| Marathon | NB and SB | CTH N | 188 |
| Marathon | NB and SB | CTH NN | 190 |
| Marathon | NB and SB | STH 29 West | 191A |
| Marathon | NB | Sherman St. | 191B |
| Marathon | NB and SB | STH 52 and Stewart Avenue | 192 |
| Marathon | NB and SB | Bridge St. | 193 |
| Marathon | NB and SB | CTH U | 194A |
| Marathon | NB and SB | Bus. 51 CTH K | 194B |
| Marathon | NB and SB | CTH WW | 197 |
| Lincoln | NB and SB | CTH Q | 205 |
| Lincoln | NB and SB | STH 17 and STH 64 | 208 |
| Lincoln | NB and SB | CTH K | 211 |
| Lincoln | NB and SB | CTH S | 225 |
| Lincoln | NB and SB | STH 86 West and CTH D East | 229 |
| Lincoln | NB and SB | CTH A | 231 |

| | | | |
|-------------------------------------|-----------|---|-----|
| Lincoln | NB and SB | USH 8 | 234 |
| <u>USH 53</u> | | | |
| La Crosse | NB and SB | STH 157 and Main St | 6 |
| La Crosse | NB and SB | CTH S and Sand Lake Rd | 7 |
| La Crosse | NB and SB | CTH OT | 9 |
| La Crosse | NB | STH 35 South, CTH HD, Business 35 and Holmen Dr | 11 |
| La Crosse | SB | STH 35 South, CTH HD and Holmen Dr | 11 |
| La Crosse | NB and SB | CTH MH and McHugh Rd | 13 |
| La Crosse | NB | STH 35 North and CTH HD | 15 |
| La Crosse | SB | STH 35 North, CTH HD, and Business 35 | 15 |
| Eau Claire | SB | IH 94 East | 84A |
| Eau Claire | SB | IH 94 West | 84B |
| Eau Claire | NB and SB | Golf Rd | 85 |
| Eau Claire | NB and SB | STH 93 – Hastings Way | 86 |
| Eau Claire | NB and SB | USH 12 – Clairemont | 87 |
| Eau Claire | NB and SB | River Prairie Dr | 89 |
| Eau Claire | SB and NB | North Crossing and STH 312 | 90 |
| Chippewa | SB and NB | Melby Street | 92 |
| Chippewa | SB and NB | CTH OO | 94 |
| Chippewa | SB and NB | STH 29 East | 95A |
| Chippewa | SB and NB | STSH 29 West | 95B |
| Chippewa | SB and NB | Business 29 – CTH X | 96 |
| Chippewa | SB and NB | CTH S | 99 |
| Chippewa | SB and NB | CTH B | 102 |
| Chippewa | SB and NB | STH 40 | 110 |
| Chippewa | SB and NB | STH 64 | 112 |
| Chippewa | NB and SB | CTH M | 118 |
| Barron | NB and SB | CTH I | 126 |
| Barron | NB and SB | USH 8 | 135 |
| Barron | NB and SB | CTH 0 | 140 |
| Barron | NB and SB | STH 48 | 143 |
| Barron | EB and SB | CTH V | 150 |
| <u>USH 61</u> | | | |
| Grant | NB and SB | STH 11 East and STH 35 South | 1 |
| Grant | NB | Badger Road and Eagle Point Rd | 2 |
| Grant | SB | Badger Rd and Eagle Point Rd | 3 |
| Grant | NB | CTH HHH and To CTH H | 5 |
| Grant | SB | CTH H and To CTH HHH | 5 |
| Grant | NB | USH 61 North Off Ramp at USH 151 | 8 |
| <u>STH 64</u> | | | |
| St. Croix | EB and WB | STH 35/CTH E | 1 |
| St. Croix | EB and WB | CTH V / Andersen Scout Camp Road | 4 |
| St. Croix | EB and WB | CTH VV / Bus 64 | 5 |
| St. Croix | EB and WB | STH 35 / CTH C / Bus 64 | 9 |
| St. Croix | EB and WB | CTH A / Bus 64 | 12 |
| <u>INTERSTATE HIGHWAY 90</u> | | | |
| La Crosse | EB and WB | CTH B | 2 |
| La Crosse | WB | STH 35 and USH 53 South | 3 |
| La Crosse | EB | STH 35 and USH 53 South | 3A |
| La Crosse | EB | STH 35 North | 3B |
| La Crosse | EB and WB | USH 53 North and STH 157 | 4 |
| La Crosse | EB and WB | STH 16 | 5 |
| La Crosse | EB and WB | CTH C | 12 |
| La Crosse | EB and WB | STH 162 | 15 |
| Monroe | EB and WB | STH 27 | 25 |
| Monroe | EB and WB | STH 16 | 28 |
| Monroe | EB and WB | STH 131 | 41 |
| Monroe | EB and WB | USH 12 and STH 16 | 43 |
| Monroe | EB and WB | IH 94 | 45 |
| Monroe | EB and WB | CTH PP | 48 |
| Juneau | EB and WB | CTH C | 55 |
| Juneau | EB and WB | STH 80 | 61 |
| Juneau | EB and WB | STH 82 | 69 |

| | | | |
|----------|-----------|-----------------------------------|------|
| Juneau | EB and WB | CTH HH and CTH N | 79 |
| Juneau | EB and WB | USH 12 and STH 16 | 85 |
| Sauk | EB and WB | STH 13 | 87 |
| Sauk | EB and WB | STH 23 | 89 |
| Sauk | EB and WB | USH 12 | 92 |
| Columbia | EB and WB | STH 33 | 106 |
| Columbia | EB and WB | STH 78 South | 108A |
| Columbia | EB and WB | IH 39 North | 108B |
| Columbia | EB and WB | CTH CS | 115 |
| Columbia | EB and WB | STH 60 | 119 |
| Dane | EB and WB | CTH V | 126 |
| Dane | EB and WB | STH 19 | 131 |
| Dane | EB and WB | USH 51 | 132 |
| Dane | EB and WB | USH 151 South | 135A |
| Dane | EB and WB | USH 151 North | 135B |
| Dane | WB | High Crossing Blvd | 135C |
| Dane | EB and WB | IH 94 East | 138A |
| Dane | EB and WB | STH 30 | 138B |
| Dane | EB and WB | USH 12 - 18 West | 142A |
| Dane | EB and WB | USH 12 - 18 East | 142B |
| Dane | EB and WB | CTH N | 147 |
| Dane | EB and WB | USH 51 North | 156 |
| Dane | EB and WB | USH 51 South - STH 73 and STH 106 | 160 |
| Rock | EB and WB | STH 59 | 163 |
| Rock | EB | STH 26 | 171A |
| Rock | WB | STH 26 North | 171A |
| Rock | EB | USH 14 West | 171B |
| Rock | WB | USH 14 West and STH 26 South | 171B |
| Rock | EB and WB | STH 14 East | 175C |
| Rock | EB and WB | Racine Street | 175A |
| Rock | EB and WB | STH 11 East | 175B |
| Rock | EB and WB | STH 11 West and Avalon Rd | 177 |
| Rock | EB and WB | CTH S | 183 |
| Rock | EB and WB | IH 43 North | 185B |
| Rock | EB and WB | STH 81 West | 185A |

INTERSTATE HIGHWAY 94

| | | | |
|-------------|-----------|------------------------|-----|
| St. Croix | EB and WB | STH 35 North | 1 |
| St. Croix | EB and WB | CTH F - Carmichael Rd | 2 |
| St. Croix | EB and WB | STH 35 South | 3 |
| St. Croix | EB and WB | USH 12 - CTH U | 4 |
| St. Croix | EB and WB | STH 65 | 10 |
| St. Croix | EB and WB | CTH T | 16 |
| St. Croix | EB and WB | USH 63 | 19 |
| St. Croix | EB and WB | CTH B | 24 |
| St. Croix | EB and WB | STH 128 | 28 |
| Dunn | EB and WB | CTH Q | 32 |
| Dunn | EB and WB | STH 25 | 41 |
| Dunn | EB and WB | CTH B | 45 |
| Dunn | EB and WB | USH 12 - STH 29 and 40 | 52 |
| Eau Claire | EB and WB | STH 312 and CTH EE | 59 |
| Eau Claire | EB and WB | STH 37 | 65 |
| Eau Claire | EB and WB | STH 93 | 69 |
| Eau Claire | EB and WB | USH 53 | 70 |
| Eau Claire | EB and WB | CTH HH | 81 |
| Trempealeau | EB and WB | USH 10 | 88 |
| Jackson | EB and WB | STH 121 | 98 |
| Jackson | EB and WB | STH 95 | 105 |
| Jackson | EB and WB | USH 12 and STH 27 | 115 |
| Jackson | EB and WB | STH 54 | 116 |
| Jackson | EB and WB | CTH O | 128 |
| Monroe | EB and WB | CTH EW | 135 |
| Monroe | EB | USH 12 | 143 |
| Monroe | WB | STH 21 | 143 |
| Monroe | EB and WB | Industrial Ave | 145 |
| Monroe | EB and WB | IH 90 | 147 |

Interchanges where IH 90 and IH 94 are concurrent are numbered as interchanges on IH 90

| | | | |
|-----------|-----------|----------------------------|------|
| Dane | WB | STH 30 West | 240 |
| Dane | WB | IH 90 East and IH 39 South | 4A** |
| Dane | EB and WB | CTH N | 244 |
| Dane | EB and WB | STH 73 | 250 |
| Jefferson | EB and WB | STH 89 | 259 |
| Jefferson | EB and WB | STH 26 | 267 |
| Jefferson | EB and WB | CTH F | 275 |
| Jefferson | EB and WB | Willow Glen Rd | 277 |
| Waukesha | EB and WB | STH 67 | 282 |
| Waukesha | EB and WB | CTH P | 283 |

**Existing Exit Number is 4A, Future Exit Number should be 240A

| | | | |
|-----------|-----------|--|--------|
| Waukesha | EB and WB | CTH C | 285 |
| Waukesha | EB and WB | STH 83 | 287 |
| Waukesha | EB and WB | CTH SS | 290 |
| Waukesha | EB and WB | CTH G | 291 |
| Waukesha | EB and WB | CTH T | 293 |
| Waukesha | WB | STH 16 | 293C |
| Waukesha | EB and WB | CTH J South and STH 164 North | 294 |
| Waukesha | EB and WB | CTH F | 295 |
| Waukesha | EB and WB | USH18/STH164 South/CTH JJ/Barker Rd | 297 |
| Waukesha | EB | Moorland Rd | 301A-B |
| Waukesha | WB | Moorland Rd | 301A |
| Waukesha | WB | Moorland Rd | 301B |
| Milwaukee | EB | STH 100 | 304 |
| Milwaukee | WB | STH 100 | 304 |
| Milwaukee | WB | IH 41 (USH 45) North | 304 |
| Milwaukee | EB and WB | USH 45 North | 305B |
| Milwaukee | EB and WB | IH 894 East and USH 45 South | 305A |
| Milwaukee | EB and WB | STH 181 - 84th St. | 306 |
| Milwaukee | EB and WB | 68th St. - 70th St. | 307A |
| Milwaukee | EB and WB | Hawley Rd | 307B |
| Milwaukee | EB and WB | V. A. Center - Mitchell Blvd. | 308A |
| Milwaukee | EB and WB | Miller Park Way (STH 175) - South | 308B |
| Milwaukee | EB and WB | STH 175 - North | 308C |
| Milwaukee | EB and WB | 35th St. | 309A |
| Milwaukee | EB | 26th St. and St. Paul Ave. | 309B |
| Milwaukee | WB | 25 th St. and Clybourn St. | 309B |
| Milwaukee | EB | 13th St. | 310A |
| Milwaukee | EB and WB | IH 43 - Northbound | 310B |
| Milwaukee | EB and WB | IH 794 - Eastbound | 310C |
| Milwaukee | EB | STH 59 - National Ave. and 6th St. | 311 |
| Milwaukee | WB | STH 59 - National Ave. | 311 |
| Milwaukee | EB | Lapham Blvd. - Mitchell St. | 312A |
| Milwaukee | EB | Becher St. - Lincoln Ave. | 312B |
| Milwaukee | WB | Becher St. - Mitchell St., Lapham Blvd - Greenfield Ave. | 312A-B |
| Milwaukee | EB | Holt Ave. | 314A |
| Milwaukee | EB | Howard Ave. | 314B |
| Milwaukee | WB | Howard Ave | 314B |
| Milwaukee | WB | Holt Ave | 314A |
| Milwaukee | EB | IH 43 and IH 894 | none |
| Milwaukee | WB | IH 894 West - IH 43 South IH 41 North and 894 Bypass | 317 |
| Milwaukee | EB and WB | Layton Ave. | 316 |
| Milwaukee | EB and WB | Airport - Mitchell Field | 318 |
| Milwaukee | EB and WB | College Ave. | 319 |
| Milwaukee | EB and WB | Rawson Ave. | 320 |
| Milwaukee | EB and WB | STH 100 - Ryan Rd | 322 |
| Racine | WB | STH 241 - North 27th St. | 325 |
| Racine | EB and WB | Seven Mile Rd | 326 |
| Racine | EB and WB | CTH G | 327 |
| Racine | EB and WB | CTH K | 329 |
| Racine | EB and WB | STH 20 | 333 |
| Racine | EB and WB | STH 11 | 335 |
| Kenosha | EB and WB | CTH KR | 337 |

| | | | |
|---------|-----------|------------------------------------|------|
| Kenosha | EB and WB | CTH E | 339 |
| Kenosha | EB and WB | STH 142 | 340 |
| Kenosha | EB and WB | STH 158 | 342 |
| Kenosha | EB and WB | STH 50 | 344 |
| Kenosha | EB and WB | CTH C | 345 |
| Kenosha | EB and WB | STH 165 and CTH Q and Tourist Info | 347 |
| Kenosha | WB | Truck Weigh Station | None |

STH 145

| | | | |
|-----------|-----------|-------------------------------------|------|
| Milwaukee | NB | Fond du Lac Avenue | None |
| Milwaukee | SB | Grantosa Drive and Villard Ave. | 7A |
| Milwaukee | NB | STH 181 North - 76th Street | 7B |
| Milwaukee | SB | STH 181 - 76th Street | 7B |
| Milwaukee | NB | Silver Spring Drive - Westbound | 8 |
| Milwaukee | SB | Silver Spring Drive - Eastbound | 8 |
| Milwaukee | NB and SB | 91st Street | 9 |
| Milwaukee | NB | Green Tree Road and 102nd Street | 10A |
| Milwaukee | NB | 107th Street and Good Hope Road | 10B |
| Milwaukee | SB | 107th Street and Fond du Lac Avenue | 10B |
| Milwaukee | NB | Park Place | 10C |

USH 151

Interchanges where USH 151 and USH 61 are concurrent are numbered as interchanges on USH 61

| | | | |
|-----------|-----------|--|----|
| Grant | SB | STH 35 North/USH 61 North/CTH HH | 8 |
| Grant | NB | CTH D and Business 151 | 18 |
| Grant | SB | CTH D | 18 |
| Grant | NB and SB | STH 80/81 | 19 |
| Grant | NB | CTH XX | 21 |
| Grant | SB | CTH XX and Business 151 | 21 |
| Lafayette | NB and SB | STH 126 South and CTH G | 26 |
| Iowa | NB | CTH O and Business 151 | 37 |
| Iowa | SB | CTH O | 37 |
| Iowa | NB | STH 23 South and To STH 39 | 40 |
| Iowa | SB | STH 23 South and To STH 39 and Bus 151 | 40 |
| Iowa | NB and SB | STH 23 North | 44 |
| Iowa | NB and SB | USH 18 West | 47 |
| Dane | NB and SB | CTH ID | 58 |
| Dane | NB | STH 78 and Business 18/151 | 65 |
| Dane | SB | STH 78 | 65 |
| Dane | NB | CTH ID | 69 |
| Dane | SB | CTH ID and Business 18/151 | 69 |
| Dane | NB and SB | CTH PD and To CTH P | 70 |
| Dane | NB and SB | CTH G/Dairy Ridge Rd. | 75 |
| Dane | NB | CTH MV and Business 18/151 | 76 |
| Dane | SB | CTH MV | 76 |
| Dane | NB and SB | STH 69 | 77 |
| Dane | NB and SB | CTH PB and To CTH M | 79 |
| Dane | SB | CTH MV and Business 18/151 | 81 |

Interchanges where USH 151 and USH 12 are concurrent are numbered as interchanges on USH 12.

| | | | |
|----------|-----------|---|-----|
| Dane | NB and SB | IH 90/94 East and IH 39 South | 97A |
| Dane | NB and SB | IH 90/94 West and IH 39 North | 97B |
| Dane | NB and SB | Nelson Road | 98A |
| Dane | NB and SB | American Parkway | 98B |
| Dane | NB and SB | CTH C and Reiner Road | 100 |
| Dane | NB | Main Street and Business 151 | 101 |
| Dane | SB | Main Street | 101 |
| Dane | NB and SB | STH 19 - Windsor Street | 102 |
| Dane | NB | CTH N - Bristol Street | 103 |
| Dane | SB | CTH N - Bristol Street and Business 151 | 103 |
| Dane | NB and SB | CTH VV | 108 |
| Dane | NB and SB | CTH V | 111 |
| Columbia | NB and SB | STH 73 and Business 151 | 115 |
| Columbia | NB and SB | STH 16/60 | 118 |
| Dodge | NB | STH 73 | 120 |

| | | | |
|-------------|-----------|-------------------------|-----|
| Dodge | SB | STH 73 and Business 151 | 120 |
| Dodge | NB | CTH D and Business 151 | 129 |
| Dodge | SB | CTH D | 129 |
| Dodge | NB and SB | CTH G | 130 |
| Dodge | NB and SB | STH 33 | 132 |
| Dodge | NB | Industrial Dr. | 134 |
| Dodge | NB and SB | CTH B and Business 151 | 135 |
| Dodge | NB and SB | CTH A | 136 |
| Dodge | NB | CTH M and Business 151 | 142 |
| Dodge | NB and SB | STH 26 | 144 |
| Dodge | NB and SB | STH 49 | 146 |
| Fond du Lac | SB | STH 26 South | 147 |
| Fond du Lac | NB and SB | STH 26 North | 148 |

INTERSTATE HIGHWAY 794

| | | | |
|-----------|----|--|----|
| Milwaukee | WB | IH 94 West, USH 41 North | 1A |
| Milwaukee | WB | IH 94 East, USH 41 South – IH 43 South | 1B |
| Milwaukee | WB | IH 43 North | 1C |
| Milwaukee | EB | Plankinton Ave. | 1D |
| Milwaukee | EB | Jackson St. - Van Buren St. | 1E |
| Milwaukee | WB | Milwaukee St. | 1E |
| Milwaukee | EB | Lincoln Memorial Dr. – Lakefront | 1F |
| Milwaukee | WB | Michigan St. | 1F |
| Milwaukee | EB | J Lovell St. – St. Paul Ave | 1H |
| Milwaukee | EB | Carferry Dr. | 3 |

INTERSTATE HIGHWAY 894

| | | | |
|-----------|-----------|--------------------------------------|------|
| Milwaukee | WB | IH 94 East | 1A |
| Milwaukee | WB | IH 94 West | 1B |
| Milwaukee | EB and WB | STH 59 and Greenfield Ave. | 1D |
| Milwaukee | EB | Lincoln Ave. | 1E |
| Milwaukee | WB | National Ave. | 2A |
| Milwaukee | EB | National Ave. - Westbound | 2A |
| Milwaukee | EB | Oklahoma Ave. | 2B |
| Milwaukee | EB and WB | Beloit Rd | 3 |
| Milwaukee | EB and WB | IH 43 and USH 45 South | 4 |
| Milwaukee | WB | STH 24 West - Forest Home Ave. | 5A |
| Milwaukee | WB | South 76th St. | 5B |
| Milwaukee | EB | South 76th St. - South 84th St. | 5A-B |
| Milwaukee | EB and WB | South 60th St. | 7 |
| Milwaukee | EB | STH 36 - Loomis Rd | 8A-B |
| Milwaukee | WB | STH 36 - Loomis Rd South | 8A |
| Milwaukee | WB | STH 36 - Loomis Rd North | 8B |
| Milwaukee | EB and WB | STH 241 - South 27 th St. | 9 |
| Milwaukee | EB | IH 94 West | 10A |
| Milwaukee | EB | IH 94 East (41 South) | 10B |

2-6-21 Overhead Arrow-Per-Lane Guide Signs**January 2013****BACKGROUND AND PURPOSE**

WisDOT has many interchanges in place that have optional exit/ahead lanes. These types of exits enhance the capacity of the exit ramps while at the same time improve the efficiency of traffic on the mainline. Traditionally, overhead signing has been installed at just the theoretical gore showing a two-lane exit only. This approach has worked with success in many locations. However, this signing approach does not fully emphasize to motorists that the lane adjacent to the exit only lane is an option lane and in some cases this has led to traffic queuing up unnecessarily in the exit lane instead of taking advantage of the optional lane.

The MUTCD Section [2E-20](#) requires that Overhead Arrow-Per-Lane or Diagrammatic guide sign designs be used for all multi-lane exits at major interchanges that have an optional exit lane. For all new or reconstructed freeways and expressways that meet the above conditions, the MUTCD Section [2E-21](#) requires that Overhead Arrow-Per-Lane guide signs be used in lieu of Diagrammatic guide sign designs. Diagrammatic guide sign designs are not allowed on new or reconstructed facilities.

It *should* be pointed out that the Overhead Arrow-Per-Lane guide signs *may not* be practical at all interchanges with optional lanes. For example, Overhead Arrow-Per-Lane guide signs *may* be too confusing for an

interchange with split exits (A-B). Therefore, in these cases, the MUTCD Figures [2E-8](#) and [2E-9](#) still allow the usage of down arrows on guide signs.

Technically the Overhead Arrow-Per-Lane guide signs have an arrow over each travel lane. This practice *should* be utilized for system interchanges (freeway-freeway) because at these interchanges, WisDOT has traditionally shown the pull through or ahead movement. However, due to the large size of the signs and the fact that pull through movements have typically not been utilized at service type interchanges, the option for a “truncated” style overhead arrow-per-lane guide sign *should* be available. The “truncated” style overhead arrow-per-lane guide sign only shows one arrow above the optional lane and one arrow above the exiting lane. Even though the usage of the “truncated” style overhead arrow-per-lane guide signs are not adopted as part of the MUTCD, the General Counsel of the National Committee on Uniform Traffic Control Devices, endorsed usage of them at the June 2012 meeting.

DEFINITIONS

System interchanges are defined as freeway interchanges with other freeways.

Service interchanges are defined as freeway interchanges with local streets, County Trunk, State Trunk, U.S. or Interstate Highways.

POLICY

Overhead Arrow per Lane Guide Signs for System Interchanges

1. Overhead arrows *should* be used over each travel lane.
2. Due to the large size of the signs, a vertical splice *should* be placed at about the midpoint of the sign, so future replacement of the sign will be easier for field crews and less disruptive to traffic.
3. The overhead guide sign closest to the gore **shall** be placed at the beginning of taper for the option lane.

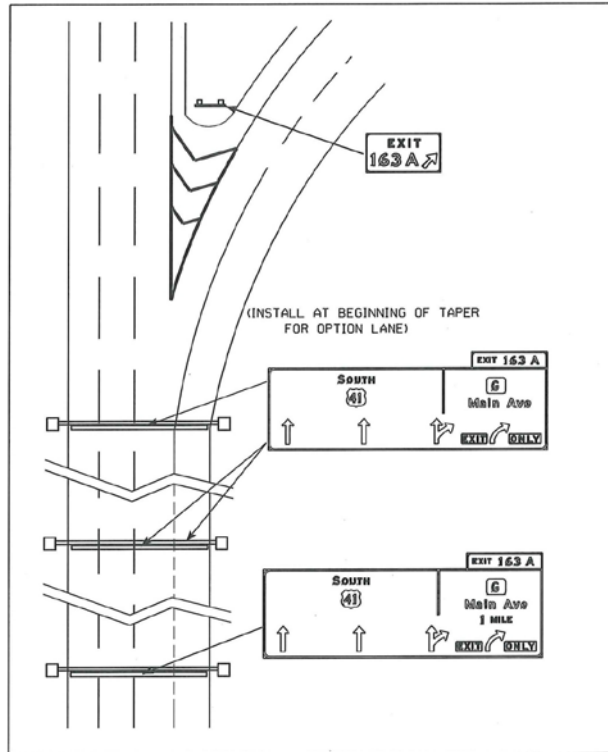
Overhead Arrow per Lane Guide Signs for Service Interchanges

1. At a minimum, overhead arrows *should* be utilized for just the option lane and exit only lane. Overhead arrows *may* be omitted for the ahead lanes.
2. The overhead guide sign closest to the gore **shall** be placed at the beginning of taper for the option lane.
3. A size 5 ground mounted regulatory (R3-33) RIGHT LANE MUST EXIT sign *should* be placed downstream of the advanced guide sign(s).

IMPLEMENTATION

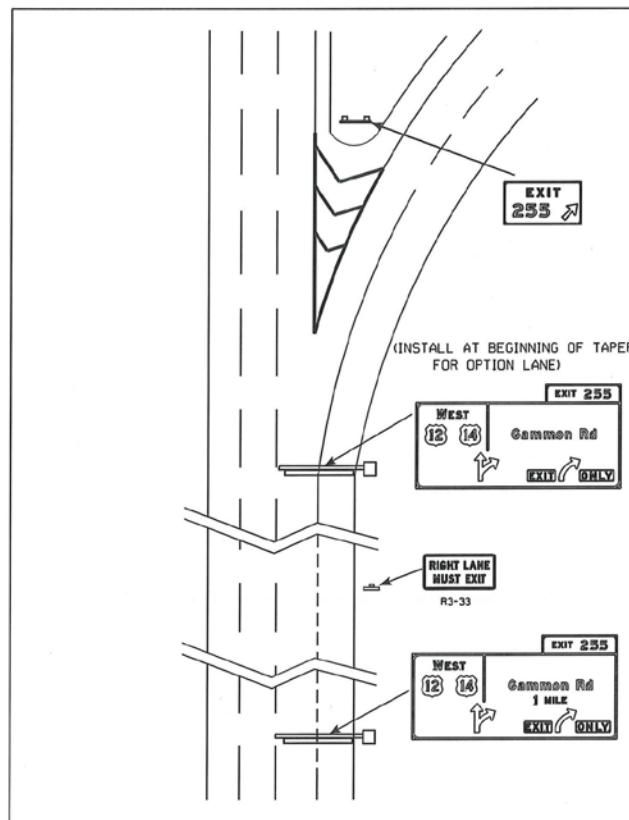
The FHWA does not have a mandated compliance date for this signing. Signing field revisions *should* be accomplished primarily through improvement projects.

Figure 1



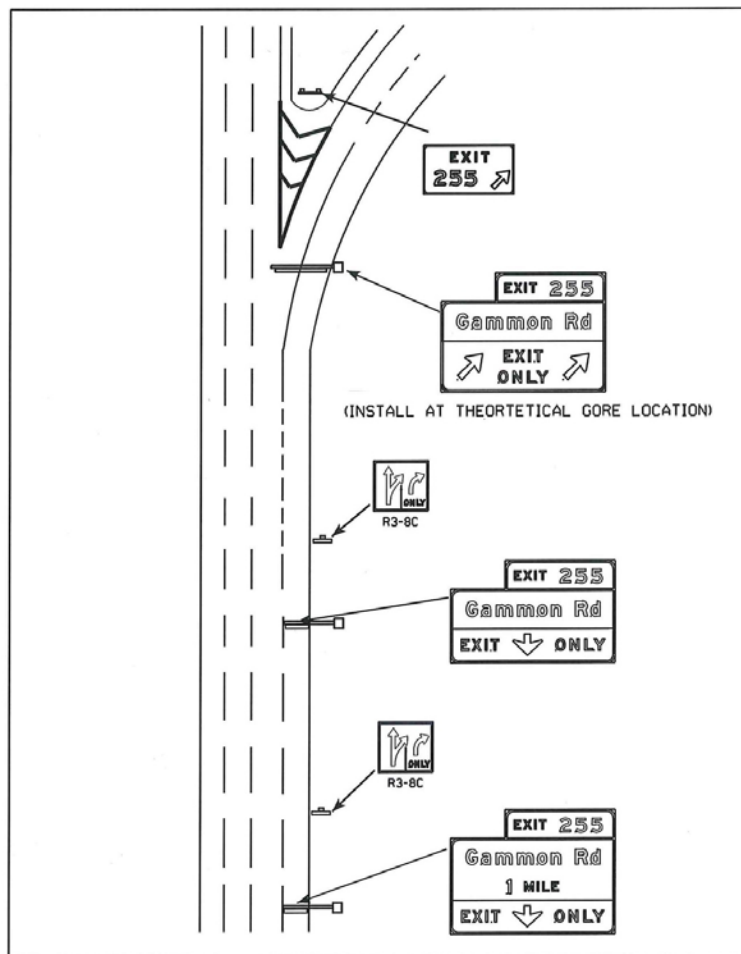
OVERHEAD ARROW PER LANE GUIDE SIGNS FOR SYSTEM INTERCHANGE

Figure 2



OVERHEAD ARROW PER LANE GUIDE SIGNS FOR SERVICE INTERCHANGE

Figure 3



OPTIONAL LANE SIGNING FOR EXISTING INTERCHANGES
(REPLACING SIGNS ON EXISTING SIGN BRIDGE STRUCTURES)

2-6-30 Grade Separated Crossroad Name Signs

December 2001

PURPOSE

Signs identifying grade separated roadway crossings (M1-94) have traditionally been installed on WisDOT freeways and expressways to help assist motorists. These signs can be very useful because they help an unfamiliar motorist find their location when using a map to orient themselves and *may* help motorists identify their location in case of emergency. The intent of this policy is to establish control and statewide consistency on the usage of these signs.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access by means of grade separations at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial controlled access and generally with grade separations at major intersections.

INSTALLATION GUIDELINES

Grade separated crossroad name signs can be used provided the following criteria are met:

1. For freeways and expressways: Signs **shall** be installed for all USH, STH, and CTH non-interchange crossroads. Signs *may* be installed for all other non-interchange crossroads.
2. For freeways and expressways in urbanized areas: Signs *may* be installed for all crossroads, interchanged or non-interchanged, but only where law enforcement and emergency medical personnel use them for incident identification.
3. Any grade separated crossroad name signs that are in place and do not meet the criteria listed in items

1 or 2 above will be allowed to remain in place until the end of their useful life. Once the signs have reached their useful life, they **shall** be removed and not be replaced. Useful life is defined as the sign being legible for its intended usage.

2-6-35 Tourist Information Signs

April 2010

GENERAL

The usage of general services signs is covered in Section [2D.45](#) of the MUTCD. One such general service sign that is permitted by the MUTCD is for tourist information. Oftentimes the department receives requests to install tourist information signs on state maintained highways. The intent of this signing is to **not** advertise for a particular tourist facility, but to provide a service in guiding motorists who are not familiar with an area to local and/or regional tourist activities and events.

DEFINITIONS

Freeways are defined as divided arterial highway facilities with full controlled access by means of grade separations at interchanges only.

Expressways are defined as divided highways with partial controlled access by a combination of interchanges, at-grade intersections and driveways.

Conventional highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

POLICY

Tourist information signs *may* be approved for installation on state-maintained roadways under the following conditions.

Freeway or expressway:

1. The information booth is no more than three miles driving distance from the exit
2. The booth must be open and staffed a minimum of eight hours a day, seven days a week by staff whose sole duty is to operate the booth
3. The booth **shall** be the sole information service to that highway for that particular county segment, operated by the county government or by a countywide tourist business association
4. Signing from one freeway/expressway to another freeway/expressway **shall not** be allowed.

Conventional State Trunk Highway

1. The booth is within one mile driving distance from the state trunk highway
2. The booth is open and staffed a minimum of four hours per day, five days per week
3. The booth **shall** be the sole information service in the municipality on that particular highway endorsed by the municipality or the local tourist business association.
4. Signing from one conventional state highway to another conventional state highway **shall not** be allowed.

General Conditions

In addition to the above, other requirements and conditions apply to signs on both types of highways:

1. When trailblazing off the state trunk highway system is required, each maintaining agency **shall** install signing before the signing on the state trunk highway is erected
2. Signing on the state trunk highway will be removed by crews under the direction of the department during the period when a seasonal booth is not operated. An alternate to removal is the application of a CLOSED panel.
3. The cost for fabrication, installation and maintenance of this signing **shall** be the responsibility of the requestor or managing organization or agency. WisDOT **shall** coordinate the fabrication, installation, and maintenance of all signs on state-maintained roadways, including ramps, and **shall** be reimbursed for all costs.
4. Signs will read "Tourist Information" in conformance with state standards.

5. Adequate parking facilities must be provided in the immediate vicinity of the booth.

2-6-36 Parallel Off-Ramp Exit Direction Signing

July 2012

BACKGROUND AND PURPOSE

The MUTCD Section [2E-36](#) states that post mounted Exit Direction signs *should* be mounted at the beginning of the deceleration lane. If there is less than 300 feet from the upstream end of the deceleration lane to the theoretical gore, the Exit Direction sign *should* be installed overhead over the exiting lane in the vicinity of the theoretical gore.

Occasionally long parallel (deceleration) exit ramps are constructed to provide for additional capacity for exiting traffic, thus helping to eliminate traffic slowing and queuing in the mainline travel lanes. Some of these parallel exit ramps can be up ½ mile in length. The challenge with interchange guide signing of long parallel exit ramps is that the motorist *should* know as soon as possible that the far right lane is for the Exit Only. This will allow an exiting motorist to shift from the mainline lane (s) to the exit ramp as soon as possible. This will maximize efficiency and safety of the freeway exit by helping to avoid last minute lane changes and traffic backups.

This policy will differentiate between the different lengths of parallel exit ramps and provide guidance as to the types of guide signing that *should* be used. Sight distance will play a factor as to what types of guide signing that *should* be used as well. Overhead exit direction signs *may* be required if sight distance is compromised by geometrics or if the theoretical gore location is beyond a bridge.

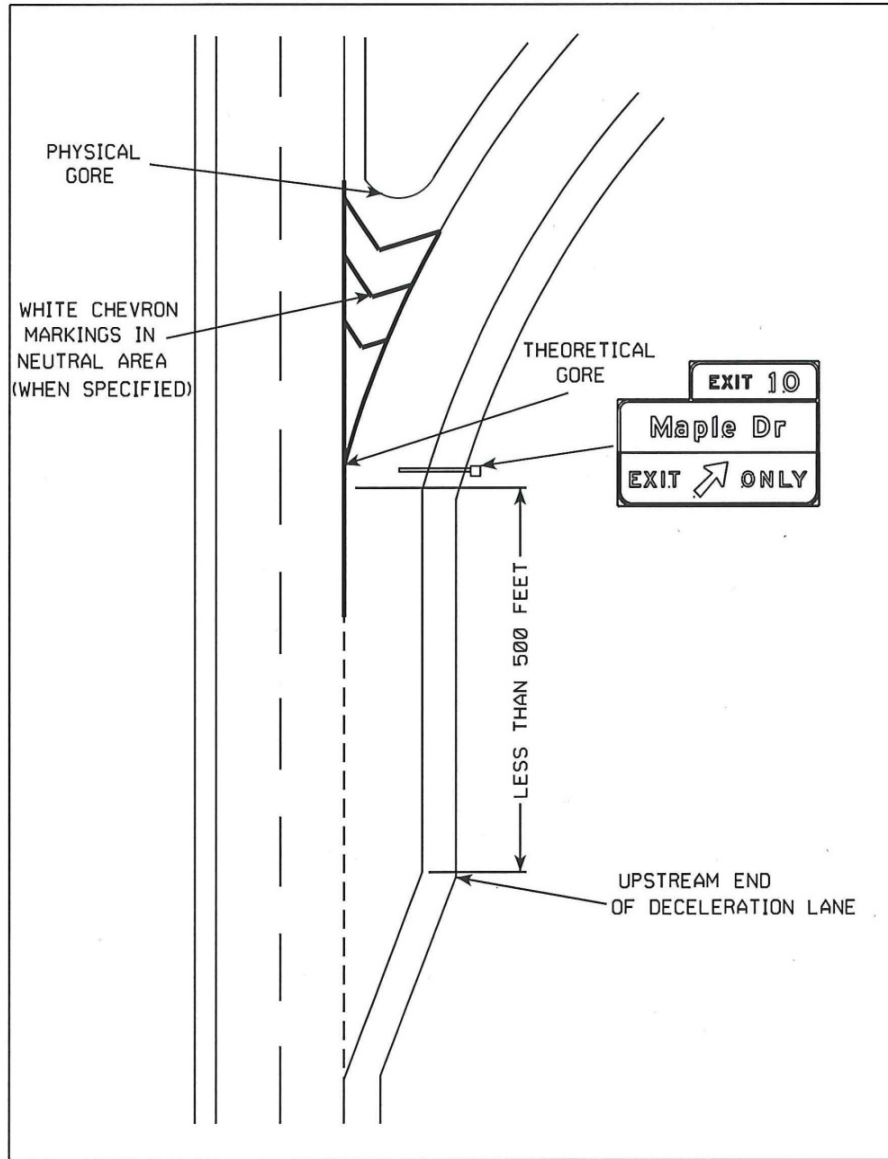
POLICY

If parallel off-ramp is less than 500 feet from upstream end of deceleration lane to theoretical gore

1. An overhead Exit Direction guide sign at the upstream end of the deceleration lane *should* be used.
2. Typically no Exit Direction guide sign would be needed at the theoretical gore location.
3. If the parallel exit ramp is greater than ¼ mile in length, then the ramp *should* be considered an auxiliary exit lane and have both an Exit Direction guide sign at the upstream end of the deceleration lane and Exit Direction guide sign installed at the theoretical gore location.

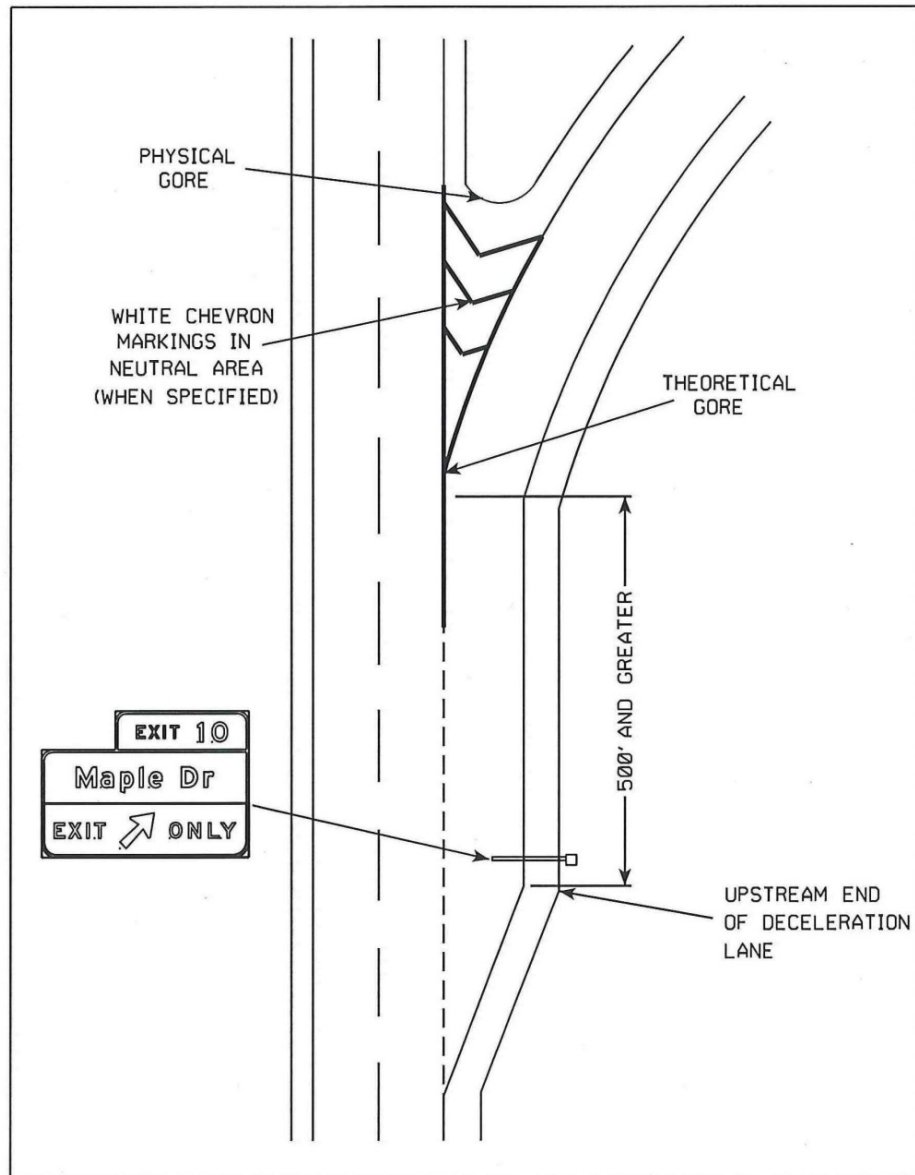
500' or greater parallel exit ramp (retrofit situation), where parallel exit ramp has been extended and existing overhead Exit Direction sign at theoretical gore is allowed to remain

1. A ground mounted Exit Direction guide sign at the beginning of the taper for parallel exit ramp *should* be used.
2. The overhead Exit Direction guide sign at the theoretical gore location would not have to be moved to the upstream end of the deceleration lane.
3. If the parallel exit ramp is greater than ¼ mile in length, then the ramp *should* be considered an auxiliary exit lane and have both an Exit Direction guide sign at the upstream end of the deceleration lane and Exit Direction guide sign installed at the theoretical gore location.



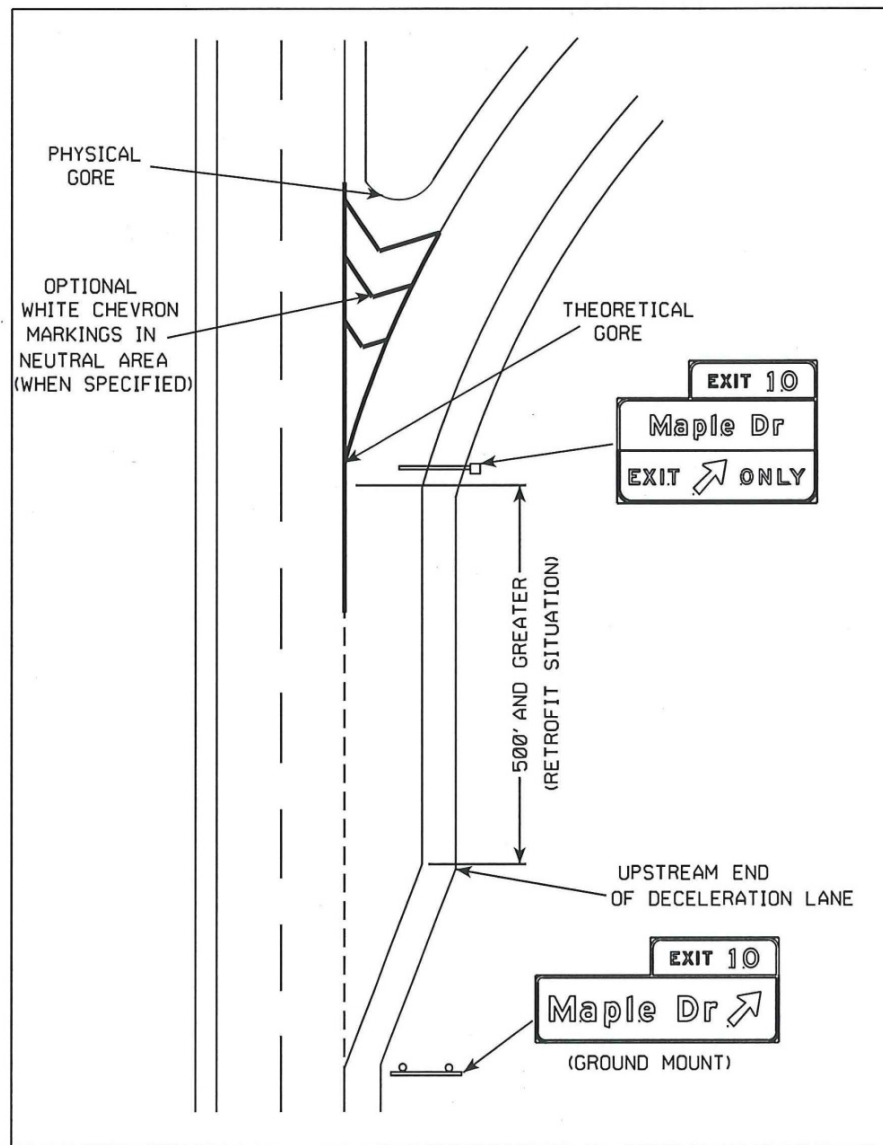
(LESS THAN 500 FEET FROM UPSTREAM END OF DECELERATION LANE TO THEORETICAL GORE)

FIGURE 1



(500' AND GREATER FROM UPSTREAM END OF DECELERATION LANE TO THEORETICAL GORE)

FIGURE 2



(500' AND GREATER FROM UPSTREAM END OF DECELERATION LANE TO THEORETICAL GORE)

(RETROFIT SITUATION)

FIGURE 3

2-6-40 No Re-Entry to Freeway Signs

July 2012

PURPOSE

In an effort to control construction costs, there are several interchanges that have been constructed as half diamond or partial cloverleaf interchanges. These are typically interchanges that do not allow access back on to the mainline (freeway/expressway). Motorists *may* have to drive a substantial distance to get back onto the mainline, which can cause potential confusion. This is especially true if adequate trailblazing is not in place to direct motorists back to the mainline. This policy provides guidance for the installation of signs on the freeway/expressway to warn motorists of the approaching half interchange.

DEFINITIONS

Freeways are defined as divided arterial highway facilities with full controlled access by means of graded separations at interchanges only.

Expressways are defined as divided arterial highway facilities with partial controlled access, generally with grade

separations at major intersections.

POLICY

1. The “NO RE-ENTRY TO FREEWAY” (W6-54) sign *may* be used by the Region where freeway/expressway interchanges are far apart or access to the next interchange is not apparent. This sign *should* only be used at freeway exit locations where there is no other on ramp in either cardinal direction to get back onto the freeway.
2. For freeway exit locations where there is a freeway on ramp in the opposite cardinal direction, the “NO *****BOUND RE-ENTRY TO FREEWAY (W6-54A-D) series signs *should* be used.
3. The signs *should* not be used if adequate trailblazing back to the mainline is already in place.
4. If used, the signs **shall** be mounted immediately below the advance guide sign for the interchange (typically the E1-1A ground mount advance sign or E6-51 overhead advance sign). The minimum height requirements for a secondary Type I sign *should* be followed (see A4-1 standard sign plate).

2-6-50 Community “Downtown” Signing

February 2017

GENERAL

Supplemental guide signs *may* be allowed to direct motorists on freeways and expressways to a community’s “downtown” area, subject to the conditions described in this guideline.

DEFINITIONS

Downtown is the area, usually within the central city that has governmental offices, business offices, retail shopping, and other amenities closely associated with each other in a contiguous re, and will normally be referred to by the community and its usual residents as downtown or the central business district. Unfamiliar motorists directed from the freeway or expressway to downtown *should* have this same expectation.

ELIGIBILITY

Communities are eligible for freeway or expressway signs directing motorists to downtown when the following criteria are met:

1. The community must be served by at least two interchanges from the freeway or expressway with the interchange highways leading toward the downtown area.
2. The freeway or expressway on which the downtown signs are located must:
 - a. Be within five miles of the nearest boundary of the community, or
 - b. Pass within the corporate limits of the community.
3. The community must agree to comply with this criteria and requirements of this guideline, and accept responsibility for all costs associated with signing for the community downtown under this guideline.

Communities *may* also be eligible for signs directing to downtown on conventional highways when the highway bypasses the downtown area and provided the signs designate the “city center” area.

SIGN REQUIREMENTS, LOCATION, AND INSTALLATION

Downtown signs on a freeway or expressway mainline are considered supplemental signing. The approval and installation is subject to all provisions of the Department’s policy on “Supplemental Guide Signing on Freeways and Expressways for Public and Private Facilities” in addition to the eligibility requirements and sign location and installation details of this guideline. Approval of signs for eligible communities is subject to the following criteria:

1. Only one downtown sign *may* be installed in each direction of travel on a freeway or expressway. The sign location in each direction of travel along the freeway or expressway *may* be at a different interchange.
2. The community must pass a resolution or similar official document which specifies the requested access location(s) for the downtown directional signs and **shall** submit the resolution to the Department’s Regional office as the official request. The location(s) selected **shall** remain fixed for ten years or the life of the signs before changes to the location(s) *may* be considered.
3. Specific location of the freeway or expressway signs will be determined by the Department.
4. The community must install and maintain confirmation signs suitable to the department on the selected access route(s), agree to comply with this guideline, and accept responsibility for all costs associated

with signing for the community downtown under this guideline. These confirmation signs are required before signs *may* be installed on the freeway or expressway.

5. Freeway or expressway sign design and message will be determined by the department in accordance with applicable standards and in the interests of uniformity.
6. Freeway and expressway downtown signs will incorporate the name of the community within the sign message.
7. The community will be responsible for all costs incurred by the department, including installation and long-term maintenance of the signs. This includes signs on the freeway and expressway mainline and ramps along with all confirmation signs.
8. A combination of community downtown signs and “Historic Downtown” signs for the same community **shall not** be allowed.
9. Downtown signs with appropriate directional arrows *should* be placed at the junction of the ramp and crossroad at the access interchange.

2-6-54 Reference Location Signs

July 2012

PURPOSE

The installation of mileposts and enhanced reference markers, which are referenced in the MUTCD Section [2H.05 and 2H.06](#), are very useful to motorists for the following reasons:

1. Providing a means of identification of emergency incident locations.
2. Precise identification of crashes.
3. Aid in the location for highway maintenance and servicing.
4. Road inventory records.
5. Aid motorists in estimating their progress.

DEFINITIONS

Freeways are defined as divided arterial highway facilities with full controlled access by means of grade separated interchanges only.

Expressways are defined as divided arterial highway facilities with partial controlled access and generally with grade separations at major intersections.

REFERENCE LOCATION SIGNS (MILEPOST) POLICY

The MUTCD requires mileposts for all freeway facilities. Mileposts **shall** also be placed on expressway facilities that are located on a route where there is milepost continuity.

It is the intent of the department to install mileposts at additional locations which satisfy the following conditions:

1. Mileposts **shall** be installed for all urban and rural freeway facilities, regardless of the ADT or traveling speed.
2. Mileposts shall be installed for all urban and rural expressways in situations where freeway segments and expressway segments are combined. An example of this is STH 29.
3. Mileposts *should not* be installed on highways that are solely expressway facilities unless there are frequent grade separated interchanges and the speed limit is 65 mph.
4. Mileposts *should not* be installed on highways that are solely conventional highways.

Mileposts **shall** be installed in accordance with the provisions contained in the MUTCD. Signs **shall** be installed that conform to the D-10 series.

Overlapping Routes: Continuity **shall** be established for one of the routes. In one of the overlapping routes in an interstate route, that route **shall** be selected for continuity of distance numbering.

ENHANCED REFERENCE LOCATION SIGNS POLICY

The Southwest and Southeast Regions have completed studies first initiated by the Southeast Region Traffic Incident Management Enhancement (TIME) committee. 1/10 and 2/10 enhanced reference location signs have

been installed along various freeway segments with positive evaluation results.

Enhanced reference location signs *should* be utilized where the following conditions occur:

1. Rapid identification of emergency incident locations by enforcement personnel, dispatchers and the motoring public.
2. Precise identification of crashes.
3. Identification of disabled vehicles on freeway systems to provide for rapid deployment of enforcement and other emergency personnel to remove the vehicle from the highway to reduce travel delays by the motoring public and to return the facility to a normal traffic flow.
4. Where a uniform system of identification on a system wide basis is necessary for 911 dispatchers and emergency and enforcement personnel.

The MUTCD Section [2H.06](#) provides for an option to utilize an enhanced reference location sign numbering system, and spacing the signs at 1/10, 2/10 or 5/10 miles.

The WisDOT practice is as follows:

1. **Urban areas:** All locations on freeway segments where there is a median barrier, 1/10 mile enhanced reference location signs *should* be installed as a system-wide installation. For example, to provide for a system-wide installation, all of Milwaukee County *should* have enhanced reference location signs. This provides for full use of the system rather than utilizing crossroads as identifiers by dispatchers for some locations and 1/10 enhanced reference location signs on some sections of the system.

For locations without median barrier in urban areas, the enhanced reference location signs *may* still be installed if it provides for continuity and completion of a system.

Option: Signs *may* be installed at 2/10 mile spacing but must be consistent for a corridor and system-wide at regional discretion.

2. **Outlying areas—semi urban:** 1/10 or 2/10 enhanced reference location signs are optional at Region discretion based on maintaining a system-wide or corridor segment continuity. Outlying areas are defined as areas with significant traffic volumes approaching 2000 vehicles per hour per lane.
3. **Rural areas:** 5/10 or 2/10 mile enhanced reference location signs are optional based on need. Examples of need are:
 - a. High traffic volumes that exceed 40,000 ADT
 - b. Incidents that are significantly reducing traffic flow a significant percentage of time similar to urban areas
 - c. Continuity of a system such as I-94 in Madison transition into I-90/94 (rural to urban)
 - d. High number of crashes above the statewide average.

If used in rural areas, 2/10 mile enhanced reference location sign spacing *should* be used in rural areas in high crash or high incident locations, areas with three or more travel lanes in each direction or areas with median barrier. All other rural locations should utilize 5/10 mile spacing.

ENHANCED REFERENCE LOCATION SIGN INSTALLATION

Install signs in the median. It has been found that median mounted signs on barrier wall require less maintenance than devices mounted on the right (outside shoulder). Where there are median light poles, install signs on light poles as much as possible or provide separate metal post. Existing mileposts **shall** be removed. Enhanced reference location signs will replace the even mile system and the milepost system is incorporated into the enhanced reference sign system.

For locations with two single-faced barriers, median mounting location for 1/10 mile spacing is every other light pole or other available structure.

For locations with one double-faced barrier (with lighting, the median mounting location for 1/10 mile spacing is every other light pole or other available structure.

For locations with one double faced barrier (without lighting), mount on top of barrier wall utilizing square tube steel post with steel plate.

When median width is 30' or more, intermediate reference location signs in opposing directions **shall** be on

separate posts.

SIGN LAYOUT

See sign plate D10-5 and D10-5A for configuration of sign, sign color and letter sizes.

2-6-55 Community “Historic Downtown” Signing

June 2014

GENERAL

Supplemental guide signs *may* be allowed to direct motorists to certain community historic districts, specifically a “Historic Downtown,” subject to the conditions described in this guideline.

DEFINITIONS

A district is a definable geographical area that can be distinguished from surrounding properties by changes such as density, scale, type, age, style of sites, buildings, structures, and objects, or by documented differences in patterns of historic development or associations.

A district also possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development. A district is considered a business district.

ELIGIBILITY

Communities are eligible for freeway or expressway signs directing motorists to a historic downtown district when that district is entered in the National Register of Historic Places by the Secretary of the Interior and listed in the State Register of Historic Places by the Wisconsin State Historic Preservation Officer. Official documents must be provided to the department affirming the national and state designations. To be eligible for signs, the area (“Historic Downtown”) within the community must be designated on the National Register under the category of “district.” Only downtown historic business districts may qualify for “Historic Downtown” signing. Historic residential districts or avenues do not qualify for “Historic Downtown” signing.

In addition, to be eligible for signs under this guideline, the community must agree to comply with the criteria and requirements of this guideline, and accept responsibility for all costs associated with signing for the historic downtown under this guideline.

SIGN REQUIREMENTS, LOCATION, AND INSTALLATION

The following criteria must be met:

1. No “Historic Downtown” signing *may* be erected within any city having a population over 500,000.
2. The freeway or expressway on which the “Historic Downtown” signs are located must:
 - a. Be within five miles of the nearest boundary of the community, or
 - b. Pass within the corporate limits of the community.
3. Only one “Historic Downtown” sign *may* be installed in each direction of travel on a freeway or expressway and only a total of two signs will be permitted for any one “Historic Downtown,” regardless of the number of highway routes that service the community. The access location for each direction of travel along the freeway or expressway *may* be at a different interchange or intersection. Ramp directional signs *may* be required if the motorist is expected to make a decision on the ramps.
4. The community must install confirmation signing on the selected access route(s), mutually suitable to both the department and community, before the freeway or expressway mainline and ramp signing is installed.
5. The location(s) selected will remain fixed for ten years or the life of the signing before changes to the location(s) *may* be considered.
6. The community will be responsible for all costs incurred by the department, including installation and long-term maintenance of the signs, plus any confirmation signing required.
7. Freeway or expressway sign design and message will be determined by the department in accordance with applicable standards and in the interests of uniformity. Signs **shall** be white text with brown background. Sign message **shall** read “Historic Downtown [Name of Community]”. Pictographs **shall not** be allowed on historic downtown signing.

8. The physical location of the freeway or expressway signing on the approaches to the interchange(s) or intersection(s) identified by the community as the access points to the “Historic Downtown” district will be determined by the department.
9. “Historic Downtown” signs with appropriate directional arrows will also be placed at the junction of the ramp and crossroad at the access interchange or intersection.
10. A combination of community downtown signs and “Historic Downtown” signs for the same community **shall not** be allowed.

“Historic Downtown” signing on a freeway or expressway mainline is considered supplemental signing. The approval and installation is subject to all provisions of the department’s [TEOpS 2-15-3](#), Sign Categories and Policy for Directional Signing, in addition to the eligibility requirements as set forth herein.

2-6-60 Cellular 911 Signs

November 2016

PURPOSE

The intent of this guideline is to restrict the usage of signs that inform the public about contacting 911 for road emergencies to locations that are most helpful to motorists.

Signs with the message “WISCONSIN ROAD EMERGENCY – CELLULAR 911” (D12-4) have been installed on state highways in the past. These signs were installed in a partnership between Bureau of Traffic Operations and Bureau of Transportation Safety to educate motorists that they can dial 911 on their cell phones for road emergencies. Since these signs were installed, the usage of 911 has been adopted pretty much nationwide and motorists are now well aware that 911 is to be used for road emergencies. The official state highway map also encourages motorists to use 911 for road emergencies. Therefore, these signs are no longer considered necessary.

POLICY

Cellular 911 signs (D12-4 signs) are declared non-essential on state highways. As a result, the following actions are expected:

1. No new Cellular 911 signs **shall** be erected on state highways.
2. Cellular 911 signs that have been installed on state highways will be allowed to remain in place until the end of their useful life, when they are to be removed and not replaced. Useful life ends when the sign message no longer meets legibility or condition standards. Cellular 911 signs *may* be removed prior to the end of the signs useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or projects make removal practical.

2-6-61 511 Travel Information Signs

January 2009

PURPOSE

The intent of this guideline is to specify the usage of signs that inform the public about 511 travel information.

The 511 travel information program assists motorists by providing critical information. This information *may* pertain to impending severe weather or to traffic delays resulting from events such as roadwork or incidents.

Signs placed in appropriate locations along roadways can assist motorists by providing a reminder that this service is available. In general, signs *should* be placed at freeway and expressway locations at the state line and freeway-to-freeway split locations. The signs *may* also show benefit to motorists in higher AADT freeway locations because of a high frequency of travel information messages for motorists.

POLICY

1. 511 Travel Info signs **shall** be installed on freeways and expressway s at the state border points. These signs **shall not** be installed on conventional highways.
2. In rural areas, 511 Travel Info signs **shall** be installed at freeway locations consisting of a freeway-freeway split. Such installations *should* be located at a sufficient distance upstream of critical decision points to enable drivers to safely access traveler information through the 511 Travel Info telephone-based system. This upstream distance could be two to five miles, and *should* be selected in consideration of relevant freeway exit guide signing. Some example locations would be Interstates 90

and 94 at Tomah and Interstates 39, 90 and 94 at Portage.

3. In urban areas involving Class I, II, and III cities as defined by the Wisconsin Blue Book, 511 Travel Info signs *should* be installed on approach to primary points of freeway entry to the metropolitan area. Within the metropolitan area, additional 511 Travel Info signs *may* be installed subject to site-specific review and justification based upon demonstrated need of 511 Travel Info users. These site-specific installations *may* include locations upstream of major freeway-to-freeway splits, areas of egress from major trip generators, or approaches to major intermodal facilities such as airports or train stations.

Below is a listing of the Class I, II, and III cities as defined by the Wisconsin Blue Book:

Class I

Milwaukee

Class II

| | |
|-------------|------------|
| Appleton | Oshkosh |
| Eau Claire | Racine |
| Fond du Lac | Sheboygan |
| Green Bay | Waukesha |
| Janesville | Wausau |
| Kenosha | Wauwatosa |
| La Crosse | West Allis |
| Madison | |

Class III

| | |
|----------------|------------------|
| Baraboo | Menasha |
| Beaver Dam | Middleton |
| Beloit | Muskego |
| Brookfield | Neenah |
| Chippewa Falls | New Berlin |
| Cudahy | Oak Creek |
| De Pere | Oconomowoc |
| Fort Atkinson | Pewaukee |
| Franklin | River Falls |
| Glendale | Stevens Point |
| Greenfield | Sun Prairie |
| Hartford | Superior |
| Kaukauna | Two Rivers |
| Manitowoc | Watertown |
| Marinette | West Bend |
| Marshfield | Wisconsin Rapids |

2-6-65 Rest Area Amenity Signs

March 2016

PURPOSE

The intent of this guideline is to establish standards for the use of signs that provide information about services available at freeway and expressway rest area facilities. This policy does not include guidance for wayside amenity signs. Guidance for wayside amenity signs can be found in [TEOpS 2-4-65](#).

This guideline is intended to reduce the number of certain informational signs and messages in order to retain or improve the impact of other guidance and warning signs. This guideline also reflects the need to focus signing efforts and resources on the signs of highest value for safety and mobility.

In the past, rest area amenities such as telephones, historical markers, vending machines, and weather information have been signed for on the advance guide signs for rest areas. Over time, motorists have become accustomed to expecting these certain amenities at rest areas. However, there are still certain amenities that motorists still do not typically expect at rest areas and may not be included at all rest areas. By policy, WisDOT does not allow signing of designated Veteran's Memorial Highways on the highway right-of-way itself. Signing for Veteran's memorial highways are encouraged in off right-of-way locations, such as inside a rest area. Therefore, it makes sense to allow the Veterans Memorial Highway Marker sign (E10-56 sign) to remain on the advanced rest area guide sign.

The NEXT REST AREA XX MILES supplemental sign (E5-62 sign) has also been mounted below the advance guide sign to rest areas, where conditions permit. This sign can be very useful in informing motorists of the distance to the next rest area.

POLICY

The NEXT REST AREA XX MILES supplemental sign (E5-62 sign) should continue to be installed below the

advance guide sign, when applicable.

Any rest areas containing Veterans Memorial Highway Markers shall have the Veterans Memorial Highway Marker (E10-56 sign) installed below the advance guide sign.

All other rest area amenity signs previously installed will be allowed to remain in place until the end of their useful life, and then they should be removed and not replaced. Useful life ends when the sign message no longer meets legibility or condition standards. These signs may be removed prior to the end of the signs useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or projects that make removal practical.



PURPOSE

This policy establishes the signing policy for special events located on the highway right-of-way that result in a closure of the roadway. The roadway closure would necessitate the detouring of traffic on to other roadways.

If a road closure or detour is not needed for an event, but short-term activities will be occurring on the highway with live traffic, then refer to [TEOps 2-10-2](#).

AUTHORITY AND APPROVAL PROCESS

[Section 84.07\(4\)](#) establishes the conditions under which a city or village *may* detour State Trunk Highway traffic: "Except in the case of emergency, no city, village or town **shall** obstruct any street over which any State Trunk Highway is marked, unless it first makes arrangements with the Department for marking a detour."

This provides the statutory basis for the issuance of detour permits. The arrangements with the department must be documented in a detour permit.

The Region Traffic Engineer or designee has the authority to make decisions with regard to requests for permits to temporarily close or obstruct a street carrying the marked route of a state highway, or to detour the marked route of a state highway. Those decisions are subject to the conditions established in this policy. Permits **shall** be issued only to a municipality upon formal request from its governing body and **shall not** be issued to individuals or non-governmental organizations. All closures and restrictions require approval by the Regional Traffic Engineer (RTE) via the Lane Closure Planning System.

This policy **shall** also apply to connecting state highways, as it is critical for WisDOT to review these requests for coordination with the Lane Closure System, 511, OSOW, etc.

POLICY

Applications for permits and the approval thereof **shall** be made in writing on the standard form provided for the purpose ([DT1479](#)) with such attachments as are necessary, such as a map. When a permit application is denied, the denial *should* be in writing with a letter of explanation to the applicant.

In all instances, the region must be satisfied that traffic on the state highway rout will not be unduly inconvenienced and that an adequate detour will be provided.

The municipality **shall** agree to accept the terms and conditions of the permit as specified by the department. Refer to Figure 1 for the Permit Application by Municipality for Permission to Detour State Trunk Highway Traffic (form [DT1479](#)).

The region *may* impose additional reasonable requirements or restrictions to the permit as are necessary for the particular circumstances of that permit.

Requests to temporarily close a road for special events *may* be considered subject to the considerations listed. These types of special events include parades, celebrations, street fairs, races, movie or television production, and other activities officially supported by the municipality.

1. Closures **shall not** be allowed during peak traffic periods, as determined by the regional traffic section.
2. The duration of road closure *should not* exceed four hours. When a closure is necessary for an event, the duration *should* be determined based on when the last event participant has cleared the roadway.
3. A plan for traffic control and detour, and documentation of the means to implement it, *should* be submitted to the WisDOT region traffic engineer for review at least 90 calendar days in advance of the event.
4. A detour **shall** be required. Motorists **shall** be guided through the detour by signs and/or law enforcement personnel.
5. A detour permit application (form [DT1479](#)) **shall** be completed.
6. All traffic control and detour signs **shall** be in conformance with the standards established in the

MUTCD.

7. The requestor **shall** notify appropriate media, emergency services, and affected schools five (5) days prior to the detour.
8. The WisDOT region traffic engineer *should* notify the region communications manager of the special event once the DT1479 forma has been completed and signed.
9. All road closures and detours **shall** be coordinated with the State Patrol and/or the local law enforcement agency. The coordination **shall** be documented by the requestor.
10. The requestor **shall** be responsible for providing adequate traffic control for the duration of the event and effective coordination with law enforcement.
11. The requestor **shall** be responsible for all costs associated with providing the traffic control, law enforcement, and coordination of other services to accomplish the closure consistent with the permit requirements.

Figure 1

| APPLICATION BY MUNICIPALITY FOR PERMISSION TO DETOUR STATE TRUNK HIGHWAY TRAFFIC | | Wisconsin Department of Transportation | |
|--|--------------------------------------|--|--|
| DT1479 6/2007 (Replaces ET604) s.84.07(4) Wis. Stats. | | | |
| TO: REGIONAL TRAFFIC SECTION | | | |
| Municipality | | County | |
| Area Code – Telephone Number | | E-Mail Address | |
| Name of Street(s) to be Closed <input type="checkbox"/> STH <input type="checkbox"/> USH | | Streets Closed Between (Street Name) FROM: TO: | |
| PROPOSED TEMPORARY ROUTE | | | |
| <input type="checkbox"/> MAP ATTACHED | Date and Duration of Detour Date: | Time: a.m. to a.m. | |
| Reason | | | |
| Name and Address to Whom Permit will be Returned | | | |
| <p>The above municipality requests permission to close the marked route as described, during which time the municipality will provide temporary route as designated.</p> <p>The municipality agrees to accept the following terms and conditions:</p> <ol style="list-style-type: none"> 1. The municipality shall provide a detour having structural, geometric and traffic control characteristics, which are acceptable to the Region. A detour map which provides street names shall be submitted. 2. The municipality shall furnish, erect and remove signs and markers at the sole expense of the municipality, unless provided for in (3), or unless directed by officers for short routes and short timeframe (less than 3 days). 3. A Detour and Traffic Control Plan shall be submitted to the Region for approval. An example is Standard Detail Drawing 15C2-4C. 4. The municipality shall agree to minimize, as much as practicable, the duration of closure, including providing for assembly and dispersal of parades in areas removed from the state highway route. 5. The municipality shall accept full responsibility for any damage to local roads and streets resulting from closure and detour. 6. The requester shall arrange for adequate traffic control from either WisDOT or the appropriate county, and provide documentation of enforcement coordination. 7. The requester shall notify all media, emergency services and schools, five (5) days prior to the detour. 8. Additional conditions: . Attachments: <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| _____ (Authorized Official Signature) | | _____ (Title) | |
| | | _____ (Date) | |
| <p>Permission is granted to temporarily close the designated segment of state trunk highway and to provide a detour, subject to the stated conditions.</p> | | | |
| _____ (Permit Number) | | _____ (Approved By) | |
| | | _____ (Date) | |

2-10-2 Special Events (Roadway Open to Traffic)**August 2013****PURPOSE**

This policy establishes the signing policy criteria for special events that take place on the highway right-of-way. These are special events that can be conducted with the road open to traffic under certain conditions.

Road closures and detours for special events shall be governed by the guidance in [TEOpS 13-10-1](#) and WisDOT permit form [DT1479](#). Signing for special events off of the state highway system shall be governed by the guidance in [TEOpS 2-10-3](#).

The department receives frequent requests to use the highway right-of-way for various activities. These activities are typically short-term, readily definable activities that fall in two categories:

1. Roadway or roadside modifications, repairs, or maintenance operations by a local unit of government, or permitted railroad or utility work
2. Certain types of special events, such as marathons, bicycle races, charity walks/runs, filming, etc.

Roadway or roadside operators, including utility work, are regulated under Chapters 90 and 96 of the Maintenance Manual and [WisDOT permit form DT1812](#).

The basis for allowing the use of the highway for these special events is [Wisconsin State Statute 349.185](#), which allows governments in charge of maintaining the highway the authority to regulate community events or celebrations, processions or assemblages on the highways. The word “assemblage” is interpreted to mean that the Department *may* consider activities such as street fairs, bike racing and marathons as legitimate reasons for traffic restrictions, up to and including closing the street and arranging for a detour if the municipality so chooses.

In general, use of the state highway right-of-way for special events will not be allowed unless a legitimate public interest (supported by the Local Government) is served and the activity does not cause safety or capacity problems. Requests for closing and detouring the highway **shall** come from the municipal government. Special event requests that only require temporary traffic restrictions *may* come from the municipality, individuals, private enterprises or a neighborhood community. In the case where the requestor is that other than a municipality, the requestor shall provide a letter from the affected municipalities as proof that the event is fully coordinated with them. Authorization for usage of the highway right-of-way for special events *may* be granted by the WisDOT Region office in the form of a permit, provided all pertinent criteria covered in these guidelines are satisfied. All closures and restrictions on Corridors 2030 roadways require approval by the Regional Traffic Engineer (RTE) via the Lane Closure Planning System.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have fully controlled access at interchanges only. Interstate Highways are freeways with the interstate route designation.

Expressways are defined as divided arterial highway facilities with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional Highways are defined as streets or roads other than freeways, expressways, or low-volume roads. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

GENERAL POLICY CRITERIA

1. This policy applies for special events on the state highway right-of-way that are running concurrent with traffic (no road closure or detour). This policy **shall** also apply to Connecting State Highways as it is critical for WisDOT to review these requests for coordination with the Lane Closure System, 511, OSOW, etc. Special events on the highway right-of-way **shall not** be allowed on freeways, expressways or any roadway with a posted speed above 55 mph.
2. FHWA concurrence is required when the special event is on the Interstate Highway system.
3. The permit **shall** identify that the special event requestor agrees to assume the entire responsibility and liability for all damages or injury to all persons, whether employees or otherwise and to all property, arising out of, resulting from or in any manner connected with the operation of the special event. The requestor **shall** provide proof of General Liability Insurance Coverage and **shall** agree to defend and indemnify WisDOT, its agents and employees from all such claims including, without limiting the

generality of the foregoing, claims for which WisDOT *may* be paid or incurred to enforce the provisions of this paragraph, and the requestor **shall** further agree and pay for such general liability coverage which protects the state as an additional named insured.

4. The requestor *should* submit the permit application to the WisDOT Region Traffic Section at least 90 calendar days in advance of the event.
5. The requestor **shall** be responsible for any damage done to the highway property as a result of the special event.
6. The special event minimum attendance is typically 100 participants. This attendance number includes anticipated spectators.
7. A special event **shall not** occur more than once annually by the same sponsor in the same section of roadway. Special events **shall not** occur more than four times a year in the same section of roadway.
8. WisDOT is responsible for determining whether the event qualifies for special event signs, providing guidance on acceptable signs and placement, reviewing the permit application, and assuring compliance with the permit.
9. The Region Traffic Section will evaluate the safety of any nighttime special event requests.

DETAILED POLICY CRITERIA

1. Special Events **shall not** be allowed during peak traffic periods, as determined by the WisDOT Region Traffic Engineer.
2. The time duration of the Special Event *should not* exceed four hours or when the last event participant has cleared the roadway.
3. The use of the right-of-way **shall not** interfere with motorists' safe operation of their vehicles.
4. The use of the right-of-way **shall not** obstruct sight distance and **shall not** detract from motorists' view of traffic control devices.
5. A plan for traffic control and documentation of the means to implement it *should* be submitted to the WisDOT Region Traffic Engineer for review and approval at least 90 calendar days in advance of the event.
6. All traffic control signs **shall** be in conformance with the MUTCD.
7. Advance notices to the media **shall** be coordinated by the Requestor.
8. All special events **shall** be coordinated with the State Patrol and/or the local law enforcement agency as appropriate, by the requestor. Documentation of this coordination is required.
9. The WisDOT Region Traffic Engineer *should* notify the Region Communications Manager of the Special Event once the attached application form has been completed and signed.
10. Parking **shall not** be allowed on the state highway right-of-way, which includes the shoulders.
11. If the event will take place on highways maintained by other governmental agencies, the Requestor **shall** coordinate the event and provide proof by letter to the WisDOT Region Traffic Engineer that the necessary coordination has taken place with the other governmental agencies.
12. The usage of police powers for special events **shall not** substitute for appropriate signing.

SIGNING LIMITATIONS

The criteria below apply for signing on the specific roadway where the event is held. Advanced directional signing for special events is covered under [TEOpS 2-10-3](#).

1. No commercial advertising is allowed on the signs. The inclusion of a brand name within the name of an event, such as "Brand X Racing Event" is permissible. The sign message *may* include the word "Event" or "Parking". Event names on signs *should* be as clear and concise as possible. Pictographs **shall not** be allowed on the signs, per interpretation of the MUTCD and guidance from FHWA.
2. The signing layout detail and installation locations **shall** be approved by the Regional Traffic Section and Bureau of Highway Operations.
3. Guidance signs with red, orange, yellow, or fluorescent yellow-green background **shall not** be used. Temporary work zone warning signs **shall** be fluorescent orange. Sign base material **shall** consist of

plywood or sheet aluminum. If banners are used, they must meet the requirements of the TEOpS policy on banners ([TEOpS 13-12-1](#)). Posts **shall** be of an approved type for highway signs per WISDOT standards. Signs **shall** be manufactured by a fabricator who has been in the traffic signing business for a minimum of three years.

4. Letter size, font, and spacing **shall** meet MUTCD guidelines. Minimum of 6" upper case letters and 4 ½" lower case letters **shall** be used.
5. If the event takes place at night, the signs **shall** be high intensity, retroreflective.
6. Changeable message signs *may* be used, subject to WisDOT policy requirements for use of changeable message signs. The Regional Traffic Section **shall** approve the message content, letter height, and sign location as specified in [TEOpS 17-2-1](#). Larger letter heights are needed on changeable message signs for readability. Refer to the [TEOpS 17-2-1](#) for additional provisions regarding PCMS usage.
7. Pre-event signing *may* be required up to 10 days in advance of the special event. The signing layout and installation details for pre-event signing **shall** be approved by the Regional Traffic Section and the Bureau of Traffic Operations.

IMPLEMENTATION COST

1. The event organization or requesting group **shall** pay for all costs associated with the special event signing, including costs to obtain the permit, which *may* include WisDOT review costs; any costs to acquire, install, and remove the special event signs, including changeable message signs; and any additional costs incurred by the department. The event organizer will be responsible for obtaining signs that conform to department standards and arranging to have those signs placed, operated, and removed consistent with the terms of the permit. All work on the highway right-of-way must be performed by a contractor or local government agency approved by WisDOT.
2. Installation by county forces *may* be an option in some situations. When that occurs, all costs are charged back to the requesting organization.

APPLICATION TO USE HIGHWAY RIGHT-OF-WAY FOR A SPECIAL EVENT

| | |
|-----------------------------|----------------------------------|
| | Permit No. |
| Event Name/Type | Event date: |
| Event Director or Organizer | Telephone Number |
| Mailing Address | |
| Email Address | Estimated number of participants |

I (We), _____
 hereby make application for a special event on the State Highway _____ right-of-way
 between _____ am/pm and _____ am/pm on _____ (date).

I (We) agree to strictly conform to the exhibits attached hereto, subject to all terms, conditions, agreements, stipulations and provisions contained in the application and permit, and the guidelines, rules and regulations, as set forth by the Wisconsin Department of Transportation and any other applicable regulations, laws or ordinances.

Event Description: (attach map and traffic control plan)

Prior to the event, I (we) agree to review the course to determine potential problems that could endanger participants or equipment and to notify the participants of them. If I (we) determine the problems to be severe, I (we) agree to cancel the event. I (we) have coordinated the Special Event with all affected governmental agencies.

Permittee must provide a certificate of insurance as evidence of an existing Comprehensive or Commercial General Liability Policy, including contractual liability coverage, with limits not less than \$500,000 combined single limit for all claims arising out of a single accident or occurrence, and naming the State of Wisconsin, Wisconsin Department of Transportation as additional insured.

PERMITTEE SHALL DEFEND, HOLD HARMLESS AND INDEMNIFY THE STATE OF WISCONSIN, DEPARTMENT OF TRANSPORTATION, AND IT'S OFFICERS, AGENTS, EMPLOYEES, AND MEMBERS FOR ALL SUITS OR ACTIONS THAT MAY RESULT FROM ANY ACTIVITY BY THE PERMITTEE, IT'S OFFICERS, SUBCONTRACTORS, AGENTS OR EMPLOYEES.

Name (Please Print)

Signature

Date (minimum of 90 days prior to event)

APPROVED DENIED

Regional Traffic Engineer or designee signature

DATE

APPROVED DENIED

Regional Maintenance Engineer or designee signature

DATE

Attachment- Copy of letter from municipality (if applicable)

2-10-3 Special Events (Advance Directional Signing) December 2011

PURPOSE

The purpose of this guideline is to establish criteria on the usage of advanced directional signs for significant traffic generator events that are open to the public and temporary in duration. Consistent and well-planned usage of special event signing allows for safe and efficient flow of traffic at significant traffic generator events. These temporary traffic generator events would be for a facility, activity, or special point of interest that attracts large numbers of people, a majority of whom are unfamiliar with the local area and/or access routes.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional Highways are defined as divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways *may* be two lane or multilane facilities.

POLICY

Qualifying Criteria

1. The event **shall** be open to the public. No commercial advertising is allowed on the signs. The inclusion of a brand name within the name of an event, such as “Brand X Racing Event,” is permissible. The sign message *may* include the word “Event” or “Parking.” Event names on signs *should* be as clear and concise as possible. Pictographs **shall not** be allowed on the signs, per interpretation of the MUTCD and guidance from FHWA.
2. For conventional highways, the minimum length of the event **shall** be one day and the maximum length of the event **shall** be two weeks.
3. For freeways and expressways, the minimum length of the event **shall** be three days and the maximum length of the event **shall** be two weeks.
4. The minimum special event attendance **shall** be 10,000 people per day. When the event involves more than one location, each signed location **shall** meet the minimum attendance of 10,000 per day.
5. The special event **shall** occur no more than once annually by the same sponsor in the same location.
6. When a facility has or qualifies for signing under the current policies for supplemental traffic generator signing ([TEOpS 2-15-3](#)), a special event sign cannot be installed for an event at that facility, unless a genuine traffic need can be demonstrated. For this situation, a changeable message sign **shall** be used to direct traffic appropriately if approved by the regional traffic section and Bureau of Traffic Operations Staff.
7. WisDOT is responsible for determining whether the event qualifies for special event signs, providing guidance on acceptable signs and placement, reviewing the permit application, and assuring conformance with the permit.

Signing Limitations

1. Trailblazing signs **shall** be installed before any mainline signs are installed.
2. Signing from freeways, expressways, and conventional STHs is allowed. No conventional STH to conventional STH trailblazing will be allowed.
3. The maximum distance of the event from the highway or nearest exit **shall** be five miles.
4. For a specific event, signing on freeways or expressways from two locations (maximum of 8 signs) will be allowed. One advance sign such as NEXT RIGHT and one exit sign at the exit taper *should* be used.
5. The signing layout detail and installation locations **shall** be approved by the regional traffic section and Bureau of Traffic Operations.
6. Signs with red, orange, yellow, or fluorescent yellow-green background **shall not** be used. Sign base material **shall** consist of plywood or sheet aluminum. Flexible banners are not allowed. Posts **shall** be of an approved type for highway signs per WisDOT standards. Signs **shall** be manufactured by a fabricator who has been in the traffic signing business for a minimum of three years.
7. Letter size, font, and spacing **shall** meet MUTCD guidelines. Minimum of 8” letters on freeways/expressways and minimum of 6” letters on conventional highways **shall** be used.

Implementation/Cost

1. Changeable message signs *may* be used, subject to WisDOT policy requirements for use of dynamic message signs. The Regional Traffic Section **shall** approve the message content, letter height, and sign location. Larger letter heights are needed on changeable message signs for readability.
2. The event organization or requesting group **shall** pay for all costs associated with the special event signing, including costs to obtain the permit, which *may* include WisDOT review costs; any costs to acquire, install, and remove the special event signs, including the changeable message signs; and any additional costs incurred by the department. The event organizer will be responsible for obtaining signs that conform to department standards and arranging to have those signs placed, operated, and removed consistent with the terms of the permit. All work on the highway right-of-way must be performed by a contractor or local government agency approved by WisDOT.
3. The requestor **shall** contact the county highway department or WisDOT-approved signing contractor for installation and removal of the signs.

APPLICATION FOR PERMIT TO INSTALL TEMPORARY SIGNING ON HIGHWAY RIGHT-OF-WAY DURING SPECIAL EVENT

| | |
|--|---|
| APPLICANT: | |
| ADDRESS OF BUSINESS/ACTIVITY: | |
| PHONE: | |
| TYPE OF BUSINESS/ACTIVITY: | |
| PROPOSED SIGN LOCATION(S): (number and placement to be coordinated with Regional Traffic Engineer) | |
| On what highway? | At or approaching intersection with what highway? |
| 1) On: | At: |
| 2) On: | At: |
| 3) On: | At: |
| 4) On: | At: |
| 5) On: | At: |
| 6) On: | At: |
| 7) On: | At: |
| 8) On: | At: |
| Remarks: | |
| <p>Two drawings MUST be attached:</p> <ul style="list-style-type: none"> - One must show the proposed sign design(s) and dimensions - One must show the proposed sign location(s) | |

I apply for permission to install and maintain temporary special event signs at the locations listed and in conformance with the guidelines attached to this application. I agree to comply with these guidelines and will remove all signs upon completion of the event, or when directed by the Regional Traffic Engineer.

I understand that signs *may* be removed without notice if they do not comply with the attached guidelines, do not match the attached drawings, or do not comply with any additional conditions stated on or attached to the permit. The Requestor **shall** contact the County Highway Department or WisDOT approved signing contractor for installation and removal of the signs.

Approved by: _____
Regional Traffic Engineer
Applicant Signature



Traffic Engineering, Operations & Safety Manual

Chapter 2 Signing

Section 15 Comprehensive Guiding Policies

2-15-1.1 AASHTO Guide for Supplemental Signs

September 2007

GUIDELINES

Following is a copy of the 2001 AASHTO Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways. These are the AASHTO Guidelines that are incorporated by reference in Section [2E.35](#) of the MUTCD. This section of the MUTCD also recommends that states *should* adopt an appropriate policy for installing supplemental signs using the AASHTO Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways.

The department has adopted policy pursuant to Section [2E.35](#) which is found in [TEOps 2-15-3](#). Both the AASHTO Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways” as incorporated in the MUTCD and the department policy found in [TEOps 2-15-3](#) apply.

PART I

PART I

Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways

PART II

Guidelines for Airport Guide Signing

PART III

List of Control Cities for Use in Guide Signs on Interstate Highways

2001

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Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways

The *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD) is the national standard for installing traffic control devices on all roads open to public travel. The MUTCD contains the standards for signing freeways and expressways for motorists who are unfamiliar with an area, but who are traveling between and through the Nation’s principal traffic generating centers.

The selection of information to be presented at an interchange is critical to the safe and efficient use of the highway system. The MUTCD provides mandatory requirements for installing many freeway signs, but leaves other signing discretion to the States. One of these discretions is the selection of destinations to be used on major guide signs and supplemental guide signs. Numerous facilities that warrant inclusion on supplemental guide signs, and the addition of new facilities, have posed signing problems in many states.

The guidelines contained herein were developed to assist the States in selecting the most appropriate generators for display on freeway supplemental guide signs. These guidelines provide a basis for development of individual State policies which should consider local needs, customs, and legal requirements.

The MUTCD provides several restrictions on the use of supplemental guide signs on freeways. Those portions of the MUTCD are repeated below.

Sec. 1A-3.1

“Traffic control devices shall be placed only by the authority of a public body or official jurisdiction, for the purpose of regulating, warning, or guiding traffic. No traffic control device or its support shall bear any advertising or commer-

cial message, or any other message that is not essential to traffic control... All unofficial and non-essential signs should be removed."

Sec. 2F-20

"...the major signs at freeway interchanges and on their approaches are advance guide signs and exit direction signs. It is essential that the same destination messages be displayed on these signs. New destination information should not be introduced into the major sign sequence for one interchange, nor should information be dropped... Supplemental guide signing should be used sparingly, as provided in Section 2E-28."

Sec. 2E-28

"Information regarding destinations accessible from an interchange, other than places shown on the standard interchange signing, may be shown on a supplemental guide sign. Such a sign may list one or two destinations followed by the interchange number (and suffix) or if interchanges are not numbered, by the legend 'NEXT RIGHT' or 'SECOND RIGHT' or both, as appropriate. The supplemental guide sign installation should be erected approximately midway between the two major advance guide signs. If only one advance guide sign is used, the supplemental guide sign should follow by at least 800 feet.

Supplemental signing can reduce the effectiveness of the other important guide signing because of the possibility of overloading the vehicle operator's capacity to receive and make decisions on visual messages. The AASHTO *Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways* is incorporated in this section as a guide. States may develop an appropriate policy for such signing. Such items as population, traffic generated, and distance should be taken into account.

Only one supplemental guide sign may be used on each interchange approach. If used, it is normally installed as an independent guide assembly.

Guide signs directing motorists to park-and-ride facilities shall be considered as supplemental signs..."

Sec. 2F-34

"Scenic area signing should be consistent with that specified for rest areas. Standard messages should read 'SCENIC AREA' or 'SCENIC VIEW' or the equivalent."

Sec. 2H-16

"Supplemental guide signs with a white legend and border on a brown background may be used on an expressway or freeway when a park or recreational or cultural interest area is signed as a significant destination for users of these roads. The same color combination may be used for the advance guide sign and the exit direction sign for an interchange where the crossroad leads exclusively to a park, or to a recreational or cultural interest area.

Where the crossroads of an expressway or freeway leads to a destination other than a park or a recreational or cultural interest area, the advance guide sign and the exit direction sign shall retain the white on green color combination.

All gore signs shall have a white legend on a green background, regardless of the above conditions. The background color of the interchange exit number panel shall match the background color of the guide sign proper."

**Secs.
2F-41,
2E-42,
2D-49
(paraphrased)**

If they do not interfere with signing for interchanges or, other equally critical points, miscellaneous guide signs, or various types may be used to show state, county, and other significant local jurisdictional boundaries. Signs of this character should not be installed unless there are specific reasons for orienting the users of the freeway or identifying control points for activities that are clearly in the public interest.

Sec. 2F-40

"The commonly used name or trailblazer symbol for a toll facility may be displayed on free sections of the Interstate System at

1. the last exit before entering a toll section of the Interstate System;
2. the interchange or connection with a toll facility, whether or not the toll facility is a part of the Interstate System; and
3. other locations within a reasonable approach distance of toll facilities when the name or trailblazer symbol for the toll facility would provide better guidance to drivers unfamiliar with the area than would place names and route numbers.

The toll facility name or marker may be included as a part of the guide sign installations on intersecting highways and approach roads to indicate the interchange with a toll section of an Interstate highway. Where needed for the proper direction of traffic, a trailblazer for a toll facility that is part of the Interstate System may be displayed with the Interstate trailblazer assembly."

General Criteria and Limitations

General signing criteria and limitations should be established by the States. Generators which have the greatest traffic should be shown on supplemental guide signs. This does not mean that all facilities that meet the criteria should automatically receive informational signing. Signing for traffic generators is considered supplemental to the overall signing system for freeways. Therefore, before a sign for a traffic generator is installed, sufficient space should exist to accommodate the placement of the sign without interfering or conflicting with required signing. Normally, supplemental guide signs for traffic generators should not be installed at freeway-to-freeway interchanges.

Not more than one supplemental guide sign for a traffic generator should be provided in each direction along any freeway. Signs for these facilities shall be located in advance of the interchanging road that provides the most direct route to the facility.

Information relating to a traffic generator should be displayed at the freeway exit nearest to the facility. Consideration may be given to displaying the information at a second freeway when the prime criterion is exceeded by at least 50 percent and the traffic generator is within two-thirds of the specified distance for the nearest freeway and within the specified distance for the farthest freeway. Supplemental guide signs should not be erected for a traffic generator that would require a motorist to travel on the interchanging road beyond a second freeway.

Signing for a seasonal generator may be displayed when warranted. Such signing shall be removed at the end of the season, or a changeable message type installation may be used.

Two traffic generators may be displayed on a single, permanent, or seasonal guide sign. When more than two traffic generators meet the signing criteria, generators having the greatest need for signing should be shown. Permanent supplemental guide sign and seasonal supplemental guide sign information for traffic generators may be installed on the same supports.

Signing for a traffic generator should not be displayed on a supplemental guide sign until signing has been installed at the ramp terminals and along the interchanging road and other roads as necessary to direct the motorist from the freeway to the traffic generator.

Specific Criteria

Certain types of generators appear through attendance or special activities to warrant signing with minimal traffic volume criteria. While it is recommended that criteria be established, signs may, at the option of the States, be erected for the following types of generators, without establishing a traffic volume warrant.

1. Major airports
2. Major military installations
3. Major colleges and universities
4. Federal and State parks
5. Major recreational areas
6. Other incorporated cities

Other generators that may qualify for signing on the conventional highway system are not normally of interest to the freeway user. Except under unusual circumstances, supplemental signing should not be considered for the generators shown in Table I. This table is not all-inclusive, but provides an indication of the type of facilities not normally warranting signs.

Table II provides guidelines to establish criteria for selection of destinations to be shown on supplemental guide signs. In view of the broad range of population densities throughout the Nation, numerical values may be altered as required by local conditions. A typical selection of generators was included in this table and geographical conditions, legal requirements, or administrative policy may require certain deletions or expansion of the table in individual states.

TABLE I

Traffic Generators That Do Not Normally Warrant Signing

| | |
|--|--|
| <p>Businesses TV/Radio Stations Theaters Motels/Hotels/Inns* Trailer Parks* Industrial Parks and Plants Shopping Centers</p> <p>Cemeteries Local or State Private/Public Military</p> <p>Communities Civil Centers Military Libraries Churches Subdivisions</p> <p>Governmental Research/Experimental County and City Facilities Courthouses Driver's License Centers Highway Buildings Jails/Prisons Civil Defense Facilities Maintenance Facilities Power Plants</p> <p>Historical Homes and Buildings Privately Owned Facilities</p> | <p>Medical Mental Facilities Research Facilities Sanitariums Infirmaries or Treatment Centers Veterans Facilities County, Fraternal, or Nursing Homes Retirement Facilities Humane Facilities Emergency Medical Services*</p> <p>Military Sites or Detachments Armories Arsenals</p> <p>Recreational/Conservational Country Clubs and Golf Courses Fish Hatcheries, Game Farms, Preserves, and Refuges Tree Nurseries/Arboretums Points of Interest Camps: Scout, Church, 4 H, Youth, and YMCA/YWCA</p> <p>Schools Grade/High Vocational/Trade Seminaries Private</p> |
|--|--|

*Items may be included on Motorist Service signs (GAS-FOOD-LODGING-HOSPITAL-CAMPING)

TABLE II

Guideline Criteria for Signing Traffic Generators

These numerical values are provided as guides and may be modified by each state as required by local conditions, laws, and customs.

| Type of Generator | Specific Criteria | Major Metro Area ¹ | Urban Area ² | Rural Area |
|---|---|--|-------------------------|--------------------|
| College or University | Total Enrollment Full & Part Time Students or | 4,000 | 2,500 | 1,500 |
| | No. of Trips ³ Generated Annually | 900,000 ^{3a} 1,200,000 ^{3b} | 550,000 750,000 | 300,000 450,000 |
| | Distance from Interchange (mi) ⁴ | 3 | 4 | 5 |
| Military Bases | No. of Employees & Permanently Assigned Military Personnel or | 5,000 | 4,000 | 3,000,000 |
| | No. of Trips ³ Generated Annually | 5,000,000 ^{3c} | 4,000,000 | 3,000,000 |
| | Distance from Interchange (mi) ⁴ | 5 | 7.5 | 10 |
| Arenas Auditoriums Convention Halls Stadiums | Annual Attendance | 300,000 | 250,000 | 200,000 |
| | No. of Seats (If Applicable) | 6,000 | 5,000 | 4,000 |

TABLE II (continued)

| Type of Generator | Specific Criteria | Major Metro Area ¹ | Urban Area ² | Rural Area |
|--|---------------------------|-------------------------------|-------------------------|------------|
| State & National Parks Monuments Major Recreational Areas (Fairgrounds, Amusement Parks, Zoos, Etc.) | Distance from Interchange | 5 | 5 | 5 |

¹ 50,000 or more population in Urban Area.

² 5,000-49,999 population in Urban Area.

³ Trip: A single or one-direction vehicle movement to the generator.

The following trip generation rates are suggested:

^{3a} College or University without dorms, each student = 1.5 trips

^{3b} College or University with dorms, each student = 2 trips

^{3c} One employee or military personnel = 0.9 trips

⁴ The distance may be increased 1/2 mile for each 10 percent over the minimum requirement listed to a maximum of two times the minimum distance listed.

Note: When the traffic generator is not located on the crossroad, written confirmation is required from the local government agency that they will install and maintain trailblazing signing for the logical direction of traffic to the facility.

2-15-3 AASHTO Guide for Supplemental Signs

April 2017

DIRECTIONAL AND INFORMATIONAL SIGN REQUESTS

The following is a table intended to provide preliminary information on the eligibility of specific sign requests for installation on the state trunk highway system, including freeways and expressways. It **shall** be used in combination with the rest of this subject, which gives more specific qualifying criteria.

Abbreviations:

Supplemental C: The category for traffic generator supplemental signing on conventional highways

Supplemental F: the category for traffic generator supplemental signing on freeways

SS (numbers): A reference to a numbered subsection of the state statutes

TEOpS (numbers): A reference to another subject in the Traffic Engineering, Operations and Safety Manual

Trans 200.nn: A reference to a subsection in Chapter Trans 200 of the Wisconsin Administrative Code

| DESTINATIONS or INFORMATION | CATEGORIES | AUTHORIZATION | REMARKS |
|-----------------------------------|----------------------|------------------------------|------------------------------------|
| Agricultural Experiment | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Agricultural Farms | Not Permitted | | |
| Air Traffic Control | Not Permitted | | |
| Airport – Major | Govt. Transportation | | |
| Airport – Public General Aviation | Govt. Transportation | | |
| Amtrak Station | Govt. Transportation | | |
| Amusement Parks | Supplemental C, SIS, | SS 86.195 | Qualifying Criteria |

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|---|---|--|---|
| | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Animal Hospitals, Emergency | Not Permitted | | |
| Animal Ranches | Not Permitted | | |
| Animal Shelters | Guidance Signs | Trans 200.03 | |
| Arboretums | Supplemental C | | Qualifying Criteria |
| Arenas, multi-purpose | Supplemental F & C | | Qualifying Criteria |
| Armories, Reserve Ctrs | Supplemental C | | Qualifying Criteria |
| Arrow Boards | Guidance Signs | Trans 200.03 | aka Guidance signs |
| Athletic Fields and/or Facilities | Community wayfinder Guidance Signs | TEOpS 2-15-60 Trans 200.03 | |
| Attractions | SIS | SS 86.195 | |
| Auditoriums | Supplemental F & C | | Qualifying Criteria |
| Auto Repair | Not permitted | | |
| Aviation Flight School | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Banners | Information | TEOpS 13-12-1 | |
| Boat Landings | Inter-agency | | Conventional Hwy only |
| Botanical Gardens | Supplemental C | | Same as Arboretums |
| Braking, Engine (Jake) | Special | TEOpS 2-2-30 | |
| Bus Terminals | Not Permitted | | |
| Business District | Special Community wayfinder | TEOpS 2-6-50 TEOpS 2-15-6 | Alternative to "Downtown" |
| Cabins, Cottages, Non-rental | Not Permitted | | |
| Cabins, Cottages, Rental | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Camping, including Logo | SIS, TODS, Guidance Signs | | Category depends upon highway type |
| Campgrounds (public) | Inter-agency | | |
| Camps, Private | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Canoe, Kayak, Tubing Facilities | TODS | SS 86.196 | |
| Casinos | Supplemental F & C | | Qualifying Criteria |
| Cemeteries | Not permitted | | See Veterans Cemeteries |
| Churches | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| City Hall | Community wayfinder | TEOpS 2-15-6 | |
| City Parks | Community wayfinder | TEOpS 2-15-6 | |
| Civic Centers | Community wayfinder | TEOpS 2-15-6 | |
| Clinics | Not Permitted | | |
| Colleges | Supplemental F & C | | Qualifying Criteria |
| Community Destination Signs | Community wayfinder | TEOpS 2-15-6 | aka "Wayfinder" signs |
| Community Welcome Signs | Special/Not Permitted | TEOpS 2-1-41 | |
| Conservation Center | Inter-agency | | Conventional Hwy only |
| Convention Centers | Supplemental F & C Community wayfinder Guidance Signs | TEOpS 2-15-6 Trans 200.03 | Qualifying Criteria Also TEOpS 2-15-60 |
| Correctional Institutions | Inter-agency | | Conventional Hwy only |
| Country Clubs | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| County Fairgrounds | Inter-agency | | |
| County Institutions (Healthcare Facilities) | Inter-agency, Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| County Parks | Inter-agency | | |
| Courthouses | Community wayfinder | TEOpS 2-15-6 | |
| Crime Stoppers | Special/Not Permitted | | |
| Cruises, Boat | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Dance Halls | Not Permitted | | |
| D.A.R.E. | Special/Not Permitted | | |
| DMV Service Center | State Govt. Service Centers/Intra-agency | | Conventional Hwy only |
| DNR Service Center | State Govt. Service Centers | | Conventional Hwy only |
| Dog Tracks | Supplemental F & C | | Qualifying Criteria |
| Donation Centers | Community wayfinder | TEOpS 2-15-6 | |
| Downtown | Special Community wayfinder | TEOpS 2-6-50 TEOpS 2-15-6 | |

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|---------------------------------------|--|---|---|
| Drive-In Theatres | TODS | SS 86.196 | |
| Emergency Medical Treatment | Special | TEOpS 2-4-45.1 & TEOpS 2-4-45.2 | Emergency Room criteria |
| Emissions Testing Station | State Govt. Service Centers/Intra-agency | | Conventional Hwy only |
| Environmental Center | Inter-agency Guidance Signs | Trans 200.03 | Conventional Hwy only, also TEOpS 2-15-60 |
| Events, Special | Special | TEOpS 2-15-25 | |
| Exhibition, Exposition Center | Supplemental F & C Guidance Signs | Trans 200.03 | Qualifying Criteria also TEOpS 2-15-60 |
| Fairgrounds | Inter-agency | | |
| Factories | Not permitted | | |
| Ferries | Govt. Transportation | | |
| Fish Hatcheries | Inter-agency | | Conventional Hwy only |
| Food, includes logo | SIS, TODS | SS 86.195 SS 86.196 | |
| Forest boundaries | Not permitted | | |
| Forest Headquarters | Inter-agency | | |
| Freight Terminals | Not Permitted | | |
| Fuel (with logo) | SIS, TODS | SS 86.195 SS 86.196 | |
| Game Farms | TODS | | |
| Gas, (with logo) | SIS, TODS | SS 86.195 SS 86.196 | |
| Golf Courses | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Government Offices | State Govt. Service Centers | | Also the State Capitol |
| Gun Clubs, Ranges | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Half-way Houses | Not Permitted | | |
| Health Clubs | Not Permitted | | |
| Heritage Tourism Sites | Program discontinued as of 12/1/13 | | Also TEOpS 2-4-52 |
| Highway Departments | Not Permitted | | |
| Highway Maintenance Facilities | Not Permitted | | |
| Historic Buildings | Special or Inter-Agency | | Could be Community wayfinder |
| Historic District / Historic Downtown | Special or Community wayfinder | TEOpS 2-6-55 TEOpS 2-15-6 | |
| Historic Neighborhoods | Not Permitted | | |
| Historic Sites | Special or Inter-Agency | | Conventional Hwy only |
| Historic Society Sites | Special or Inter-Agency | | |
| Historical Markers | | TEOpS 2-4-40 | |
| Horseback Riding | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Hospitals | Special | TEOpS 2-4-45.1 | Emergency Room criteria |
| Hotel (See Lodging) | SIS, TODS, Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Humane Society Shelter | Guidance Signs Community wayfinder | Trans 200.03 TEOpS 2-15-6 | also TEOpS 2-15-60 |
| Ice Arenas, community | Community wayfinder | TEOpS 2-15-6 | |
| Industrial Parks | Supplemental C | | |
| Jails | Not Permitted | | |
| Jurisdictional Boundary Signs | Information | TEOpS 2-1-41 | |
| Kennels | Not Permitted | | |
| Lake, River, Stream | Information | TEOpS 2-4-55 | |
| Libraries | Community wayfinder Guidance Signs | TEOpS 2-15-6 Trans 200.03 | also TEOpS 2-15-60 |
| Local Parks | Community wayfinder Inter-agency | TEOpS 2-15-6 | |
| Lodging (with logo) | SIS TODS | SS 86.195 SS 86.196 | |
| (without logo) | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Logos on Signs | SIS | SS 86.195 | also TEOpS 2-15-4 |
| Main Street Community | Special/Not permitted | | |

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|--------------------------------------|---|--|--|
| Malls | Not Permitted | | |
| Marinas (Public) | Inter-agency | | Qualifying Criteria |
| Marinas (Privately owned) | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Memorial Facilities | Information | SS. Chapter 84 | Legislated |
| Mental Facilities (Public) | Not Permitted | | |
| Military Academies | Community wayfinder | TEOpS 2-15-6 | |
| Military Bases, Major | Inter-agency | | |
| Mobile Home Parks | Not Permitted | | |
| Motel (See Lodging) | SIS, TODS, Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Museums | Supplemental F & C TODS, Guidance Signs | SS 86.196 Trans 200.03 | Could also be Community Wayfinder |
| National Forest boundaries | Not Permitted | | Off R/W only |
| National Historic Landmark | Inter-agency | | Could also be Historical Marker Guide Signs (TEOpS 2-4-40) |
| Neighborhood Watch | Special | ss. 66.0429(2) ss. 60.23(17m) | ss. 86.19 & TEOpS 2-4-45.3 |
| NEXT (n) EXITS | Information | | Primary signing, freeway only |
| Nursing Homes – Private | Not Permitted | | See County Institutions |
| Office Buildings | Not Permitted | | See Government Offices |
| Orchards | TODS | SS 86.196 | |
| Park & Ride Lots | Govt. Transportation | | |
| Parks, State/county/local | Inter-agency | | Or Community wayfinder |
| Parking Lots, municipal | Community wayfinder | TEOpS 2-15-6 | |
| Parking Restrictions | Special | ss. 349.13 TEOpS 2-2-41 | MUTCD 2B.41 |
| Pharmacy | Not Permitted | | |
| Police Stations | Community wayfinder | TEOpS 2-15-6 | |
| Population Signs | Information | TEOpS 2-1-41 | |
| Ports | Supplemental F & C | | Great Lakes Shipping only |
| Post Offices | Community wayfinder | TEOpS 2-15-6 | |
| Power Plants (utilities) | Not Permitted | | |
| Preserves, Nature/Wildlife | Not Permitted | | See Wildlife Refuges & Watchable Wildlife |
| Prisons | Inter-agency | | Conventional Hwy only |
| Private Camps | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Public Access, lake/river | Inter-agency | | |
| Race Tracks | Supplemental F & C | | Qualifying criteria |
| Rail Passenger Stations | Govt. Transportation | | Amtrak only |
| | | | |
| Recreation Trails | Guidance Signs | TEOpS 2-15-15 Trans 200.03 | also TEOpS 2-15-60 |
| Recycling Centers | Community wayfinder | TEOpS 2-15-6 | |
| Rehabilitation Centers | Not Permitted | | |
| Religious Camps | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Religious Worship | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Research Facilities | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Resorts | TODS, Guidance Signs | SS 86.196 Trans 200.03 | also TEOpS 2-15-60 |
| Restaurants | SIS, TODS, Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Retirement Facilities | Not Permitted | | |
| River, Lake, Stream | Information | TEOpS 2-4-55 | |
| Sanitariums (Public) | Community wayfinder Supplemental C | TEOpS 2-15-6 | |
| Schools, High, Middle, Elementary | Community wayfinder Guidance Signs | TEOpS 2-15-6 Trans 200.03 | also TEOpS 2-15-60 |
| Scientific Experiment (public owned) | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Seminaries | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Service Organization | Not Permitted | | |
| Sheriff Freeway Patrol Substations | Inter-agency | | Freeways Only |
| Shooting Ranges | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |

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|---------------------------------------|---|---|---|
| Shopping Centers | Not Permitted | | |
| Ski Areas, Downhill | Inter-agency | | |
| Skiing – Cross Country Trails | Inter-agency | | Conventional Hwy only, For trailheads only |
| Snowmobile Trails (named) | | TEOpS 2-1-50 TEOpS 2-15-15 | |
| Stadiums | Supplemental F & C | | Qualifying criteria |
| State Forest / State Parks Boundaries | Not Permitted | | |
| State Forest / Parks HQs | Inter-agency | | |
| State Historical Markers | | TEOpS 2-4-40 | |
| State Historic Sites | Supplemental or Inter-agency | | Operated by WI Historical Society |
| State Patrol HQs | Intra-agency | | |
| State Trails | Inter-agency | TEOpS 2-15-15 | |
| Subdivisions | Not Permitted | | |
| Supper Clubs | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Swimming Pools & Natatoriums | Community wayfinder | TEOpS 2-15-6 | |
| Synagogue | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Taverns | Not Permitted | | |
| Technical College | Supplemental F & C | | Qualifying criteria |
| Theaters, Live | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Theatres, Movie | Not Permitted | | |
| Tourist Information Centers | | TEOpS 2-6-35 | County or Local |
| Tourist Oriented Directional Signs | TODS category | ss. 86.196, Trans 200.08 | |
| Township Boundary | Not permitted | TEOpS 2-4-60 | |
| Trails, Recreation | Guidance Signs | TEOpS 2-15-15 Trans 200.03 | also TEOpS 2-15-60 |
| Train rides (Entertainment) | TODS Guidance Signs | SS 86.196 Trans 200.03 | also TEOpS 2-15-60 |
| Train station | Govt. Transportation | | See Amtrak & Rail Passenger Stn |
| Travel Information | Inter-agency | | State Tourism |
| Tree City | Special / Not Permitted | | |
| Tree Nurseries | Not Permitted | | |
| Truck Stops, Truck Parking | SIS, TODS | | |
| Tubing, River | TODS | SS 86.196 | |
| TV/Radio Stations | Not Permitted | | |
| Unincorporated Communities | Information and/or Special | TEOpS 2-4-48 | |
| Universities | Supplemental F & C | | Qualifying criteria |
| UW Extension Offices | Not Permitted | | |
| Vehicle Emissions Testing Stations | State Govt. Service Centers/Intra-agency | | Conventional Hwy only |
| Vehicle Registration | State Govt. Service Centers/Intra-agency | | Conventional Hwy only |
| Veterans Cemeteries | | TEOpS 2-15-20 | |
| Veterans Centers | Inter-agency | | |
| Veterans Memorials | Not Permitted | | |
| Vocational Schools | Supplemental F & C | | |
| Watchable Wildlife Area | Inter-agency | | DNR designation |
| Wayfinder Signs | Community wayfinder | TEOpS 2-15-6 | |
| Welcome To | Not Permitted | TEOpS 2-1-41 | |
| Wildlife Refuges | Supplemental C Guidance Signs | Trans 200.03 | Conventional Hwy only, To Instructional Centers only |
| Wineries | TODS | SS 86.196 | |
| Youth Camps | Guidance Signs | Trans 200.03 | also TEOpS 2-15-60 |
| Zoos | Supplemental F & C Community wayfinder Guidance Signs | TEOpS 2-15-6 Trans 200.03 | Qualifying criteria also TEOpS 2-15-60 |

Any facilities not included in this listing, **shall** be considered non-qualifying and **shall not** be permitted.

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|---|----------|
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| <u>General guidance</u> for freeway & expressway signing begins on | page 12. |
| <u>General guidance</u> for conventional highway signing begins on | page 16. |
| <u>Specific guidance</u> for signing in <u>all categories</u> begins on | page 18. |
| Community Destination (Wayfinder) Signs | page 18 |
| Government Service Centers | page 19 |
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| <u>Specific guidance</u> for miscellaneous generator supplemental signing | |
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| Methods for sign installation and cost reimbursement begin on | page 31 |

DEFINITIONS

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate highways are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

Traffic generators are defined as any facility, activity, or special point of interest which attract large numbers of people, the majority of whom are unfamiliar with the local area and/or access routes.

Trailblazing signs, in this context, are community destination signs or other directional guide signs that direct subsequent turns on local streets to reach a destination.

GENERAL PURPOSE AND GUIDELINES

Department Functions and Responsibilities

The Wisconsin Department of Transportation (hereinafter referred to as Department) has the primary responsibility to develop, maintain, and operate a state trunk highway system designed to move traffic from one destination to another in a safe, efficient, and expeditious manner. Erecting and maintaining highway traffic signs on the state highway system is a part of this responsibility.

Standards for the design and application of all highway traffic signs erected on public highways are specified in the MUTCD which, in turn, is required by statute to conform to national standards on highway signing. Refer to [SS 84.02\(4\)\(e\) and \(f\)](#), [SS 84.60\(1\)\(a\)](#) and [SS 349.065](#).

Signing under permit is addressed in [Chapter Trans 200.03 Wisconsin Administrative Code](#). Specific Information Signing (Logo), authorized pursuant to [SS. 86.195](#), is addressed in Chapter [Trans 200.06](#), Wisconsin Administrative Code.

The basic supposition of supplemental signing is that the facility or institution as a class is of interest and concern to a sufficient number of motorists to warrant special directional signing. It is also a basic assumption that the purpose of this signing is guidance and not advertising.

It is the purpose of these guidelines to describe all types of facilities and institutions for which signs *may* be

erected on State Highway right-of-way by state forces or under contract to the state. Conversely signs will not be permitted for any type of facility or institution not addressed herein.

Need for Signing Policy

The Highway Beautification Act of 1965, public law 89-285, placed severe restrictions on billboard advertising. Governor Lee S. Dreyfus issued an administrative order in 1981, requiring the Department to permit supplemental guide signs, directing to the University of Wisconsin campuses. Ever since, there has been a substantial demand on the Department to permit additional directional signs on highway rights-of-way. In order to respond to all sign requests in a fair and consistent manner, the Department recognized the need to establish a signing policy that addressed all aspects of highway signing while maintaining a safe and logical sequence of informational displays in the highway environment. This document supersedes all previous policy guidance on supplemental signing for public and private facilities.

Although the WMUTCD contains standards for design and application of traffic control devices, it does not contain specific criteria on the following subjects:

- (1) Allowable sign messages,
- (2) Qualifications which permit placement of highway signs for various facilities and/or activities, or
- (3) Priority (ranking) of the various sign groups on the basis of highway user needs which, in turn, *should* determine the selection process for sign installations.

These guidelines provide criteria by which to evaluate all highway signing requests in an equitable manner without penalizing the greater majority of highway users.

Human Factors

As vehicles move along a highway, each driver is confronted with many elements; the presence of other vehicles and pedestrians, roadway alignment and other design features, roadside signs and other obstacles, commercial development, wildlife, and adverse weather conditions. Any or all of these factors *may* affect highway safety, as well as the driver's ability to observe, assimilate, and react to pertinent highway sign messages.

Studies of human behavior have shown that a driver can focus attention on only one thing at a time, but he can respond very rapidly to several stimuli. However, receiving too much information in a short time can adversely affect the driver's ability to process information effectively, causing what is known as information overload. Information overload is a condition in which the driver is unable to perceive and/or use the information displayed. When this condition occurs, the driver will shift attention from one source of information to another and *may* overlook important sign messages.

Considering the large number of highway elements confronting each driver, it is apparent that the amount of information which can be effectively conveyed by traffic signs, is limited. Therefore, a system for avoiding information overload must be established.

MUTCD References

As a general background, several pertinent paragraphs from the MUTCD, as adopted by Wisconsin, are enumerated below.

Section 1A.01 Purpose of Traffic Control Devices

Support:

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 throughout the Nation.

Traffic control devices notify road users of regulations and provide warning and guidance needed for the reasonably safe, uniform, and efficient operation of all elements of the traffic stream.

Standard:

Traffic control devices or their supports shall not bear any advertising message or any other message that is not related to traffic control.

Support:

Tourist-oriented directional signs and Specific Service signs are not considered advertising; rather, they are classified as motorist service signs.

Section 1A.02 Principles of Traffic Control Devices

Support:

This Manual contains the basic principles that govern the design and use of traffic control devices for all streets and highways open to public travel regardless of type or class or the public agency having jurisdiction. This Manual's text specifies the restriction on the use of a device if it is intended for limited application or for a specific system. It is important that these principles be given primary consideration in the selection and application of each device.

Guidance:

To be effective, a traffic control device *should* meet five basic requirements:

- A. Fulfill a need;
- B. Command attention;
- C. Convey a clear, simple meaning;
- D. Command respect from road users; and
- E. Give adequate time for proper response.

Section 2D.02 Application

Support:

Guide signs are essential to direct road users along streets and highways, to inform them of intersecting routes, to direct them to cities, towns, villages, or other important destinations, to identify nearby rivers and streams, parks, forests, and historical sites, and generally to give such information as will help them along their way in the most simple, direct manner possible.

Section 2D.03 Color, Retroreflection and Illumination

Standard

Except where otherwise specified herein for individual groups of signs, guide signs on streets and highways shall have a white message and border on a green background. All messages, borders, and legends shall be retroreflective and all backgrounds shall be retroreflective or illuminated.

Historic downtown, State and National Historic Sites and Historical Marker signs shall have a white retroreflective message and border on a brown retroreflective background.

Section 2D.07 Amount of Legend

Support:

The longer the legend on a guide sign, the longer it will take road users to comprehend it, regardless of letter size.

Guidance:

Guide signs *should* be limited to three lines of principal legend. Where two or more signs are included in the same overhead display, the amount of legend *should* be minimized. The principal legend *should* include only place names, route numbers, and street names.

Option:

Symbols, action information, cardinal directions, and exit numbers *may* be used in addition to the principal legend where sign space is available.

Section 2E.02 Freeway and Expressway Signing Principles

Support:

The development of a signing system for freeways and expressways is approached on the premise that the signing is primarily for the benefit and direction of road users who are not familiar with the route or area. The signing furnishes road users with clear instructions for orderly progress to their destinations.

Section 2E.03 General

Support:

Signs are designed so that they are legible to road users approaching them and readable in time to permit proper responses. Desired design characteristics include: (a) long visibility distances, (b) large lettering and symbols, and (c) short legends for quick comprehension.

Standard:

Standard shapes and colors shall be used so that traffic signs can be promptly recognized by road users.

(End of MUTCD references)

Signing Priorities

Basic concepts of traffic engineering recognize that the primary function of traffic control signs is to warn, regulate, and guide traffic. Sign spacing and the amount of information displayed have an impact on the driver's ability to read and respond to sign messages in an expected, predictable manner.

Accordingly, traffic control signs on the highway are primarily intended to enable drivers to react promptly, naturally, and properly to the traffic and design conditions encountered; to advise of the regulations and use of streets and highways; to warn of potential roadway hazards; and to provide guidance to major destinations.

Secondary functions of traffic control signs are to advise drivers of various services normally required to complete an extended journey (emergency services, motorist services, public transportation), and of supplemental services, such as recreational facilities or points of interest.

Traffic control signs can be classified into eight basic sign groups. Following is the order of priorities for these sign groups, and a brief description of their specific function, as adopted by the national committees of the American Association of State Highway and Transportation Officials and the Institute of Transportation Engineers.

1. Regulatory Signs - Advise the driver of traffic laws or regulations concerning vehicle operation on the highway.
2. Warning Signs - Advise the driver of unexpected highway conditions which require extra care in driving.
3. Navigational Guide Signs - Identify the route, or routes, that the driver *should* follow to complete a trip. Navigational guide signs indicate directions and distances to cities and to other destinations or regions.
4. Emergency Services Signs - Advise of and direct the driver to facilities providing emergency medical service or assistance. Such facilities include state enforcement agencies and hospitals providing outpatient emergency medical treatment.
5. Motorist Services Signs - Advise of and direct the driver to basic services normally needed to complete a long trip (motor fuel, food, lodging, camping, tourist information centers, and rest areas).
6. Public Transportation Signs - Advise of and direct the driver to facilities providing commercial passenger travel service (airports, park and ride lots, rail passenger stations).
7. Traffic Generator Signs - Advise of and direct the driver to activities, facilities, or special points of interest which attract large numbers of people, a majority of whom are unfamiliar with the local area and/or access routes.
8. General Information Signs - Advise the driver of information that *may* be of interest, though not necessary for travel (municipal boundaries, landmarks).

Signing needs to be evaluated and signs installed in descending order of the priorities indicated as long as adequate space between signs is maintained, thus avoiding information overload and confusion to the driver.

It *may* be necessary to prioritize sign requests. An example of this situation would be where there are more qualifying traffic generators than can be accommodated under the established guidelines. In these circumstances, the several qualifying generators will be ranked according to which generator exceeds, by the greater percentage, the minimum criterion for signing. Those exceeding the warrants by the greatest percentage will be given priority. Where specific criteria are not applicable, those traffic generators closest to the intersection where signing is requested **shall** determine the priority for signing.

FREEWAY & EXPRESSWAY GUIDE SIGNING GENERAL POLICY CRITERIA & RESTRICTIONS

Guide signing can be divided into two basic categories: primary and supplemental. Each category is subject to various practical requirements.

Primary signing includes standard interchange and intersection signing, destination signs, distance signs, required motorist services signs, plus regulatory, warning, and route marker signs. This type of signing always takes precedence in the signing scheme of any intersection or interchange because it is directly related to the primary purpose of the intersection or interchange.

Supplemental freeway signing includes signing to places of lesser importance. Signing for traffic generators is considered secondary to primary signing needs. Highway signing is not intended for the purpose of advertising or promoting the facility, but to direct and guide traffic seeking that facility.

As stated in the MUTCD Section [2E-35](#):

Support:

Supplemental Guide signs can be used to provide information regarding destinations accessible from an interchange, other than places shown on the standard interchange signing. However, such Supplemental Guide signing can reduce the effectiveness of other more important guide signing because of the possibility of overloading the road user's capacity to receive visual messages and make appropriate decisions.

Guidance:

No more than one Supplemental Guide sign *should* be used on each interchange approach.

A Supplemental Guide sign (see Figure [2E-24](#)) *should not* list more than two destinations. Destination names *should* be followed by the interchange number (and suffix), or if interchanges are not numbered, by the legend NEXT RIGHT or SECOND RIGHT or both, as appropriate. The Supplemental Guide sign *should* be installed as an independent guide sign assembly.

Where two or more Advance Guide signs are used, the Supplemental Guide sign *should* be installed approximately midway between two of the Advance Guide signs. If only one Advance Guide sign is used, the Supplemental Guide sign *should* follow it by at least 245 m (800 feet). If the interchanges are numbered, the interchange number *should* be used for the action message.

States and other agencies *should* adopt an appropriate policy for installing supplemental signs using "The AASHTO Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways." In developing policies for such signing, such items as population, amount of traffic generated, distance from the route, and the significance of the destination *should* be taken into account.

Standard:

Guide signs directing drivers to park and ride facilities shall be considered as Supplemental Guide signs (see Figures [2E-25](#)).

(End of MUTCD reference)

Placement of supplemental guide signs for a traffic generator **shall** be limited to the nearest freeway or expressway. Signing which would require a motorist to travel on the crossroad beyond another state highway and/or through a community **shall not** be permitted.

Supplemental signs **shall not** be permitted in advance of a system interchange connecting two freeways in which all legs or roadways are declared freeways.

The minimum spacing between guide signs *should not* be less than 800 feet on freeways and expressways (see Figure 1 on page 15). Actual sign installation will depend on whether there is sufficient longitudinal space to accommodate the new sign installation without violating the minimum allowable 800 feet spacing between signs.

Along a freeway, only one supplemental guide sign **shall** be permitted in each direction of travel for a traffic generator. Signs for generators are to be located in advance of the interchanging roadway that provides the most direct and best route to the facility. In determining the most direct and best route, the Department will consider all relevant conditions including directness of route, speed of travel, length of travel, and ease of locating the facility.

Information relating to more than two traffic generators **shall not** be displayed on supplemental guide signs in advance of an interchange. Both traffic generators **shall** be shown on a single supplemental guide sign installation except where a traffic generator message is included as part of a major guide sign destination. The

traffic generator message on the major guide sign **shall** count as one of the two acceptable signs, but an additional sign installation *may* be allowed in such cases.

In the event that there are more than two qualifying facilities, the two facilities that generate the greatest need for providing directional information to motorists **shall** have signs displayed. In determining which signs are most necessary, the Department will consider such factors as the amount of traffic generated, distance from the freeway exit, and ease of locating the facility. If a quantitative comparison is needed, the Principal Destination formula in [TEOpS 2-15-5](#) *may* be used, substituting comparable attendance or enrollment figures for the population.

TABLE 1

GENERAL QUALIFYING CRITERIA FOR SIGNING TRAFFIC GENERATORS ON FREEWAYS OR EXPRESSWAYS

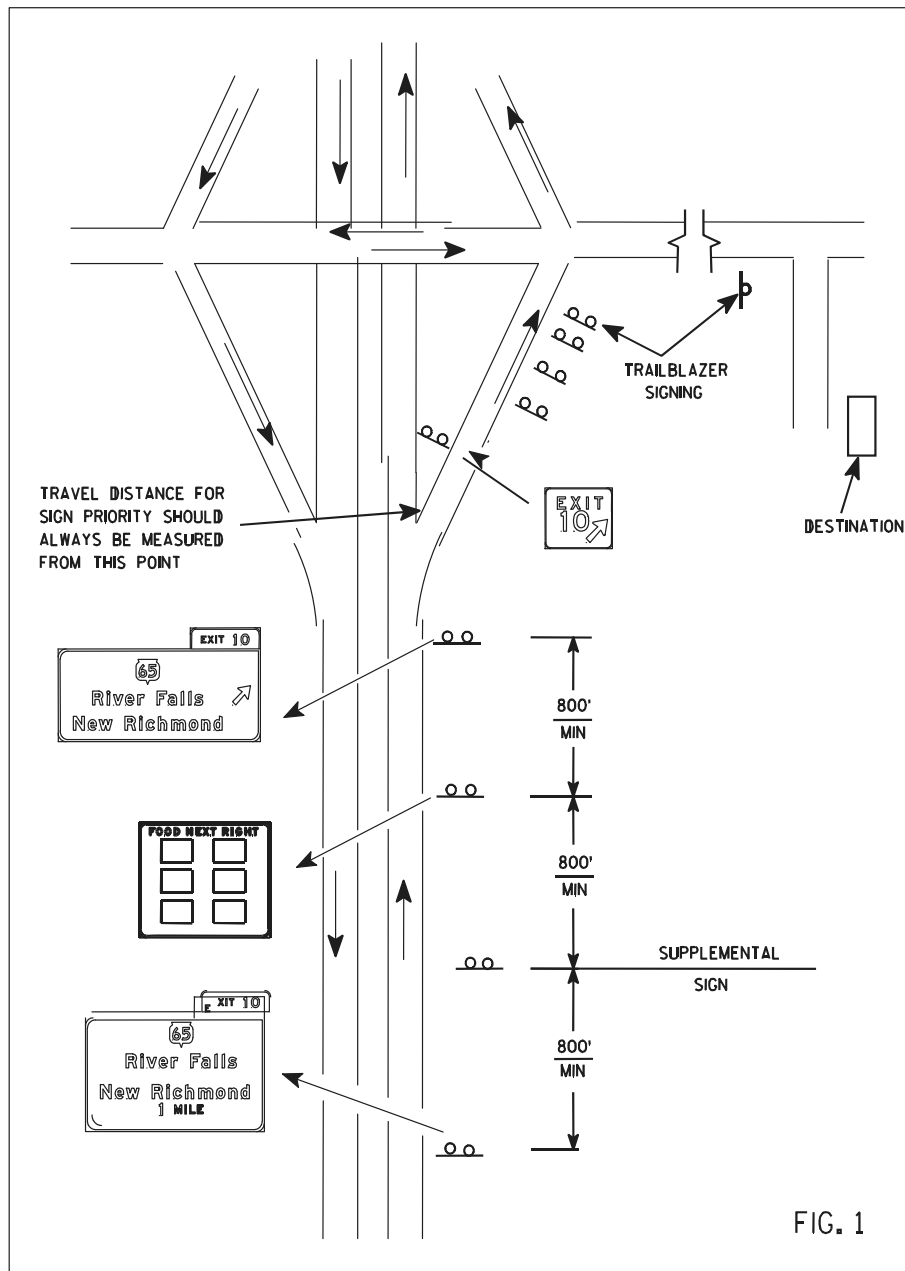
| TYPE OF GENERATOR | SPECIFIC CRITERIA | POPULATION OF METROPOLITAN AREA | | |
|--|---|------------------------------------|-------------------------|-----------------------|
| | | Major ¹ OVER 500,000 | Urban 50,000-500,000 | Rural Under 50,000 |
| Colleges, Universities, Vocational, Technical & Adult Education Colleges | Minimum Campus Enrollment ² | 2,500 | 1,000 | 1,000 |
| | Maximum Distance From Interchange (mi.) | 2 | 8 | 12 |
| Multipurpose Arenas, Auditoriums, Fairgrounds, Museums, Race Tracks, Stadiums, & Zoos. | Minimum Annual Attendance | 300,000 | 200,000 | 100,000 |
| | Minimum No. of Seats (If Applicable) | 6,000 | 5,000 | 4,000 |
| | Maximum Distance from Interchange (mi) | 2 | 5 | 7 |

¹ Major Metropolitan Area is defined as within Milwaukee County.

² Campus enrollment is defined as the total number of full and part-time students that physically attend classes on the specific campus site.

Information relating to traffic generators **shall not** be displayed on a supplemental guide sign until signing has been installed along the interchanging and/or intersecting minor roads to adequately direct the motorist from the freeway exit or intersecting road to the facility. (See [SUBSEQUENT TRAILBLAZING SIGNING](#) in **PART 5**.)

For additional specific criteria, see **PART 6** and **PART 7**.



CONVENTIONAL HIGHWAY GUIDE SIGNING GENERAL POLICY CRITERIA & RESTRICTIONS

1. All specific WisMUTCD requirements must be met in all situations.
2. Location and placement of all signing is dependent upon the availability of longitudinal spacing (200 feet desirable, 100 feet minimum) with respect to existing traffic control devices.
3. A significant portion of the traffic volume generated by the facility must be drivers who are unfamiliar with the local area and/or access routes to the facility. The adverse effects on highway operations created by motorists seeking a facility without guide signing will also be taken into consideration.
4. In designing signs and selecting locations for sign installation on state highways, the department retains the authority to specify message content (including abbreviations), size of sign, sign location, and combination of message, in accordance with standards for acceptable signing practice. The department also retains the authority to deny requests for signing where it deems acceptable standards cannot be met, including locations where other supplemental signs are already in place.
5. Signing for a specific traffic generator:
 - a. **Shall** be limited to a maximum of four signs on state trunk highways

- b. **Shall** be installed only at an intersection that gives the best, most direct access to the traffic generator
 - c. **Shall not** be installed at more than one intersection for each direction of traffic on a state trunk highway, but not necessarily at the same intersection for both directions.
6. Signing will normally not be permitted if the establishment is readily visible from the state trunk highway.
 7. An on-premise sign identifying the facility is required. A sign *may* be installed on the highway fronting a facility if the on-premise sign is not feasible due to terrain-related visibility.
 8. Supplemental signs and/or trailblazing signs **shall not** be permitted at an intersection from one state highway to another state highway.
 9. Placement of supplemental guide signs for a traffic generator **shall** be limited to nearest state highway. Signing which would require a motorist to travel on the crossroad beyond another state highway and/or through a community **shall not** be permitted.
 10. Facilities must be open a minimum of five days a week, including normal business hours.
 11. The traffic generator must be located within the distance noting in Table 2 from the highway intersection at which signing is requested, unless a different distance is noted in other specific criteria.
 12. Signing for a seasonal generator **shall** be covered, removed, or overlaid with a “CLOSED” plaque during the off-season.
 13. When two or more qualifying facilities are affiliated with the same agency or institution and share a common access, only one specific name will be permitted on the sign to identify the conglomerate.
 14. A facility *may*, at any time, request that a sign erected under these guidelines be removed and the department will arrange for its removal.

TABLE 2. General Qualifying Criteria for Signing Traffic Generators on Conventional Highways

| TYPE OF GENERATOR | SPECIFIC CRITERIA | POPULATION OF METROPOLITAN AREA | | | |
|--|--|------------------------------------|------------------------------|-----------------------------|--------------------------|
| | | Major ¹ Over 500,000 | Urban 50,000 – 500,000 | Urban 20,000 – 50,000 | Rural Under 20,000 |
| Colleges, Universities, Vocational, Technical & Adult Education Colleges | Minimum Campus Enrollment ² | 2,500 | 750 | 500 | 500 |
| | Maximum Distance from Intersection (mi.) | 2 | 8 | 12 | 15 ³ |
| All Other Traffic Generators | Minimum Annual Attendance | 150,000 | 100,000 | 50,000 | 20,000 |
| | Minimum No. of Seats (if applicable) | 3,000 | 2,500 | 2,000 | 2,000 |
| | Maximum Distance from Intersection (mi.) | 2 | 7 | 10 | 15 ³ |

¹Major Metropolitan Area is defined as within Milwaukee County.

² Campus enrollment is defined as the total number of full and part-time students that physically attend classes on the specific campus site.

³The distance designated, or half the distance to the next parallel State Trunk Highway, whichever is greater.

Subsequent Trailblazing Signing

Appropriate local road signing to guide motorists to a facility which will be signed from a State Highway or freeway is the responsibility of the facility and the local road authority.

Information relating to traffic generators **shall not** be displayed on a supplemental guide sign until signing has been installed along the interchanging and/or intersecting minor road and other roads to adequately direct the motorist from the freeway exit or intersecting road to the facility. In determining whether there is adequate signing to direct the motorist from the State Highway to the facility, the Department will consider such factors as the directness of the route, the distance involved, and the environment in which the signs are installed.

These signs, used only on non-freeways, are to be placed at sufficiently frequent intervals to adequately guide and reassure motorists. A trailblazing sign with the appropriate arrow **shall** be placed in advance of each intersection where the route changes from one highway to another or where there *may* be confusion as to the direction, which the route takes.

The Department *may* issue a written permit for trailblazing signing on a conventional State Highway to a qualifying traffic generator, which has been signed from a freeway or expressway exit ramp. Subsequent trailblazing signing **shall not** be erected on a State Trunk Highway without such written authority.

Supplemental signs and/or trailblazing signs **shall not** be permitted through a system interchange from one freeway to another or at an intersection from one conventional State Highway to another conventional State Highway.

CATEGORIES & SPECIFIC CRITERIA

The following are categories and relevant information regarding directional and informational signs permitted on the state trunk highway system. References are made to authorization in the statutes, administrative rules, MUTCD, and other subjects in the TEOpS. For each type of sign listed earlier, there is a category below, a TEOpS reference, and/or a notice that the sign is not permitted.

Community Destination (Wayfinder) Signs

These signs are installed, owned and maintained by the community. They direct to area destinations such as Downtown, or Historic District, and individual destinations such as City Hall, Convention Center, museums, and local parks. The individual destinations are generally publicly owned and operated for public use or privately owned non-profit and open to the public. Complete guidance is in [TEOpS 2-15-6](#).

Government Service Centers

State agencies *may* request signs to be installed on state trunk highways to direct traffic to certain service centers. This policy pertains only to state agencies. Local agencies are not included since local agencies generally serve local traffic and the need is not as significant.

Signs *may* be permitted on a state highway only when the service center is not located directly on the state highway system; signs will not be permitted on the state highway system when extensive trail blazing would be required or when guidance *may* be reasonably provided to the service center using street names and addresses.

No signs will be permitted on freeways or expressways.

Signs *may* be allowed at only two intersections of the state trunk highway system with county or local roads for any service center or complex of service centers.

Sign messages must be approved by the department and signs *may* only be installed under the direction of the department.

Service centers are those governmental offices whose primary purpose is to provide direct customer service to the public. Service centers do not include those offices that are predominantly administrative or serving internal agency operations. The extent of external customer traffic will be considered in determining eligibility for service center signs.

The service center requesting the sign is responsible for all costs related to those signs which are incurred by the department.

This guidance is premised on the view that only a select number of locations will qualify for signs. *Should* the number of signs allowed under this guidance adversely affect the safe and efficient operation of the state highway system, signs *may* be further restricted.

Government Transportation Facilities

Guide signs are Department funded and installed on freeways and conventional highways.

Major Airport

The facility must provide regularly scheduled commercial passenger flights and be located within 15 miles of the freeway or expressway, or within 5 miles of a conventional state trunk highway. Signing to General Mitchell International Airport and Austin Straubel International Airport **shall** be evaluated as a special case.

Public Airport, General Aviation

The facility must be classified as a Large General Aviation Airport or Medium General Aviation Airport, as listed in the Wisconsin State Airport System Plan that is published by the Wisconsin Department of Transportation, Bureau of Aeronautics. The General Aviation airport **shall** be located within 15 miles of the freeway or expressway, or within 5 miles of a conventional state trunk highway.

Park & Ride Lots

The facility must provide free parking, be approved by the Department, and be located within ½ mile of the state trunk highway.

Ports and Harbors

The port or harbor facilities must serve commercial Great Lakes shipping and be located within 10 miles of the freeway or expressway, or within 5 miles of the conventional state trunk highway.

Amtrak Passenger Stations

Facility must provide regularly scheduled intercity passenger service, protection for passenger comfort, public parking, and be within 5 miles of the state trunk highway.

Ferries

Facility must provide regularly scheduled passenger service, protection for passenger comfort, public parking, and be within 5 miles of the state trunk highway.

Guidance Signs

Sometimes called arrow boards, guidance signs are only permitted on conventional state highways or expressway approaches to at-grade intersections. As prescribed in the Wisconsin Administrative Code Chapter Trans 200, these narrow horizontal sign panels *may* bear the names of, and direct to:

- Resorts,
- Hotels,
- Places of public entertainment or instruction,
- Any place of religious worship,
- County institutions,
- Scientific experimental locations for the furtherance of agriculture, science or art.

The term “entertainment” in this case does not include nightclubs, taverns, or similar establishments.

The regions *may* issue a permit; there is no permit fee, and installation **shall** be by the requestor’s choice of a WisDOT approved signing contractor or county signing crew. Detailed department guidelines and the permit application Form DT1903 are contained in [TEOpS 2-15-60](#).

Information Signs

Information signs *may* be permitted or installed by the Department to identify geographic features and/or provide information to the traveling public. Qualifying geographic features are those found on the official state highway map.

The following specific guidelines **shall** be applied to these individual signs.

- City or village population signs limit signs *may* be installed and maintained by the Department in accordance with [TEOpS 2-1-41](#).
- County Line signs **shall** be installed by the Department on all state highways at or near the county line. No other signs **shall** share the supports.
- Lake, River or Stream signs *may* be installed and maintained by the Department in accordance with [TEOpS 2-4-55](#).
- Memorial Facilities signs **shall** be installed and maintained by the Department in accordance with [Chapter 84 of the State Statutes](#).
- NEXT (n) EXITS signs *may* be installed and maintained on freeways by the Department, upon request by an incorporated city or village being appropriately served by two or more consecutive exits.
- Street Name Signs *may* be independently installed and maintained on the STH right-of-way by the municipality with jurisdiction over the side road or crossroad.
- Unincorporated Community signs *may* be installed and maintained by the Department in accordance with [TEOpS 2-4-48](#).
- Advance Crossroad Name signs *may* be installed and maintained by the Department in accordance with [TEOpS 2-4-50](#).

Inter-Agency Facilities

Signs *may* be permitted on the basis of agreements with other state, federal, and county agencies, such as state and county historical societies, the Department of Natural Resources, and Department of Tourism. In most cases, the Department of Transportation will arrange for sign installation and maintenance and request reimbursement. Agreements and permits are subject to the department's evaluation and approval based on the following specific requirements.

- Boat landings; public access to lakes & rivers
 - Conventional highways only.
 - No attendance criteria.
 - A sign **shall not** be permitted unless the access point is located on a road that is sufficiently improved so that a passenger car can use the road without being scratched, dented, or otherwise damaged.
 - Additional criteria:
 - Maximum distance from state trunk highway intersection: 2 miles
 - Parking provided at access site
 - Gravel surface (or better) at access site
 - Improved boat-launching ramp
- Campgrounds, public
 - Conventional highways only
 - No attendance criteria
 - Signing *may* be permitted on conventional highways only, subject to all other general criteria applicable to each facility and location
 - Additional criteria:
 - Public-owned and operated campgrounds *may* be signed if they have a minimum of 50 campsites, adequate toilet facilities, and safe drinking water
 - Only requests from the public agency owning the campground **shall** be considered
 - Campgrounds that are a part of a national, state, county, or local park **shall not** be signed separately, but signing *may* be considered for the park
 - Privately-owned camping facilities *may* qualify for signing under the Specific Information Sign (SIS), Tourist-Oriented Directional Sign (TODS) or Trans 200 Guidance Sign programs
- Conservation or environmental centers
 - Supplemental signing *may* be permitted on conventional highways, subject to the general criteria applicable to each facility and location and the following additional criteria:
 - Provide on-site, off-street parking for minimum 50 vehicles
 - Provide educational programs and/or audio/visual presentations
 - Centers that are part of a national, state, county, or local park or forest **shall not** be signed separately, but signing *may* be considered for the park or forest headquarters entrance
- Corps of engineering facilities (such as lock and dam sites)
 - Conventional highways only
 - No attendance criteria
 - Signing *may* be permitted on conventional highways only, subject to all other general criteria applicable to each facility and location
 - Additional criteria:
 - Must provide picnic and park facilities
 - Must provide viewing provisions for the public
 - Must provide parking for 25 vehicles or more
- Fairgrounds, state and county

Supplemental signing *may* be permitted on freeways or conventional highways, subject to all the general criteria applicable to each facility and location
- Fish hatcheries
 - Conventional highways only
 - No attendance criteria
 - Signing *may* be permitted on conventional highways only, subject to all other general criteria applicable to each facility and location
 - Additional criteria:
 - Must be state-owned facilities
 - Must provide visitor accommodations
- Forest headquarters
 - No attendance criteria

- Supplemental signing *may* be permitted on freeways or conventional highways, subject to all other general criteria applicable to each facility and location
- Additional criteria:
 - Provide on-site, off-street parking for minimum 50 vehicles
 - Provide educational programs and/or audio/visual presentations
- Only requests from the public agency managing the forest **shall** be considered
- Historic sites
 - Conventional highways only
 - No attendance criteria
 - Signs on freeways or conventional highways *may* be permitted for state historical sites operated by the Wisconsin Historical Society, subject to all other general criteria applicable to each facility and location
- Institutions, county (publicly-owned nursing homes)
 - Conventional highways only
 - No attendance criteria
 - Signing *may* be permitted on conventional highways only, subject to all other general criteria applicable to each facility and location
- Marinas (publicly-owned)
 - Signs on freeways or conventional highways *may* be permitted for marinas, subject to all other general criteria applicable to each facility and location
 - Additional criteria:
 - To qualify for freeway signs, the marina **shall** have a minimum of 500 boat slips
 - To qualify for conventional highway signs, the marina **shall** have a minimum of 125 boat slips
- Military bases, major
Signs *may* be permitted to Fort McCoy, Volk Field, and Camp Williams
- National historic landmarks
 - Signs *may* be permitted for freeways, expressways and conventional highways, subject to all other general criteria applicable to each facility and location
 - Additional criteria:
 - The site **shall** be a documented national historic landmark that is officially on the listing for National Historic Landmarks in Wisconsin designated by the secretary of the U.S. Department of the Interior (www.nps.gov/nhl/find/statelists/wi/WI.pdf)
 - Only historical sites are eligible, not individual buildings
 - A historical site is comprised as a complex of buildings or an entire district that is a documented national historic landmark
- Parks, national state, and county freeway
 - Supplemental signing *may* be permitted, subject to the general criteria applicable to each facility and location
 - No annual attendance criteria
 - Signing *may* be erected for state parks with the Department of Transportation and the Department of Natural Resources mutually agreed upon. The following **shall** be provided as a minimum:
 - Off-highway parking
 - Safe drinking water
 - Toilet facilities
 - 50 camping sites
 - Swimming
 - Handicapped-accessible camping and picnic areas
 - State parks **shall** also offer other special attractions, such as skiing, nature trails, improved hiking trails, interpretive centers, vistas and overlooks, or be of statewide historical significance
- Conventional highway
 - Supplemental signing *may* be permitted, subject to the general criteria applicable to each facility and location
 - No annual attendance criteria
 - Signing *may* be erected for state parks with the Department of Transportation and the Department of Natural Resources mutually agreed upon. The following **shall** be provided as a minimum:
 - Off-highway parking
 - Safe drinking water

- Toilet facilities
 - Handicapped-accessible camping and picnic areas
 - State parks **shall** also offer other special attractions, such as skiing, nature trails, improved hiking trails, interpretive centers, vistas and overlooks, or be of statewide historical significance
- Prisons, federal/state
 - Conventional highways only
 - No attendance criteria
 - Signing *may* be permitted on conventional highways only, subject to all other general criteria applicable to each facility and location
- Sheriff freeway substations
 - Signs on freeways *may* be permitted for county sheriff freeway substations
 - County sheriff's office **shall** have unique statutory authority for patrolling the freeway system to qualify for signage. Presently, only Milwaukee County has this statutory authority.
- Ski areas, downhill
 - No attendance criteria
 - Signs on freeways or conventional highways *may* be permitted for downhill ski areas, subject to all other general criteria applicable to each facility and location
- Travel information, state
 - No attendance or usage criteria
 - Subject to other general criteria, state travel information stations *may* be signed under mutual agreement between the Department of Transportation and the Department of Tourism. As a minimum, the locations **shall** provide parking facilities and public restrooms.
- Veterans centers/facilities
 - No attendance or usage criteria
 - Signs on freeways or conventional highways *may* be permitted for veterans centers with hospitals providing major medical or outpatient services, subject to all other general criteria applicable to each facility and location
- Intra-agency

Signs are permitted under agreements with other divisions in the Department of Transportation, such as DMV and DSP. No reimbursement is required.
- Special

This category addresses these specific types of signs which are described in other parts of the TEOpS or in other policies

 - Downtown: the department permits downtown sign(s) at strategic freeway or expressway exit(s) into the city in accordance with [TEOpS 2-6-50](#)
 - Historic downtown/district: the department permits historic downtown or historic district sign(s) at strategic freeway or expressway exit(s) into the city in accordance with [TEOpS 2-6-55](#)
 - Business district: as an alternative to downtown, the department permits business district signs on conventional highways at main street intersections
 - Emergency medical: standard hospital or emergency medical services signs are installed by the department on state trunk highways to direct to facilities which meet the qualifying criteria in [TEOpS 2-4-45.1](#) and [2-4-48](#)
 - Unincorporated communities: the department *may* install signs directing to unincorporated communities in accordance with [TEOpS 2-4-48](#)
 - Engine braking: WisDOT standard signs are permitted on conventional highway entrances to communities in accordance with [TEOpS 2-2-30](#)
 - Events, special: the department *may* permit signs directing to special events in accordance with [TEOpS 2-15-25](#)
 - Heritage tourism: program has been discontinued as of 12/1/13 in accordance with [TEOpS 2-4-52](#)
 - Neighborhood watch: approved signs are permitted within cities and villages under [State Statute 66.0429\(2\)](#). Further guidance is provided in [TEOpS 2-4-45.3](#)
 - Parking restrictions: no parking zones and seasonal or overnight parking restrictions *may* be signed by the department or cities and villages in accordance with [State Statute 349.14](#). Sign messages *should not* attempt to detail complex parking ordinances. Further guidance is provided in MUTCD Section [2B.41](#) and [TEOpS 2-2-41](#).
 - Miscellaneous non-permitted: some municipalities desire various nonstandard promotional signs. Examples include, but are not limited to, CRIME STOPPERS, DARE COMMUNITY, MAIN STREET USA, TREE CITY, COMMUNITY RECYCLING, SERVICE CLUBS, WELCOME

TO _____, and HOME OF THE _____. Such signs **shall not** be permitted on the state highway right-of-way under WisDOT jurisdiction. They *may* be displayed at or outside the right-of-way line.

- Special information signs (SIS)
 - References: [State Statute 86.195](#) and Administrative Code Trans 200.06. Specific information signs are only allowed on the highway segments listed in this statute.
 - Business signs are separately attached rectangular plates which show the brand, symbol, trademark, name or combinations of these for motorist services accessible from an approaching interchange or intersection. They are commonly called “logos” and are confined to five categories: fuel, meals, lodging, camping, and attractions.
 - Specific information signs are technically the blue rectangular sign panel on which the business signs are mounted along with directional information.
 - Interstate logos: Wisconsin is under contract to administer this signing program for the department. The contractor verifies the qualifications, and installs and maintains all signs. Application and annual fees are charged.
 - All inquiries, including damage reports, *may* be referred to Jordan VanGeffen at 1(844)496-9163 or visit the website.
- Tourist-oriented directional signs (TODS)
 - References: [State Statute 86.196](#), and Administrative Code Trans 200.08
 - These signs are blue panels in rural areas (outside urban area boundaries) on conventional state highways that are not under the SIS sign program. Businesses which make all or most of their sales to visitors or tourists *may* be eligible. Applications, installation, and maintenance *should* be arranged by the county, subject to the approval of the maintaining authority. Application and renewal fees are charged. These signs are not permitted on the freeway system.

SPECIFIC POLICY FOR SUPPLEMENTAL SIGNS ON FREEWAYS & EXPRESSWAYS

The document, *Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways*, published in 2001 by the American Association of State Highway and Transportation Officials, has been used as the basis for WisDOT policy in order to be in substantial conformance with the national standards, required by Federal and State law. This AASHTO document is reprinted with permission in [TEOpS 2-15-1.1](#).

Supplemental guide signs, directing to municipalities, *may* be permitted, upon request, as provided for in [ss. 86.19\(6\)](#), but subject to the other general policy criteria & restrictions in PART 4. Qualifying municipalities **shall** be incorporated cities or villages shown on the official State Highway map and **shall** be within 5 miles of the freeway exit. The municipality **shall** be billed for all costs of fabrication, installation, maintenance and removal. The Department **shall** specify the sign design and *may* arrange for fabrication, installation, maintenance and/or removal.

Signing for a municipality or traffic generator *should not* be displayed on a supplemental guide sign until signing has been installed at the ramp terminals and along the interchanging road and other roads as necessary to direct the motorist from the freeway exit to the municipality or traffic generator.

Signing for a seasonal generator *may* be displayed when warranted. Such signing **shall** be removed, covered, overlaid with a "CLOSED" plaque, or fitted with a "CLOSED" flip-panel during the off-season.

The cost of signs erected under this section of the guidelines, **shall** be segregated from other signs in order to properly invoice the municipality or facility to cover the cost of installation and maintenance of these signs. The cost of the installation **shall** include the cost of the signs, posts, mounting hardware, labor, vehicles and miscellaneous materials.

Sign installation and cost reimbursement methods are in **PART 9**.

If only one municipality or facility makes a request but others could qualify later, the initial facility will be invoiced for the total initial installation cost. The subsequent facility will be invoiced only for the additions to the existing installation. The facilities *may* agree between themselves to share the costs in a different manner, but no such agreement **shall** involve the Department. (For example: The first facility *may* request the second to reimburse it for a portion of the post cost.)

Maintenance costs associated with these signs **shall** be shared equally by all destinations on the installation. Maintenance includes replacement of the signs when they wear out and the cost of repairing the signs in the case of damage, when that cost is not recovered from the person causing the damage.

A facility or municipality *may*, at any time, request that a sign erected under these guidelines be removed and the Department will arrange for its removal.

If a facility or municipality fails to pay any invoice within six months of billing, the Department will remove the sign.

In-Place Signing

1. Conforming to Policy: Signs which are in place and meet all established provisions of this policy *may* remain in place until they have reached the end of their useful life, or are rendered useless by damage or vandalism. If desired, the sign(s) will be replaced, and the facility served by the sign **shall** pay the full cost of replacement.

Before replacing a sign when it wears out or is damaged, the Department will evaluate other requests for signing at the same location, selecting the request with the greatest priority among the requests. If there are no other requests, the Department will contact each facility on the sign to determine whether or not they wish their name retained and are willing to bear the replacement cost. The Department is not obligated to leave a sign in place after judging it to be worn out, merely because the facility is unwilling to pay for a replacement.

2. Non-conforming Signs will be allowed to remain until the end of their useful life, or are rendered useless by damage or vandalism, or are removed under a sign replacement or highway reconstruction project. Prior to the removal of any non-conforming signs, the Region **shall** contact the Bureau of Traffic Operations to discuss potential political impacts and acceptable signing alternatives.
3. Sign Replacement Program: Periodically, the Department replaces traffic signs along a complete segment of a highway route, so that all devices are uniformly maintained and proper retroreflectivity is assured on all signs. When this activity occurs, supplemental guide signing to traffic generators will generally be included in the replacement program, and facilities will be billed for their particular sign costs.

Milwaukee Metropolitan Area: Specific Policy

Because of the numerous and often closely-spaced interchanges, the frequency of in-place primary signing, and the adequacy of route and street identification signing already in place, supplemental signing is limited by these additional restrictions:

1. All supplemental signing—downtown loop:

Other than supplemental guide signing for National Major League Sports teams venues, signing for any other specific facility or generator (including educational institutions) **shall not** be permitted on the entire length of I-794, nor on any downtown freeway comprising a loop bounded by McKinley Avenue on the north, I-43 on the west, I-794 on the south and Lincoln Memorial Drive on the east. The only exceptions to these restrictions *may* be: LAKEFRONT, PORT OF MILWAUKEE, DOWNTOWN, or any large area within the loop boundaries which can be meaningful to the visitor and whose area name has broad community support (subject to Department approval). Signing for such large area(s) will be considered on the basis that it is a substitute for other exceptions named herein and in consideration of the other space restrictions cited in this policy. If a substitute is approved, it *may* be funded with Department funds. National Major League Sports teams venues *may* be permitted if they follow all other criteria as spelled out in this policy.

2. Medical facilities:

Signing to the Milwaukee Regional Medical Center (but not to individual facilities within the Regional Medical Center) will be permitted.

SPECIFIC POLICY FOR SUPPLEMENTAL SIGNS ON CONVENTIONAL HIGHWAYS

The basic supposition of supplemental signing is that the facility or institution as a class is of interest and concern to a sufficient number of motorists to warrant special directional signing. It is also a basic assumption that the purpose of this signing is guidance and not advertising.

Supplemental guide signs, directing to municipalities, *may* be permitted, upon request, as provided for in [SS. 86.19\(6\)](#), but subject to the other general policy criteria & restrictions listed previously. Qualifying municipalities **shall** be incorporated cities or villages shown on the official State Highway map and **shall** be within 5 miles of the state highway intersection. The municipality **shall** be billed for all costs of fabrication, installation, maintenance and removal. The Department **shall** specify the sign design and *may* arrange for fabrication, installation, maintenance and/or removal.

Signing for a municipality or traffic generator *should not* be displayed on a supplemental guide sign until signing has been installed along the intersecting road and other roads as necessary to direct the motorist from the intersection to the municipality or traffic generator.

Signing for a seasonal generator *may* be displayed when warranted. Such signing **shall** be removed, covered, overlaid with a "CLOSED" plaque, or fitted with a "CLOSED" flip-panel during the off-season.

Only one supplemental sign designating traffic generators *may* be erected under this policy on the approach to an intersection, and the maximum number of facilities listed on the sign **shall** be three.

Actual sign installation will depend upon sufficient longitudinal space to accommodate the new sign without violating the minimum spacing between signs.

Signing on connecting highways **shall** be the responsibility of the respective local unit of government having jurisdiction. The provisions of this policy **shall not** be construed to be the policy for the signing on connecting highways.

The cost of signs erected under this section of the guidelines, **shall** be segregated from other signs in order to properly invoice the municipality or facility to cover the cost of installation and maintenance of these signs. The cost of the installation **shall** include the cost of the signs, posts, mounting hardware, labor, vehicles and miscellaneous materials, and *may* be based on average costs for a typical installation.

Sign installation and cost reimbursement methods are in **PART 9**.

If only one municipality or facility makes a request but others could qualify later, the initial facility will be invoiced for the total initial installation cost. The subsequent facility will be invoiced only for the additions to the existing installation. The facilities *may* agree between themselves to share the costs in a different manner, but no such agreement **shall** involve the Department. (For example: The first facility *may* request the second to reimburse it for a portion of the post cost.)

Maintenance costs associated with those signs **shall** be shared equally by all facilities in the installation. Maintenance includes replacement of the signs when they wear out and the cost of repairing the signs in the case of damage, when that cost is not recovered from the person causing the damage.

In-Place Signing

1. (1) Conforming to Policy: Signs which are in place and meet all established provisions of this policy *may* remain in place until they have reached the end of their useful life, or are rendered useless by damage or vandalism. If desired, the sign(s) will be replaced, and the facility served by the sign **shall** pay the full cost of replacement.

Before replacing the sign when it wears out, the Department will evaluate other requests for supplemental signing at the same location (if any), selecting the sign with the greatest priority from among the requests prior to contacting a facility with the original sign to determine whether or not they wish the sign replaced and are willing to bear the cost. The Department is not obligated to leave a sign in place after judging it to be worn out merely because the facility is unwilling to pay for a replacement.

2. Non-conforming Signs will be allowed to remain until the end of their useful life, or are rendered useless by damage or vandalism, or are removed under a sign replacement or highway reconstruction project. Prior to the removal of any non-conforming signs, the Region **shall** contact the Bureau of Traffic Operations to discuss potential political impacts and acceptable signing alternatives.
3. Sign Replacement Program: Periodically, the Department replaces traffic signs along a complete segment of a highway route, so that all devices are uniformly maintained and proper retroreflectivity is assured on all signs. When this activity occurs, supplemental guide signing to traffic generators will generally be included in the replacement program, and facilities will be billed for their particular sign costs.

METHODS FOR SIGN INSTALLATION AND COST REIMBURSEMENT

There are several methods that can be utilized by the regions for the installation and maintenance of signs for supplemental traffic generators. County forces *may* be used for the installation and maintenance of Type II signs. The statewide open-end signing contractor *should* be used for all Type I signs and *may* be used for Type II signs also. Private individuals or facilities themselves **shall not** be allowed to install signs on WisDOT roadways.

The common methods for accomplishing sign installation are detailed below. The regions have the opportunity to work within these guidelines and select a method that best fits the region and/or situation.

Setting up a Professional and Technical Project ID (P & T ID)

When cost reimbursement is part of the permit agreement, the Region **shall** set up an individual P & T project ID to track all costs, which would include sign manufacturing, installation (either County or Contractor), subsequent maintenance and/or replacement, and any Region personnel field layout costs associated with the sign request. Under this method, if county crews install the signs, the signs **shall** be furnished by WisDOT. The Region *should* furnish the P & T project ID to the county to charge their time, fleet and material costs. WisDOT staff *should* stake the sign location(s).

If the statewide open-end contractor is utilized, it is expected that the contractor will furnish the signs. WisDOT will provide the sign fabrication detail to the contractor and field stake the location of the sign(s). Charge the P & T project ID for all sign manufacture, for county installation and/or contractor installation costs once invoices are received.

Permitting the County to Install a Sign Directing to a County Facility

This method would only be utilized if a county were to request a sign for one of their own facilities off the state trunk highway. WisDOT would permit the county to install the sign(s). If this option were utilized, WisDOT would field stake the sign location and *may* either provide a fabrication detail so the county can get the sign made or manufacture and sell the sign to the county. If WisDOT manufactures the sign for the county, the Region *should* utilize the Sales to Others Form (DT1668). The Region *should* fill out the form and send it to the Central Office Sign Mfg. Shop. The requestor will then be invoiced for the sign manufacture costs. This option would only be used for county facilities.

Signing for Government, State University Facilities

For these types of government facilities, the Region *may* elect to have them work directly with the county. If this option were utilized, WisDOT would field stake the sign location and provide a fabrication detail to the requesting agency. The requesting agency would then work directly with the county to get the sign(s) manufactured and installed. The county would direct bill all charges to the requestor.

WisDOT *may* manufacture the sign(s) also. If WisDOT manufactures the sign(s), the Region *should* utilize the Sales to Others Form (DT 1668 form). The Region *should* fill out the form and send it to the Central Office Sign Mfg. Shop. The requestor will then be invoiced for the sign manufacture costs.

Figure 2. REQUEST FOR GUIDE SIGN INSTALLATION ON STATE HIGHWAY (DT1332)**REQUEST FOR GUIDE SIGN INSTALLATION ON STATE HIGHWAY**Wisconsin Department of Transportation
DT1332 2/2018
 Sign Requested For College/University
 Institution
 Municipality
 Other: _____

| | | |
|---|------|--------------|
| Name of Requesting Facility or Municipality | | |
| Street Address | City | Zip Code |
| Contact Person: _____ | | Phone: _____ |
| | | Email: _____ |

SIGN MESSAGE or What does the sign direct to?**PROPOSED SIGN LOCATIONS**

| | | | |
|----------------------------------|-------------------|-----------|---|
| Hwy. Interchange or Intersection | Town/City/Village | County of | Traffic Direction at Proposed Sign Site _____ -bound on Hwy. _____ |
| Hwy. Interchange or Intersection | Town/City/Village | County of | Traffic Direction at Proposed Sign Site _____ -bound on Hwy. _____ |

Additional requests should be submitted on a separate form.

The requesting facility agrees to and will abide by the conditions contained within the Supplemental Guide Sign Policies and general signing policy provisions attached to this application, which is made by the undersigned official under proper authority to act on behalf of the facility represented above. The requestor agrees to pay for installation costs and costs to replace the signs when they have reached the end of their useful life or repairs if they become damaged, when the cost is not recovered from the person(s) causing the damage.

| | | |
|----------------------------------|-------|------|
| Signature of Authorized Official | Title | Date |
|----------------------------------|-------|------|

 APPROVED
 DENIED

 Regional Traffic Engineer Date
2-15-4 Pictographs on Signs**March 2011****PURPOSE**

This guideline provides criteria for determining when pictographs *may* be allowed on supplemental traffic generator signs which qualify for a permit under [TEOpS 2-15-3](#) (Sign Categories and Policy for Directional Signing). The term "pictograph" is defined by the Federal Highway Administration as a pictorial representation used to identify a governmental jurisdiction, a governmental agency, a governmental approved university or college, or a branch of the military service. In general, the use of pictographs is limited to those conditions where an easily recognized, widely understood pictograph *may* add to the effectiveness of a standard text sign by providing a quick visual cue to drivers in need of guidance. This guideline establishes criteria for determining when pictographs *may* be used, and establishes standards for the type and design of pictographs in order to assure their effective use through consistent application. The guideline also is intended to prevent the inappropriate use of pictographs as a means of promoting or advertising destinations, as advertising on the right of way is not legal.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional highways are defined as either divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways can be two lane or multilane facilities.

Pictographs are defined as a pictorial representation used to identify a governmental jurisdiction, a governmental agency, a military base or branch of service, a governmental-approved university or college, or a government-approved institution.

Logos are defined as a distinctive emblem or trademark that identifies a commercial business and/or the product or service offered by the business.

Symbols are defined as the approved design of a pictorial representation of a specific traffic control message for signs, pavement markings, traffic control signals, or other traffic control devices, as shown in the MUTCD.

POLICY

Pictographs *may* be used on supplemental traffic generator signs, provided that the following criteria are met:

- The supplemental traffic generator sign **shall** be approved for installation by meeting the criteria outlined in [TEOpS 2-15-3](#) (Sign Categories and Policy for Directional Signing). Central office approval **shall** be obtained for any pictograph requests.
- Pictographs **shall** only be allowed for guide signs that are listed below:
 - Colleges/universities
 - Auto tour route (Great River Road, Lack Michigan/Superior Circle Tour)
 - Wayfinding signing
 - Airport signing
 - Street name signs, including overhead
 - Military branch
- College and university pictographs **shall** be the official seal adopted by the educational institution. Pictorial representatives of college and university programs are not permitted.
- Advanced street name signs **shall not** contain pictographs.
- Per an October 11, 2017 Official Ruling Letter from FHWA (2(09)-(136)I), federal government facilities (US Fish & Wildlife Service, National Park Service, US Forest Service) **shall not** contain pictographs.
- Auto tour route pictographs **shall not** be displayed on advance guide or exit direction signs. Auto tour route pictographs **shall** only be displayed on supplemental guide signs on freeways and expressways. For conventional highways, auto tour route pictographs **shall** be displayed on conventional route assemblies.
- Military branch pictographs **shall not** be displayed on advance guide or exit direction signs. Military branch pictographs, related to military installations, **shall** only be displayed on supplemental guide signs.
- Commercial graphics for businesses **shall not** be used on community wayfinding signs, including within the pictographs.
- Wayfinding signing **shall** be approved for installation by meeting the criteria outlined in [TEOpS 2-15-6](#).
- The pictograph **shall** fit within the sign face and *should* be placed to the left of the accompanying message. Whenever the addition of a pictograph requires a change in the size or shape of a sign, all costs of the change must be paid by the requestor.
- The maximum dimension (height or width) of a pictograph **shall not** exceed the size of the route shield on the guide sign. If the guide sign does not include a route shield, the maximum size of the pictograph (height or width) **shall not** exceed two times the height of the destination legend.

Typical Sizes of Pictographs

| <u>Lettering Size on Sign</u> | <u>Pictograph Dimensions</u> |
|------------------------------------|------------------------------|
| 6" upper case / 4 ½" lower case | 12" x 12" |
| 8" upper case / 6" lower case | 16" x 16" |
| 10" upper case / 8" lower case | 20" x 20" |
| 13.33" upper case / 10" lower case | 26" x 26" |
| 16" upper case / 12" lower case | 32" x 32" |
| 20" upper case / 15" lower case | 40" x 40" |

- Pictographs **shall** be retroreflective. Colors, arrows, and borders of the logos *should* meet the

- requirements defined in [TEOpS 2-15-6](#).
- Pictographs that resemble an official traffic control device **shall not** be used.
- The sign requestor **shall** pay for the manufacture, installation, and maintenance of all pictographs, including the sign(s) and posts. The actual method of pictograph installation will be left up to the discretion of each regional traffic section.
- Pictographs currently installed that do not meet the criteria in this policy will be allowed to remain in place until the end of their useful life. Useful life ends when the pictograph message no longer meets legibility or condition standards. Existing pictographs **shall** be removed prior to the end of their useful life when opportunities arise such as knockdown or damage, when other work is occurring nearby, or projects make removal practical.

2-15-5 Destinations on Signs

January 2018

GENERAL

The display of appropriate destinations on guide signs can be particularly helpful to drivers, regardless of the type of road or highway. It is the purpose of this policy to set specific standards and guidelines for the selection of destination names for various types of guide signs on each classification of highway. General guidance is provided in the following sections of the MUTCD.

- Section [2D.37](#) Destination Signs (D1 Series)
- Section [2D.36](#) Distance Signs (D2 Series)
- Section [2E.07](#) Characteristics of Urban Signing
- Section [2E.10](#) Amount of Legend on Guide Signs
- Section [2E.12](#) Pull-Through Signs
- Section [2E.13](#) Designation of Destinations
- Section [2E.30](#) Interchange Guide Signs
- Section [2E.33](#) Advance Guide Signs
- Section [2E.35](#) Other Supplemental Guide Signs
- Section [2E.36](#) Exit Direction Signs
- Section [2E.39](#) Distance Signs
- Section [2E.40](#) Interchange Sequence Signs
- Section [2E.41](#) Community Interchanges Identification Signs
- Section [2E.42](#) NEXT X EXITS Sign

DEFINITIONS

1. Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.
2. Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.
3. Conventional highways are defined as either divided or undivided roadway facilities that have no control of access or grade separations at intersections. These highways can be two-lane or multi-lane facilities.
4. A major state trunk highway (STH) is defined as
 - a. A state highway operated as a freeway
 - b. A highway designated as part of the National Highway System, or
 - c. A state highway route or segment approved as such by the state traffic engineer, based on its character as a principal route for cross-state traffic, traffic between major cities in Wisconsin and adjacent states, or traffic from major cities to major northern resort areas.
5. A standard highway is defined as any conventional state or local highway which is not a major STH.
6. Urban areas are defined as
 - a. An established urbanized area, based on the US Bureau of the Census and adjusted by metropolitan planning organizations and the DOT
 - b. Two or more contiguous cities and/or incorporated villages, or
 - c. A single city or incorporated village which is not contiguous with any other.
7. National control cities are Chicago, Milwaukee, Beloit, Rockford, Janesville, Madison, Wisconsin Dells,

La Crosse, Albert Lea, Eau Claire, St. Paul, Sheboygan, and Green Bay.

8. Regional Control Cities are defined as

- a. Urban areas in Wisconsin or within 60 miles of the state line with a population in the most recent decennial census of 30,000 or more.
- b. Other communities, such as Sturgeon Bay, Woodruff, Minocqua, and Lake Geneva, which are approved by the State Traffic Engineer based on their character as widely known tourism destinations, and
- c. Urban areas on or north of Highway 64 with a population exceeding 3,500, and urban areas south of Highway 64 with a population exceeding 10,000.

9. Communities are defined as

- a. Any urban area, or
- b. An unincorporated village which is identified on the official state highway map and is not adjacent to or within an urban area.

PRINCIPAL DESTINATION CALCULATION

A Principal Destination is defined as a community served by a standard highway and located within 25 miles of a major state trunk highway, as measured along the standard highway, and having a location and population such that

$$\frac{P_p}{P_c} \geq \frac{D_p}{D_c} \quad \text{where}$$

P_p = Population of Principal Destination (from official state highway map)

D_p = Distance in whole miles from the major STH to the Principal Destination

P_c = Population of the community closest to the major STH and in the same direction from it (from official state highway map)

D_c = Distance in whole miles to the closest community

If more than one community meets the above criteria, the community for which the term

$$\frac{P_p}{P_c} - \frac{D_p}{D_c} \quad \text{is the greatest **shall** be selected.}$$

Notes: When measuring distances D_p and D_c , it is recommended that consistency be applied in what points are being measured to.

Where the through highway passes adjacent to or within the closest community, D_c will approach zero, and $\frac{D_p}{D_c}$ will approach infinity.

D_c

Therefore, in this case, the closest community **shall** be the principal destination.

POLICY

| On Hwy Intersecting | | Standard STH | Major STH | Interstate Highway |
|------------------------|--------------------------|--------------------------|------------------------------|--------------------------|
| Standard Highway | Ahead Destination | Next Community | Regional Control City (1) | (2) |
| | Crossroad Destination | Next Community | Principal Destination | Principal Destination |
| Major STH | Ahead Destination | Next Community | Regional Control City (1) | (2) |
| | Crossroad Destination | Regional Control City | Regional Control City | Regional Control City |
| Interstate Highway | Ahead Destination | Next Community | Regional Control City (1) | National Control City |
| | Crossroad Destination | National Control City | National Control City | National Control City |

1. If the major STH is constructed and signed as an expressway or freeway, an ahead destination is generally not displayed except as a pull-through sign at a system or directional interchange.
2. An ahead destination is generally not displayed except as a pull-through sign at a system or directional interchange.

SPECIFIC SELECTION CRITERIA

1. **On standard state trunk highways:** Destination signs (D1 series) *should* be used on the standard state highway approach to a numbered interstate. If designated, the "ahead" destination **shall** be the closest community on the through route. The first choice of destination names for the interstate **shall** be the closest national control city in each direction. The first choice of destination name for other freeways **shall** be the closest regional control city in each direction.
 - a. If the intersecting route does not serve a national control city, then the regional control city, next community, or principal destination *may* be designated.
 - b. Unincorporated communities meeting the qualifying criteria in definition 9 *may* be displayed on destination signs (D1 series) on conventional state highways.
 - c. Unincorporated communities **shall not** be displayed on distance signs (D2 series) unless the community is designated a regional control city according to the definition 8b. However, they *may* be identified as unincorporated on the I2-3 name sign.
2. **On major state trunk highways:** Use regional control cities according to definition 8 and selected as follows:
 - a. Select urban areas meeting the criteria of definition 8a & 8b
 - b. If less than two meet the criteria of 8a or 8b, select urban area(s) meeting the criteria of 8c
 - c. If the distance between areas selected above exceeds 160 miles, select urban areas between them, which meet the criteria of 8c.

Unincorporated communities **shall not** be displayed on freeway or expressway exit signs, unless the community has been designated a regional control city according to the definition 8b.
3. **On interstate highways:** Use national control cities, except regional control cities or principal destinations *may* be selected as appropriate for intersecting highway destinations.
4. **Urban areas with more than one city or village:**
 - a. On highways which serve the largest city in the urban area, only the largest city **shall** be named and **shall** be considered to represent the entire urban area.
 - b. Destination signs **shall not** be erected within an urban area directing to a city or village within the same urban area, except:
 - i. On major state trunk highways, signs *may* direct to the central business district of the largest city
 - ii. On highways near the edge of urban areas, signs *may* direct to the largest city in the urban area which is served by the crossroad

iii. In bi-state urban areas, signs *may* direct to the largest out-of-state city.

5. Control cities beyond the end of a highway:

A national or regional control city located beyond the end of a highway *may* be considered to be served by that highway if the connecting route:

- a. Is of the same or higher classification, and
- b. Continues in the same general direction as the ending highway, and
- c. Carries considerable through traffic from the ending highway.

6. Bi-state urban areas:

In determining the population of an urban area, part of which is in Wisconsin and part of which is in an adjacent state, for the purpose of selecting regional control cities, the population of the in-state and out-of-state cities **shall** be added. Directional signs *may* name the largest Wisconsin city and/or the largest out-of-state city, as provided in criteria 4c(3) above.

7. Other supplemental guide signs:

Additional communities are allowed on other supplemental guide signs. Only one supplemental guide sign with cities/communities **shall** be allowed per interchange, maximum of two cities/communities per sign.

8. When opportunity presents itself (improvement project, refurbishment project, etc.), the destinations on primary and supplemental guide signs *should* be reevaluated to ensure conformance to this policy.

2-15-6 Community Wayfinding Signs

January 2015

PURPOSE

This policy sets the uniform, Wisconsin state standards for signs, which communities *may* install by permit on conventional State Trunk Highways under DOT jurisdiction to provide directional guidance to public facilities and traffic generators within the community.

The MUTCD Section [2D.50](#) provides guidelines and standards for Community Wayfinding signing. Substantial conformance of these signs to the MUTCD and DOT policy is required by state law. Poorly designed and/or cluttered guide signs will not meet these requirements and could adversely impact safety.

On local streets and connecting highways, local agencies have the authority to install destination signs for local attractions and generators. If there is deviation from state and national standards to the extent that highway signing would adversely affect driving behavior, local agencies *may* face liability problems.

Therefore this policy establishes the following to be applied to Community Wayfinding Signing on State Highways under DOT jurisdiction:

1. the qualifying criteria for Community Wayfinding Signing;
2. guidance on qualifying destinations or facilities;
3. clarification of sign design and installation standards, applicable to WisDOT
4. the application and permit process for roadways under WisDOT jurisdiction.

DEFINITIONS

Community Wayfinding Signs

These are the signs, allowed by permit, which are owned and maintained by the community and direct to

1. municipal area destinations such as Downtown, or Historic District,
2. individual destinations that are publicly leased or owned and operated for public use, such as City Hall, Convention Center, and local parks, or
3. Privately owned non-profit facilities open to the public, such as a local museum or ice center.

Trailblazing Signs

In this context, these are community destination signs that direct subsequent turns on local streets to reach the

destination.

Trailblazing (directional route signing) to state routes is the responsibility of WisDOT and will not be permitted on Community Wayfinding Signs.

POLICY FOR INSTALLATION ON STATE TRUNK HIGHWAYS

The Department will allow the local agency, by permit, to install and maintain community wayfinding signs on the right-of-way of the conventional state trunk highway system, subject to the destinations, design, location, and maintenance of the signs being reviewed and found satisfactory by the Department. These signs **shall not** be permitted on freeways or expressways.

WisDOT *may* fund the installation of wayfinding signs as part of a Community Sensitive Solutions project. For all Community Sensitive Solutions projects that include wayfinding signs, the sign design and locations **shall** be reviewed for conformity to WisDOT and MUTCD policies by the Region Traffic Operations. Wayfinding signs that are funded and installed as part of a Community Sensitive Solutions project **shall** be maintained by the community.

This policy does not apply to banners or civic displays, which are addressed in [TEOpS 13-12-1](#).

Qualifying Criteria for Community Wayfinding Signing Programs

Community wayfinding signs will not be permitted outside a readily apparent urban developed area, usually characterized by a reduced speed limit, nearby transition to curb and gutter, and dense residential and/or business development adjacent to the highway.

Geographical areas or districts within a community *may* be permitted Community Wayfinding Signing. Two or more adjacent communities in an urbanized area *may* coordinate a common signing program, but the department will issue separate permits to each individual municipality.

No countywide programs will be permitted.

The community must develop a Master Plan for Community Wayfinding Signing, which contains the following information:

1. A map of the community, including the city street/local road system, which clearly identifies:
 - a. Exact locations of destinations and attractions to be included in this signing program.
 - b. State trunk highway approaches to city street/local road intersections where signing is proposed.
 - c. Which destination(s) and attraction(s) are to be signed on each state trunk highway approach at each city street/local road intersection
 - d. City street/local road intersections where trailblazing signing is required to direct motorists to each facility.
2. A concept design of a typical community wayfinding sign, which *may* include the city logo, a street name and up to a total of three destinations/attractions. A maximum of three destinations *should* be displayed on a sign.

The Master Plan **shall** be submitted to the WisDOT Regional Traffic Engineer for review. This submittal **shall** be initiated and coordinated by the community and **shall** identify one contact or lead person in the community, through which all Department correspondence and contact will be made.

If a community obtains DOT approval for Community Wayfinding Signing, no new requests for traffic generator signing, which would qualify for Community Destination Signs, will be approved within the community.

Qualifying Destinations or Facilities

Destinations or attractions must be of general interest to the traveling public and **shall not** be a retail, business or manufacturing center. The individual destinations **shall** be publicly leased or owned and operated facilities for public use or privately owned non-profit facilities open to the public.

Destinations which qualify for either Supplemental Traffic Generator signing or Community Wayfinding Signing,

1. *should* be included on the Community Wayfinding Signs,
2. *may* be on permitted supplemental signing,
3. but **shall not** be on both at the same intersection approach.

A specific destination **shall** only be displayed on one sign structure in each direction on a highway unless straight ahead signing is also approved by the Regional Traffic Engineer.

This type of signing **shall not** display advertising for a commercial product or service.

IH, USH or STH directional signage **shall not** be allowed on Community Wayfinding signs.

Sign Design Standards

Shape

The shape of the signs **shall** be rectangular and *may* have rounded corners. A rounded or other regular geometric shape on the top will be allowed to accommodate a logo.

Pictograph

Only one community pictograph *may* be incorporated in the top of the sign subject to WISDOT approval. If used, it **shall** be simple and easily recognizable. The height of the pictograph **shall not** exceed two times the height of the upper-case letters of the principal legend on the sign. For coordinated programs, a unique pictograph for each municipality *may* be used.

If a community name is to be displayed at the top of the sign panel, instead of or in addition to a pictograph, the lettering **shall** be of a size, font style and high color contrast for motorists to read at the posted speed.

All signs in a Community Wayfinding Signing program **shall** have the same format. If a community pictograph, and/or name, and/or street name, is to be used on any sign, it **shall** be used on all signs in the community program.

Pictographs for destinations and attractions **shall not** be permitted, since the traveling public will not recognize pictographs of local destinations.

Facing

Sign panel legends and backgrounds **shall** be reflective to meet the minimum standards of High Intensity sheeting.

Fluorescent reflective sheeting of any color **shall not** be permitted on these signs.

The sign **shall not** contain any animated or moving parts, flashing or moving lights, or flashing disks.

Color

Colors **shall** meet the standards for highway colors specified by the Federal Highway Administration. Color combinations **shall** have high contrast. Two-color combinations which *may* be used are:

1. White or yellow on blue, green or brown.
2. Blue, green, black or brown on white.
3. Red or orange on white, but not the reverse.
4. A third color, if used, must provide suitable contrast (i.e., not red on blue).

The background colors of orange, red, yellow, purple, or the fluorescent versions thereof, fluorescent yellow-green and fluorescent pink **shall not** be permitted on Community Destination Signs. One background color is preferred. A third color for the logo area *may* be used, or that area *may* be reversed in color. Color plaques or accents **shall not** be used under arrows or destination names. Lettering, arrows, and border **shall** be the same color.

Border

Border is optional. If used, it **shall** be plain, retroreflective, not decorative, and the same color as the letters.

Lettering & Sign Size

A minimum Series B font as specified in the Standard Highway Signs manual is preferred. A similar font is allowable, unless the style detracts noticeably from legibility.

The preferred letter size is 6" Upper Case/ 4 ½" Lower Case. In areas, where the posted speed is less than 35 mph, a minimum 5" Upper Case/ 3 ¾" Lower Case or 5" Capital Letters will be allowed.

The resulting sign width **shall not** exceed five feet adjacent to a roadway posted at 35 MPH or above. The sign width **shall not** exceed four feet adjacent to a roadway posted at 30 MPH or below.

Arrows

Arrows **shall** be as big in dimension as the lettering, and the same color as the adjacent lettering. The arrows **shall not** have encircling accents, or contrasting mini-backgrounds.

Arrows **shall** be left of the message for left destinations, and right of the message for right destinations.

Ahead arrows **shall not** be used except in combination with left and/or right arrow(s) and destination(s) to pull through to one major area destination, such as DOWNTOWN, or direct ahead to one or more qualifying destinations where the through route turns. When used, ahead arrows **shall** be on the left side of the top line.

Destinations

Destinations/attractions on a community destination sign **shall** be displayed (from top to bottom of sign) in the following sequence:

1. ahead destination (if used);
2. left-oriented destinations/attractions (closest to furthest);
3. right-oriented destinations/attractions (closest to furthest).

Community Wayfinding Signs *should* be limited to three destinations per sign.

Sign Installation Standards

Signs **shall** be installed by the community on separate supports furnished and typically used by the community. They **shall not** be combined with other signing by the community or the Department.

If signing is approved on the state trunk highway directing to a facility, any necessary trailblazing signing **shall** be installed on the city streets/local roads by the community before signing is installed on the state trunk highway.

The community **shall** affix an identification code number label to the back of each sign in accordance with [State Statute Section 86.19\(5\)](#) and [TEOpS 2-1-30](#).

Sign supports **shall** conform to [TEOpS 2-15-52](#).

Sign installation and placement **shall** be in accordance with WisDOT Standard Sign Details [A4-3](#), [A4-4](#), and [A4-8](#), [A4-9](#), [A4-11](#), or [A5-9](#), as applicable.

Signs **shall** be placed in advance of the intersection where a turn would be required.

Only one sign **shall** be permitted in each direction approaching an intersection and it *should* be located on the right side of the roadway.

The preferred sign spacing is 200 feet from any other highway sign. The minimum spacing **shall** be 100 feet.

Signs erected on the state trunk highway system **shall** have their locations approved by the Regional Traffic Engineer. Signs at all locations *should* be installed with due care to be visible, and to not obscure other traffic control devices. Further guidance on location is contained in Section [2A.16](#) of the MUTCD.

Application and Permit

Sign destinations, designs, and locations on State highways under DOT jurisdiction **shall** be approved by the WisDOT Regional Traffic Engineer. Installation of these signs **shall** be through this permit process.

Upon receipt of a master plan for Community Wayfinding Signing, including the typical standard sign design and the identification of the community contact person, the Regional Traffic Engineer will review the plan for

1. appropriate qualifying destinations,
2. direct and effective routing to the destinations, including trailblazing on local roadways,
3. appropriate sign locations,
4. individual sign designs, and
5. roadside conditions and constraints.

In order to expedite the process, the community *should* prepare the master plan in compliance with the guidelines in this policy. Any necessary denials or revisions *may* cause a return of the plan to the community contact person, resulting in a delay of the permit.

The permit will consist of an approved master plan attached to a permit letter signed by the Regional Traffic Engineer, and *may* include the necessary standard sign installation details mentioned above.

All sign panel designs *should* be reviewed and approved by the Regional Traffic Engineer before fabrication.

The community **shall** be responsible for the construction, installation and maintenance of the community wayfinding sign structures and sign panels at its own expense.

If community wayfinding signs are not properly maintained, the community **shall**, upon request by WisDOT, replace or remove the signs at its own expense. If not replaced or removed within 30 days of notification, WisDOT will remove the community wayfinding signs at the expense of the community.

Roadway reconstruction and/or installation of new regulatory, warning or guide signs *may* necessitate relocation or removal of community wayfinding signs by the community at its own expense.

GRANDFATHER CLAUSE

Existing permitted Community Wayfinding Signs will be allowed to remain temporarily without modification or replacement until the end of their useful life, or December 31, 2015, whichever comes first. Unpermitted signs **shall** be removed as soon as possible, unless they meet the standards contained in this policy. In that case, the community *may* apply for a retroactive permit by submitting the required master plan.

SAMPLE PERMIT FORM LETTER

Copy and paste to your Region letterhead.

Provide date, contact name, and address

Modify as needed.

RE: Community Wayfinding Signing Permit

This letter **shall** serve as the Community Wayfinding Signing Permit for (city, village, town) of (name) to install and maintain guidance signing on STH (number) as contained and approved in the attached master plan.

No additions or changes will be allowed without a revised and approved master plan.

WisDOT Standard Sign Installation Details, A4-3, A4-4, and (others as needed), are attached. Adherence to these standards is required.

Sincerely,

(signature)

(name, P.E.)
(Region) Traffic Engineer

2-15-7 Temporary Traffic Generator Signing on Improvement Projects

January 2013

BACKGROUND AND PURPOSE

Section [2E-35](#) of the MUTCD allows states and other agencies the option to adopt policies for Supplemental Traffic Generator (Directional Signing). Correspondingly, WisDOT has adopted a Supplemental Traffic Generator policy for permanent signs ([TEOpS 2-15-3](#)). However, there are cases (most notably improvement projects) where temporary Supplemental Traffic Generator signs are needed. Temporary Traffic Generator signs *may* be needed to temporarily replace SIS signs or previously approved Supplemental Traffic Generator signs that were previously installed on the roadway, but taken down temporarily for the project. There are other times where a business *may not* have been previously signed, but the improvement project closes off an access to a business and temporary signs *may* be needed to ease the construction impact to the business. In some of these cases, a Temporary Business Guidance Sign *may* be permitted.

The following policy provides guidance on the different types of Temporary Traffic Generator signs that *may* be utilized on improvement projects.

DEFINITIONS

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate highways are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional Highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

POLICY

Projects that have previously approved SIS or Supplemental Traffic Generator Signs that have been temporarily removed during construction.

1. Temporary SIS Signs and Supplemental Traffic Generator signs **shall** only be allowed for approved SIS or Supplemental Traffic Generator signs that were removed as part of the improvement project (See Figure 1).
2. Temporary SIS Signs and Supplemental Traffic Generator signs **shall** be black on orange and contain no logos.
3. Temporary SIS Signs and Supplemental Traffic Generator signs **shall** be designed by WisDOT Bureau of Traffic Operations for all Regions, except SE. For SE Region projects, the signs **shall** be designed by the SE Region Traffic Operations. Sign details and installation details *should* be included as part of the improvement project plans.
4. Temporary SIS Signs and Supplemental Traffic Generator signs are typically paid for as part of the improvement project under the bid item, Traffic Control Signs Fixed Message.

Temporary Business Guidance Signs (signs not previously approved as SIS or Supplemental Traffic Generator signs).

1. Temporary directional signing for local businesses *may* be allowed in the highway right-of-way, at locations approved by the Project Manager.
2. Privately erected signs **shall** require an approved permit (see attached Temporary Business Guidance Signs Permit Application). Privately erected signs Temporary directional signing for local businesses **shall not** be allowed on freeways, expressways or at the exit ramp.

Figure 1. Example of Temporary SIS Signs for Improvement Projects

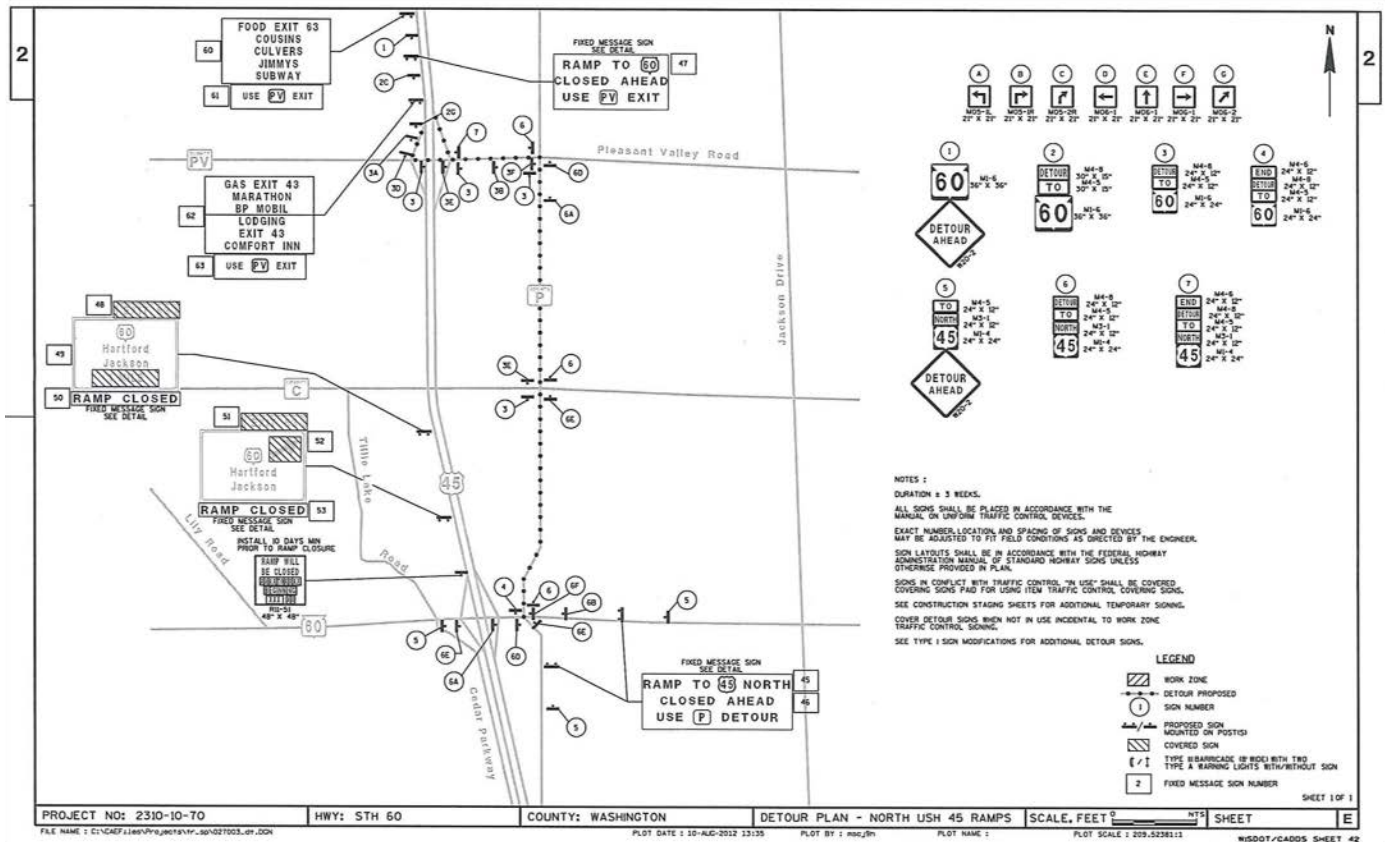
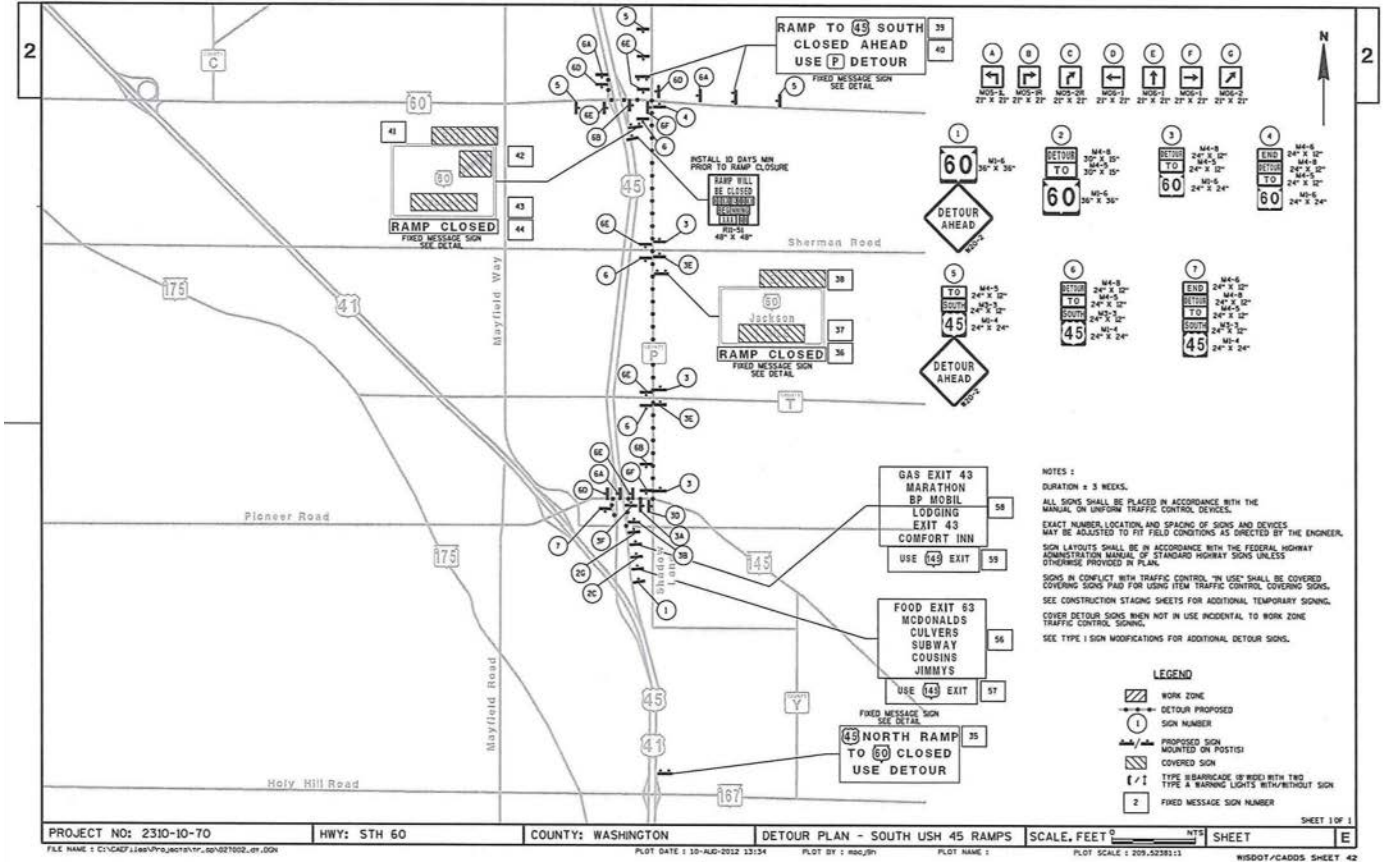


Figure 2. Temporary Business Guidance Signs Permit Application

**APPLICATION FOR PERMIT TO INSTALL TEMPORARY BUSINESS SIGN(S)
ON HIGHWAY RIGHT-OF-WAY DURING IMPROVEMENT PROJECT**

| | |
|--|---|
| APPLICANT: | |
| ADDRESS OF BUSINESS / ACTIVITY: | |
| PHONE: | |
| TYPE OF BUSINESS / ACTIVITY: | |
| SIGN LOCATION(S): (number and placement to be coordinated with Project Engineer) | |
| On what highway? | At or approaching intersection with what highway? |
| 1) On: | At: |
| 2) On: | At: |
| 3) On: | At: |
| 4) On: | At: |
| 5) On: | At: |
| 6) On: | At: |
| Remarks: | |
| Two drawings MUST be attached: One drawing must show the proposed sign design(s) and dimensions and the other must show the proposed sign location(s). | |

I apply for permission to install and maintain temporary directional signs at the locations listed and in conformance with the guidelines attached to this application. I agree to comply with these guidelines and will remove all signs upon completion of the project, or when directed by the project engineer. I understand that signs may be removed without notice if they do not comply with the attached guidelines, do not match the attached drawings or do not comply with any additional conditions stated on or attached to the permit. I further understand that WISDOT is not responsible for lost or stolen temporary signs.

| | |
|--|---|
| Reviewed by: _____ Traffic Operations | _____ Applicant signature |
| Approved by: _____ Project Manager | _____ Maintaining authority (if sign location is not on STH, a representative's signature is required) |
| Project I.D.: _____ | |

GUIDELINES FOR INSTALLATION OF TEMPORARY BUSINESS GUIDANCE SIGNS ON IMPROVEMENT PROJECTS

Whenever a traffic generator (typically a commercial business) normally obtains its access from within the limits of a construction project or detoured roadway, WisDOT may allow the placement of temporary directional signs in the highway right-of-way at locations approved by the Project Manager. **Privately erected signs require an approved permit (see attached permit form) and will not be allowed on the mainline of freeways or expressways or at the exit ramp. Approval may be granted to place a sign at the intersection where the ramp connects to the crossroad (ramp termini). Signs with generic messages not containing individual business names (e.g., Access to Downtown) should generally be shown on the traffic control plan and erected as part of the improvement contract as a fixed message sign (643.1000 pay item) in orange background and black letters** Typical locations for generic message signs in the improvement contract may include endpoints of the construction project or detour (as shown on Standard Detail Drawing 15C2-(X)a, Detail A), sideroads approaching the project.

The following guidelines apply to privately erected signs along conventional highways (non-freeway/non-expressway) or at the ramp termini where it connects to the crossroad near the project:

1. The signs will not obstruct the view of, interfere with, or be attached to official traffic control devices such as signs and barricades, or obstruct the view of drivers entering or traveling on the highway. Signs shall be placed to allow at least 6 feet of clearance from edge of gravel shoulder to edge of sign, or at least 2 feet from back of curb to edge of sign (per MUTCD 2A.19). Signs shall be placed as near the right-of-way line as possible and shall not be placed in the median of divided highways.
2. Where several neighboring businesses are affected, every effort shall be made to identify these businesses on common signs. In the interest of legibility and not creating undue distraction to drivers, it may be necessary to identify businesses by their general location, e.g., "Main Street Businesses", "Downtown Businesses", or "City Business District", rather than by individual business names. Use the phrase "Access To" instead of "Open To" on signs to clarify that although access is provided to businesses, the roadway is still closed to through traffic. No one sign may be larger than 4' x 6'. For a sign request for one business the maximum sign size is 2' x 4'.
3. If access to the business(s) will be through the closed portion of the highway under construction, one directional sign at the beginning of the detour, from each direction, will be allowed. Additional "trailblazers" may be necessary to guide traffic along the closed portion of the road, as approved by the Project Engineer.
4. If access to the business(s) will be via a road connecting the detour route to the closed portion of the highway, one sign will be allowed in each direction on the detour at the point where a motorist must leave the detour. Additional "trailblazers" may be necessary to guide traffic along the local road system after leaving the detour route. These signs must be approved by the Project Engineer and the local road's maintaining authority.
5. For uniformity and readability, the lettering shall be black block style letters on an orange or white background and shall conform to the following size requirements: 4" high for posted

speeds less than 45 mph; 6" high for posted speeds 45 mph or greater. No other colors will be allowed for lettering. Business logos may be used as an alternative to word messages but maximum allowable logo size is 4 square feet per policy in Traffic Guidelines Manual. Trademark logos may be permitted in alternate colors subject to approval by the Project Engineer. No advertising is allowed on signs such as SALE, or MERCHANDISE REDUCED.

6. Sign supports shall be of FHWA approved breakaway materials, i.e., 4" x 4" wood posts, or smaller, as appropriate to the size and weight of the sign. It is the responsibility of the sign installer to contact Diggers' Hotline at 1-800-242-8511 prior to installation. When it is not possible to mount the signs on post supports, use portable mounts, i.e. type II or III barricades, approved by the Project Engineer. Business signs shall not be placed on any devices that are part of the official traffic control for the project. In urban locations, the project manager may have the work zone contractor install a type III barricade for mounting of the sign, and coordinate obtaining the sign from the permit requestor. This avoids the permit requestor being out on our state highways in high traffic volume areas for safety reasons.

The following guidelines apply along freeway/expressway mainline:

1. No privately erected signs will be allowed on mainline freeways/expressways. Temporary Business Signs are **not allowed on freeway**. All signs on mainline freeways/expressways will be erected by contractor, county, or state forces, at the discretion of the Region Traffic Operations Engineer. Where there are existing green traffic generator signs on the freeway that met statewide policy approval (TGM 2-15-3) prior to the project starting, temporary fixed message sign details should already be included in the original contract. Examples: University of Wisconsin, Waukesha or Bristol Renaissance Faire.

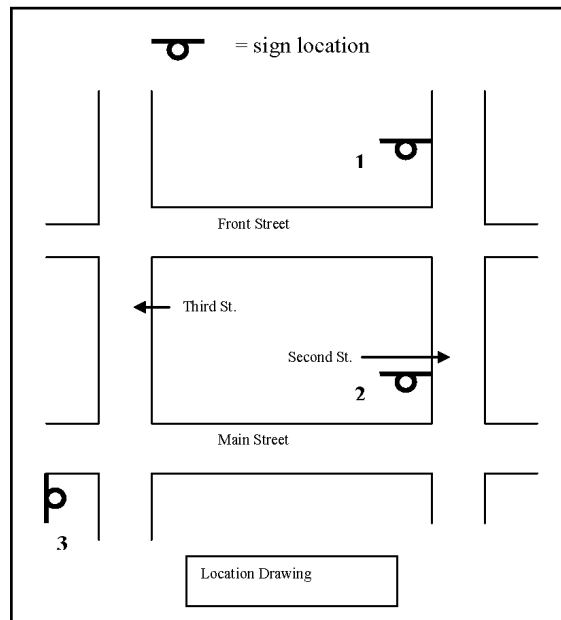
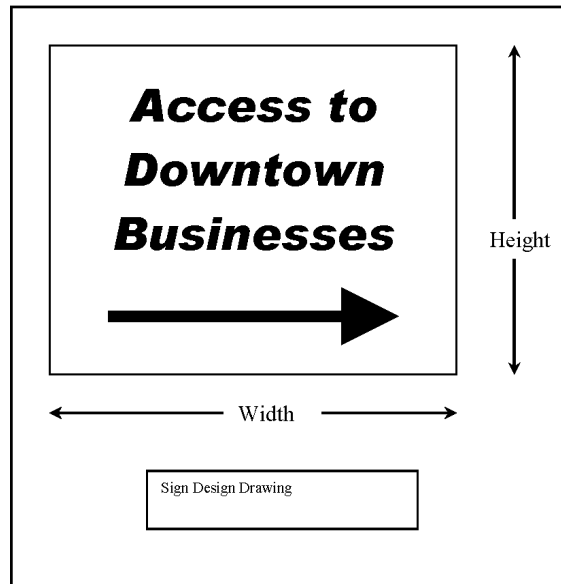
General Coordination & Permit Conditions for Privately Erected Signs

The Project Engineer will coordinate the design and placement of the signs with the owner, and the Project Manager will grant or deny approval. All approved signs, their design and locations, will be documented on the permit form attached to these guidelines. A copy of the permit shall be sent or faxed to the WisDOT Region Traffic Engineer and the maintaining authority in the case of local roads. The approved signs will be erected and removed at the expense of the applicant. If consultation on sign design or installation requirements is needed, contact the Region Traffic Engineer.

If non-complying signs or signs with potential to cause safety problems are located on a project, the Project Engineer will notify the business identified on the sign. Such signs not removed or corrected immediately will be removed by the department or its representatives and the cost billed to the sign owner.

All temporary signs must be removed by the applicant within 48 hours following restoration of normal traffic patterns. Such signs not removed after 48 hours will be removed by the department or its representatives and the cost billed to the sign owner. The Project Engineer is responsible for seeing that all signs are removed at the completion of the project.

Example of required drawings:



2-15-11 Transition, Two to Four Lanes

June 2005

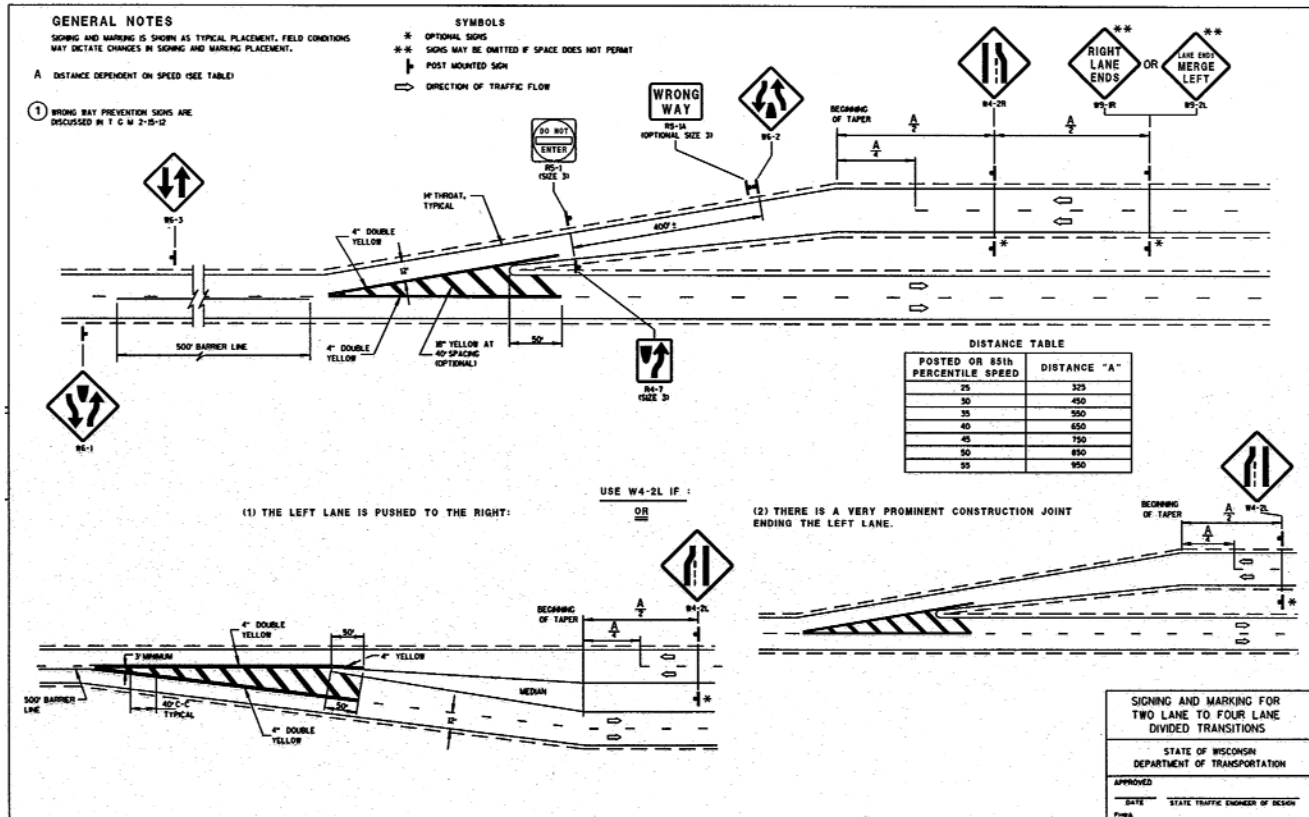
GUIDANCE

Figure 1 portrays recommended pavement markings and signing for typical transitions of two-lane highways to divided highways.

The main feature of the pavement markings is the formation of a large "V," which will give continuous guidance to the left of the driver leaving the divided section.

The choice between using a W4-2R or L has been debated and has arguments on both sides. The illustration provides an acceptable signing choice in the absence of any other determinant factors.

Figure 1. Marking and Signing for Two-Lane to Four-Lane Divided Transitions



2-15-12 Wrong Way Prevention

November 2015

PURPOSE

Prevention of wrong way movement is a concern wherever an entire roadway is dedicated to one-way traffic. Wrong-way prevention signing consists of the appropriate use and placement of Turn Prohibition signs, Keep Right signs, DO NOT ENTER signs, WRONG WAY signs, ONE WAY signs, and Divided Highway Crossing signs.

The need for wrong way prevention signing in any situation is determined by the complexity of the situation requiring positive guidance and the consequence of error. The following guidance and details are intended to define the typical amount of signing for the various applications.

APPLICATIONS

DIVIDED HIGHWAY WITH WIDE MEDIAN intersection with TWO-WAY CROSS STREET (See Figure 1)

This typical signing plan *should* be sufficient for most intersections of this type.

The MUTCD Section [2B.37](#) and Figure 2B-12 allows the single installation of DO NOT ENTER and WRONG WAY SIGNS. Where the median width is 30 feet or greater, the signs *should* be installed on the median side.

DIVIDED HIGHWAY WITH NARROW MEDIAN intersection with TWO-WAY CROSS STREET (See Figure 2)

This typical signing plan *should* be sufficient for most intersections of this type. Additional needs *may* be met by installing additional signs as shown in MUTCD Figure 2B-15.

The MUTCD Section [2B.37](#) and Figure 2B-12 to allow the single installation of DO NOT ENTER and WRONG WAY SIGNS. Where the median width is less than 30', the signs *should* be installed on the outer side.

DIVIDED HIGHWAY WITH WIDE MEDIAN intersection with INTERCHANGE RAMPS (See Figure 3)

This typical signing plan *should* be sufficient for most intersections of this type. It combines the typical signing requirements from **Figure 1** with the Standards, Guidance and Options in the MUTCD Section [2B.41](#) and Figure 2B.18, except that the Turn Prohibition signs are designated optional. This is consistent with the last Option

paragraph in the MUTCD Section [2B.18](#).

DIVIDED HIGHWAY WITH NARROW MEDIAN intersection with INTERCHANGE RAMPS (See Figure 4)

This typical signing plan *should* be sufficient for most intersections of this type. It combines the typical signing requirements from **Figure 2** with the Standards, Guidance and Options in the MUTCD Section [2B.41](#) and Figure 2B.18, except that the Turn Prohibition signs are designated optional. This is consistent with the second to last Option paragraph in the MUTCD Section [2B.18](#).

TWO-WAY UNDIVIDED HIGHWAY intersection with INTERCHANGE RAMPS (See Figure 5)

This typical signing plan *should* be sufficient for most intersections of this type. It reflects the Standards, Guidance and Options in the MUTCD Section [2B.41](#) and Figure 2B.18, except that the Turn Prohibition signs are designated optional. This is consistent with the second to last Option paragraph in the MUTCD Section 2B.18.

TRANSITION FROM TWO-WAY UNDIVIDED HIGHWAY TO DIVIDED HIGHWAY (See Figure 6)

This typical signing plan *should* be sufficient to prevent wrong-way movements in these transition areas. [TEOpS 2-15-11](#) illustrates the overall signing and pavement marking requirements in greater detail.

DIVIDED HIGHWAY WITH INTERSECTING SIDEROAD (See Figures 7 and 8)

These typical signing plans *should* be sufficient for most side roads of these types. Additional needs *may* be met by installing additional signs as shown in the MUTCD Figure 2B-15.

The MUTCD Section [2B.37](#) and Figure 2B-12 allows for the single installation of the DO NOT ENTER and WRONG WAY signs. Where the median width is less than 30', the signs *should* be installed on the outer side.

DIVIDED HIGHWAY WITH NARROW OR WIDE MEDIAN DRIVEWAY (See Figures 9, 10, 11, 12 and 13)

These typical signing plans *should* be sufficient for most driveways of these types. Additional needs *may* be met by installing additional signs as shown in the MUTCD Figure 2B-15.

The MUTCD Section [2B.37](#) and Figure 2B-12 allows for the single installation of the DO NOT ENTER and WRONG WAY signs. Where the median width is less than 30', the signs *should* be installed on the outer side.

ROUNDABOUTS (See Figure 14)

This typical signing plan *should* be sufficient for the prevention of wrong way movements on roundabouts with single and multiple approach lanes and interchange off-ramps.

DIVIDED HIGHWAY WITH SIGNALIZED WIDE MEDIAN INTERSECTION (See Figure 16)

This typical signing plan *should* be sufficient for most intersections of this type.

The MUTCD Section [2B.37](#) and Figure 2B-12 allows the single installation of DO NOT ENTER and WRONG WAY SIGNS. Where the median width is 30 feet or greater, the signs *should* be installed on the median side.

DIVIDED HIGHWAY WITH SIGNALIZED NARROW MEDIAN INTERSECTION (See Figure 17)

This typical signing plan *should* be sufficient for most intersections of this type. Additional needs *may* be met by installing additional signs as shown in MUTCD Figure 2B-16.

The MUTCD Section [2B.37](#) and Figure 2B-12 to allow the single installation of DO NOT ENTER and WRONG WAY SIGNS. Where the median width is less than 30', the signs *should* be installed on the outer side.

POLICY

At approaches to multi-lane roadways with median widths less than 30', the R6-1 ONE WAY sign **shall** be installed at the near right installation above the STOP or YIELD sign. At approaches to multi-lane roadways with median widths 30' or greater, two R6-1 ONE WAY signs **shall** be installed back to back at the near right installation above the STOP or Yield sign. The R6-1 ONE WAY sign **shall** be used at "T" intersections with divided highways or above the roundabout directional arrow (R6-4b) sign.

At divided highways with wide medians that have a STOP or Yield sign in the median, a R6-1 ONE WAY sign **shall** be installed back to back above the STOP or Yield sign (See Figure 15).

The R6-2 ONE WAY sign **shall** be used for all other locations on the STH system.

The DO NOT ENTER sign **shall** be installed where it does not obscure the outline or shape of STOP or YIELD signs. If space does not permit, it is permissible to trim the DO NOT ENTER sign into an octagon shape,

however the preference is to install the DO NOT ENTER sign on a separate post, next to the STOP sign.

GUIDELINES

Short divided sections with low traffic volumes and a posted speed of 40 mph or less *may* not need the DO NOT ENTER and WRONG WAY signs.

An urban boulevard with frequent cross streets and median openings *should* not need repeated DO NOT ENTER and WRONG WAY signs.

A history of wrong way movements and/or related crashes *may* warrant further measures. If visibility of the far roadway from the side street or ramp is obscured by geometrics or cross section, additional ONE WAY signs *may* be necessary and positioned as shown in the MUTCD Figure 2B-15.

Highway lighting *may* be a solution to visibility problems, eliminating the need for extra signing.

Pavement marking arrows *may* be used to supplement signing and reinforce the wrong way prevention message, especially on exit ramps.

Freeway ramps *may* warrant additional signing and marking strategies to help prevent wrong way movements. The following strategies *may* be used at freeway ramp locations that have exhibited problems with wrong way drivers entering the freeway:

1. Upsizing of DO NOT ENTER and WRONG WAY signs
2. Stop bars and type 4 pavement marking arrows
3. Dotted pavement marking line extensions through the intersection

The following strategies *may* be used in addition to the ones above or on their own. All of the following strategies are optional, and **shall** only be used at side by side ramp locations that have exhibited problems with wrong way drivers entering the freeway:

1. Additional WRONG WAY signs mounted below the DO NOT ENTER signs at a 3 foot mounting height as measured vertically from the bottom of the sign to the top of the near edge of pavement.
2. Reflective strips on WRONG WAY and DO NOT ENTER sign posts. These strips **shall** be 2 inches wide, composed of red Type H sheeting on 0.040 inch sheet aluminum, and **shall** run from the bottom of the sign to within 2 feet above the edge of pavement.
3. A FREEWAY ENTRANCE sign placed at the entrance to the on ramp
4. Dynamic (flashing) WRONG WAY signs

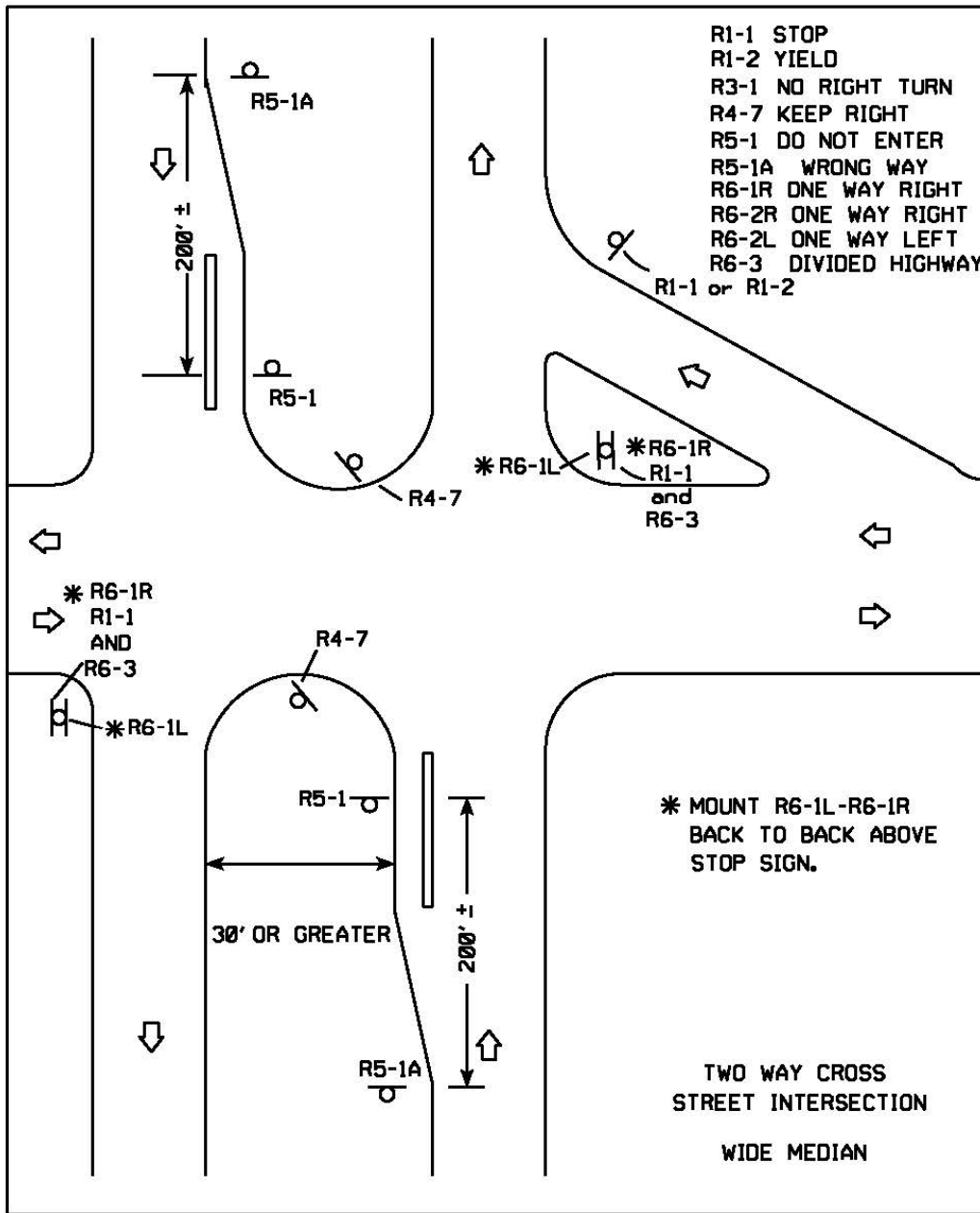


FIG. 1 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

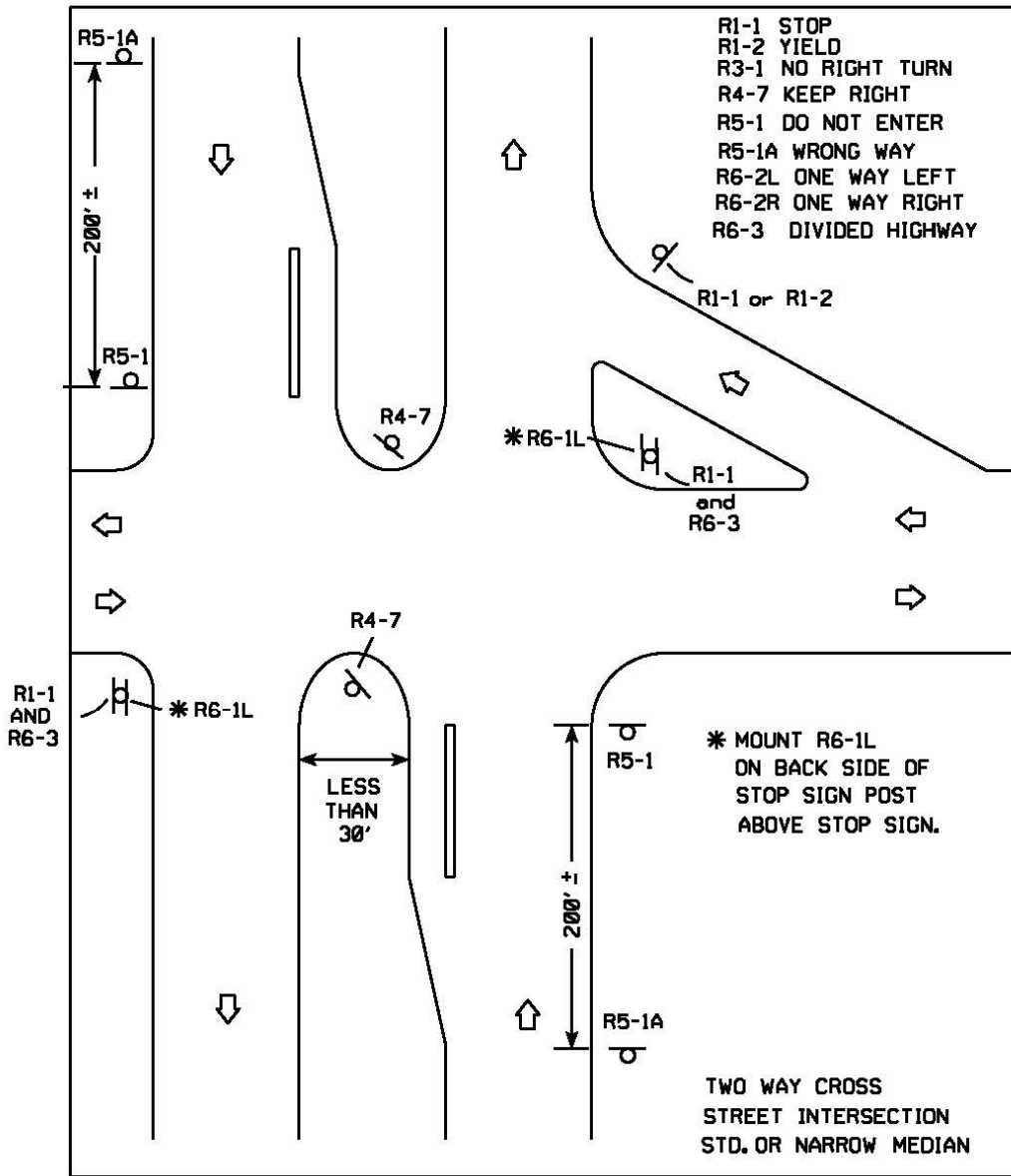


FIG. 2 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

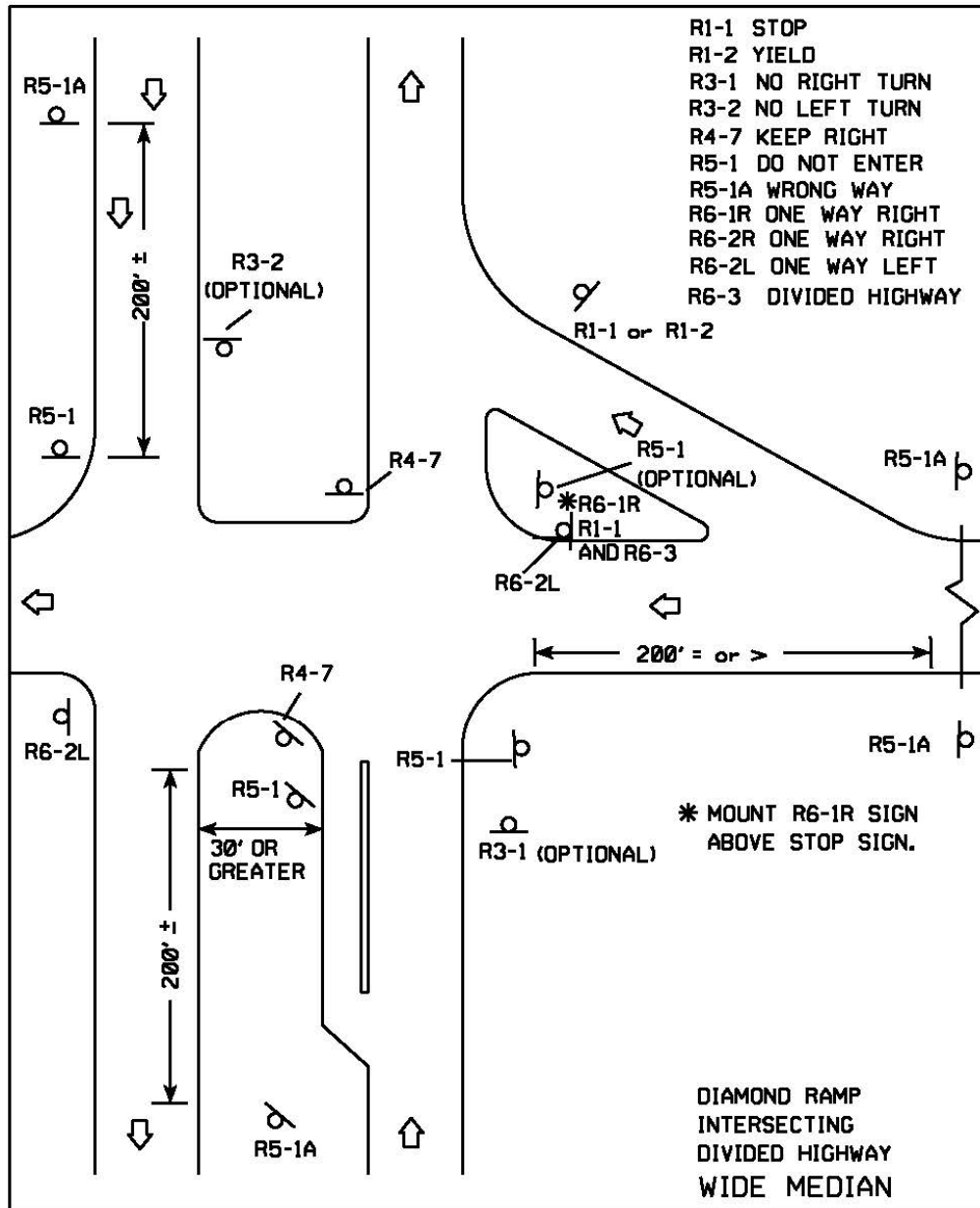


FIG. 3 WRONG WAY SIGNING RELATIVE TO RAMP.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

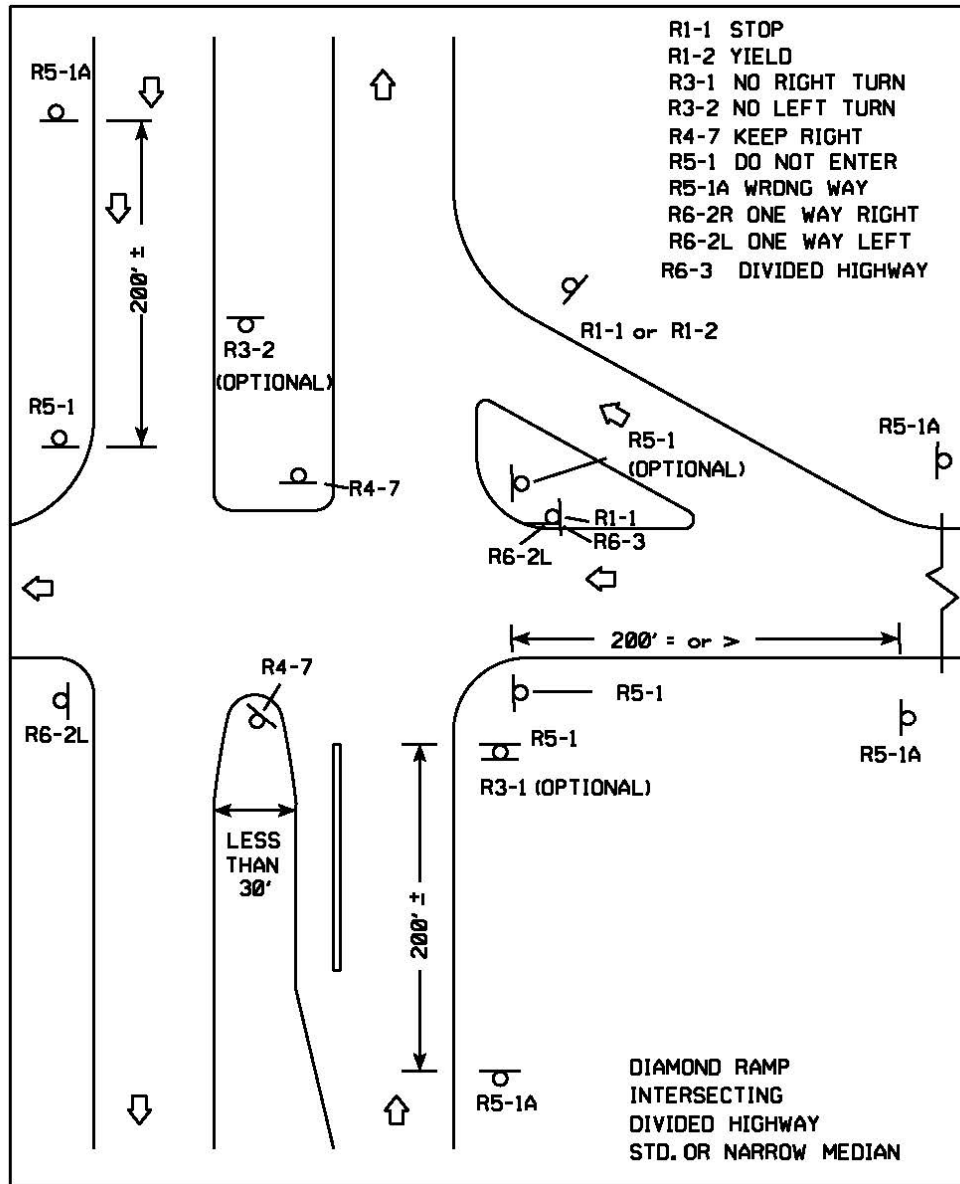


FIG. 4 WRONG WAY SIGNING RELATIVE TO RAMP.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

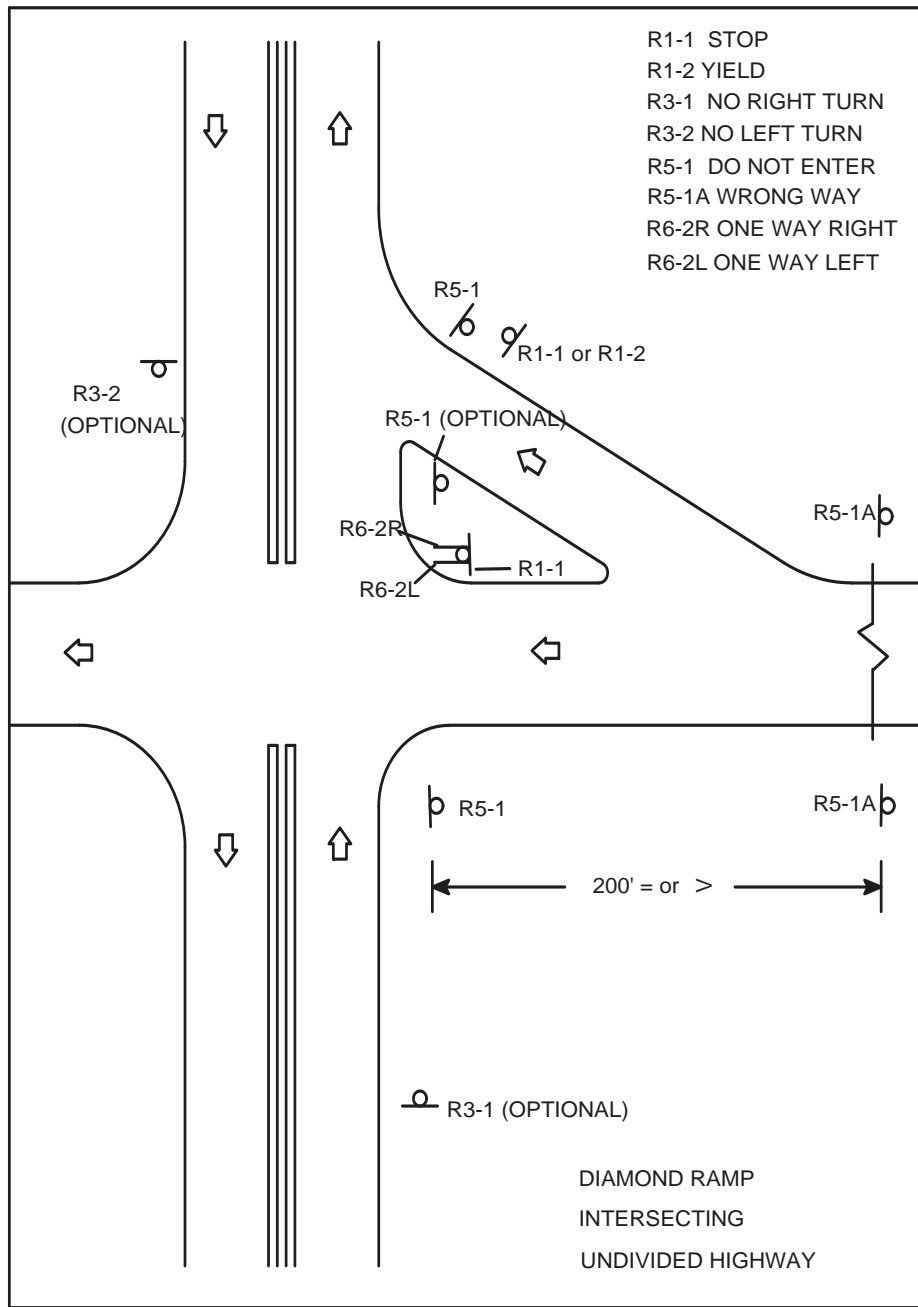


FIG. 5 WRONG WAY SIGNING RELATIVE TO RAMP.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.

FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

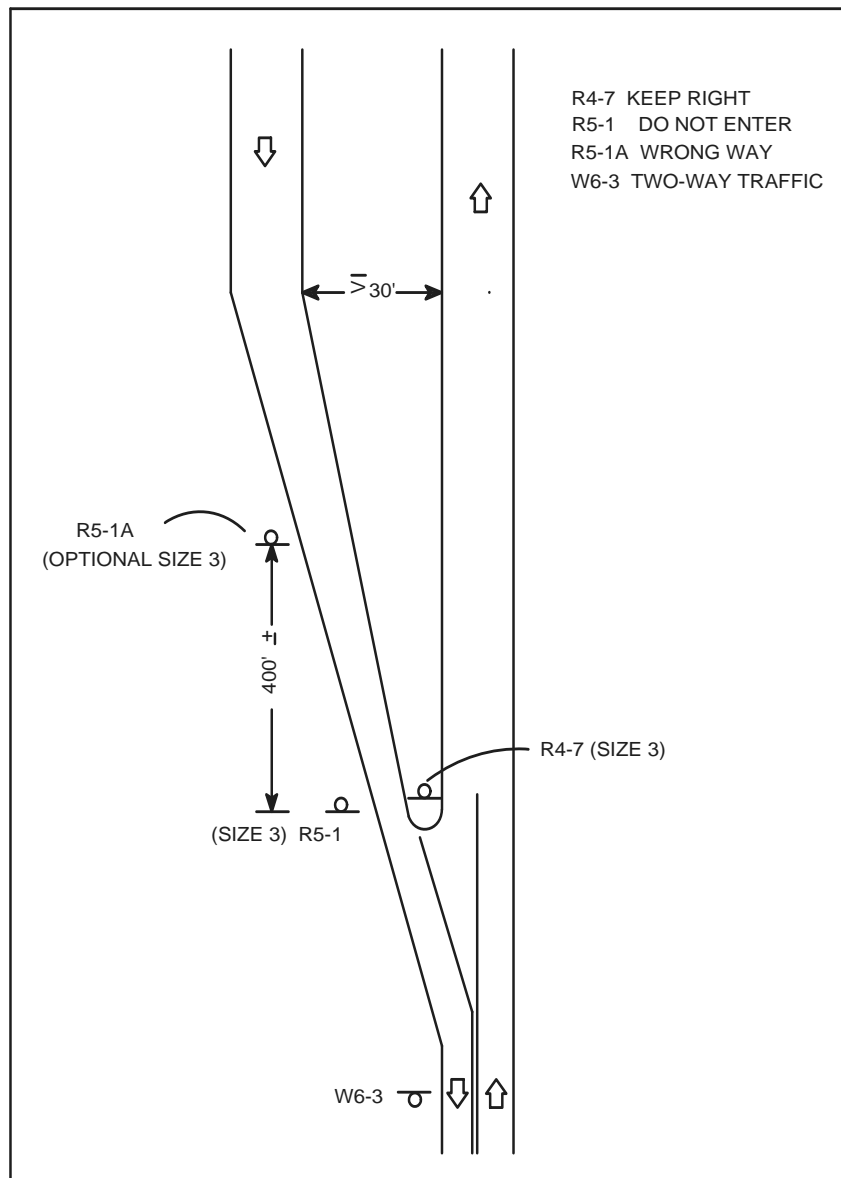


FIG. 6 TRANSITION FROM TWO-WAY UNDIVIDED HIGHWAY TO DIVIDED HIGH'

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
FIELD CONDITIONS MAY DICTATE CHANGES IN
SIGN PLACEMENT.

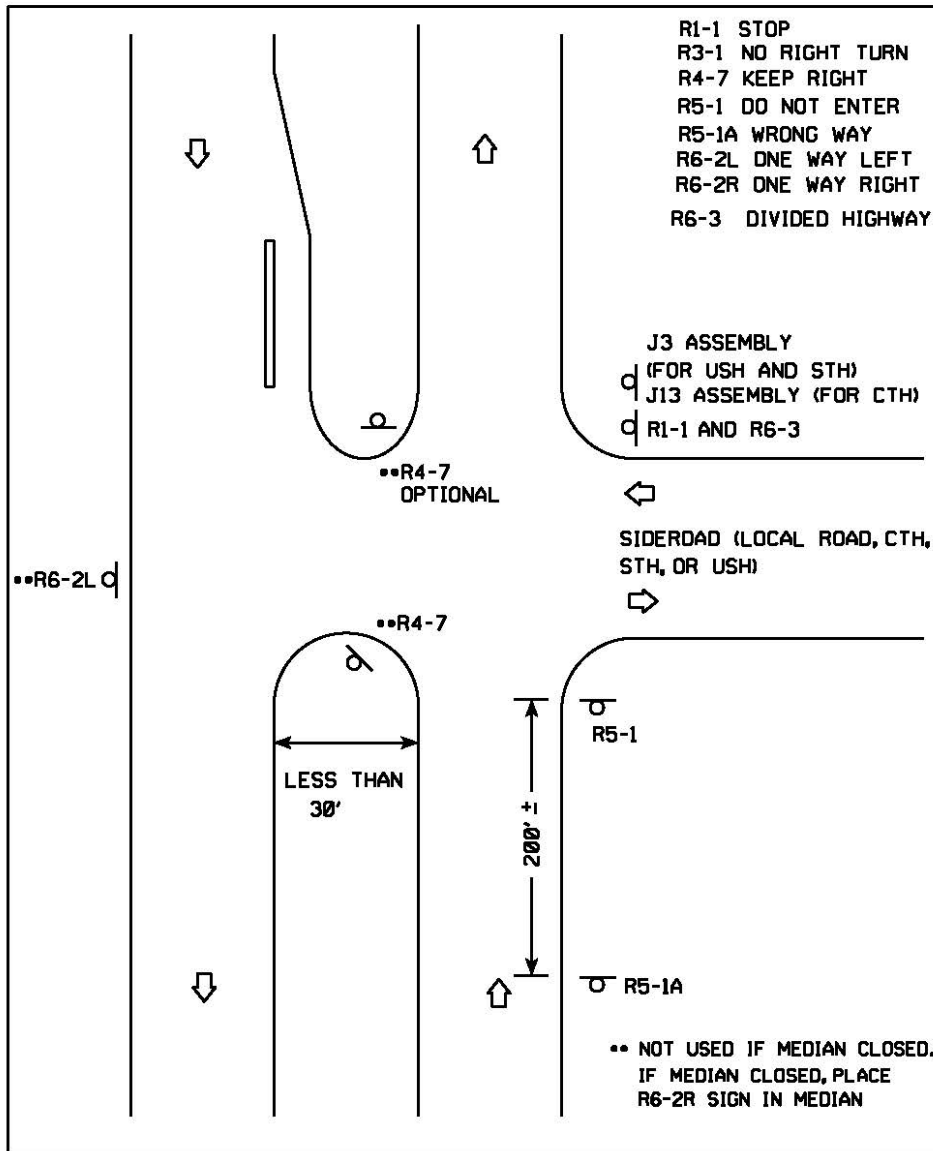


FIG. 7 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

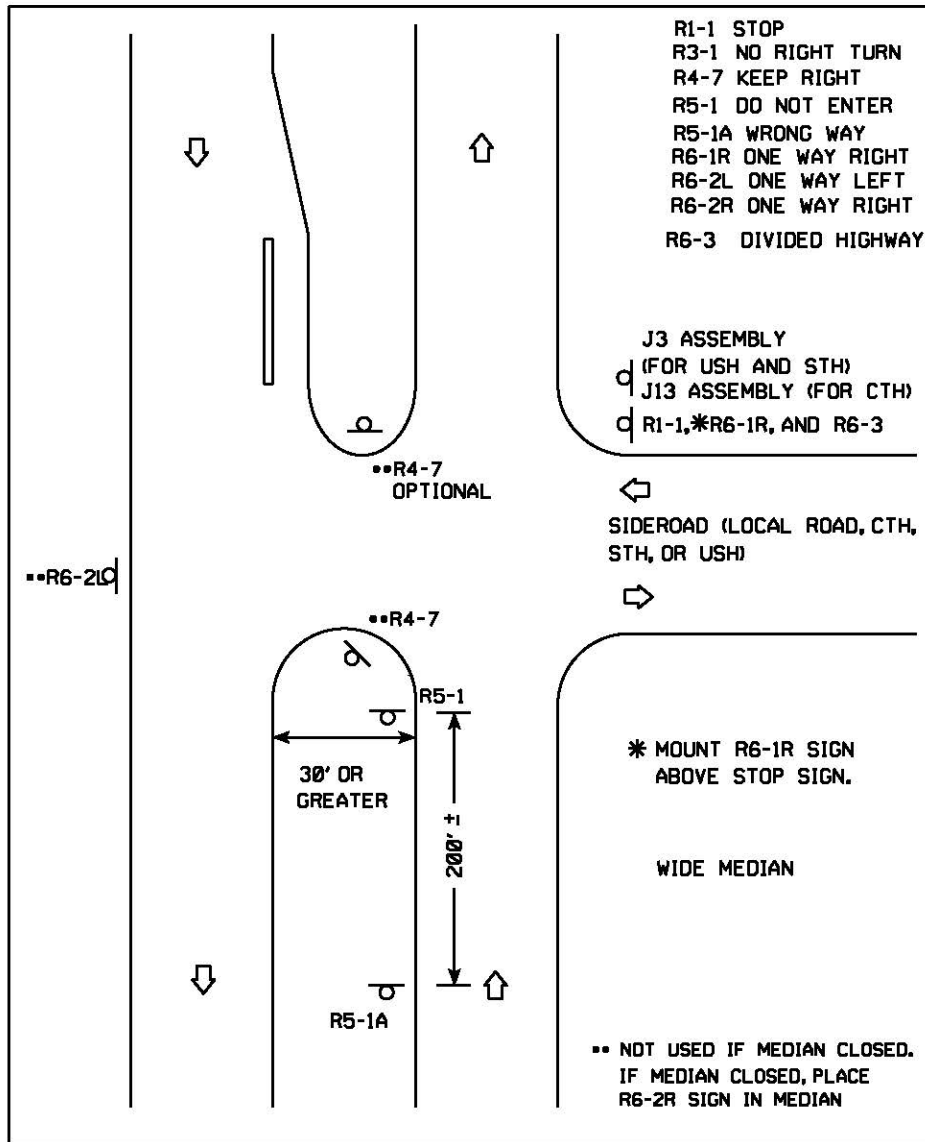


FIG. 8 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
FIELD CONDITIONS MAY DICTATE CHANGES IN
SIGN PLACEMENT.

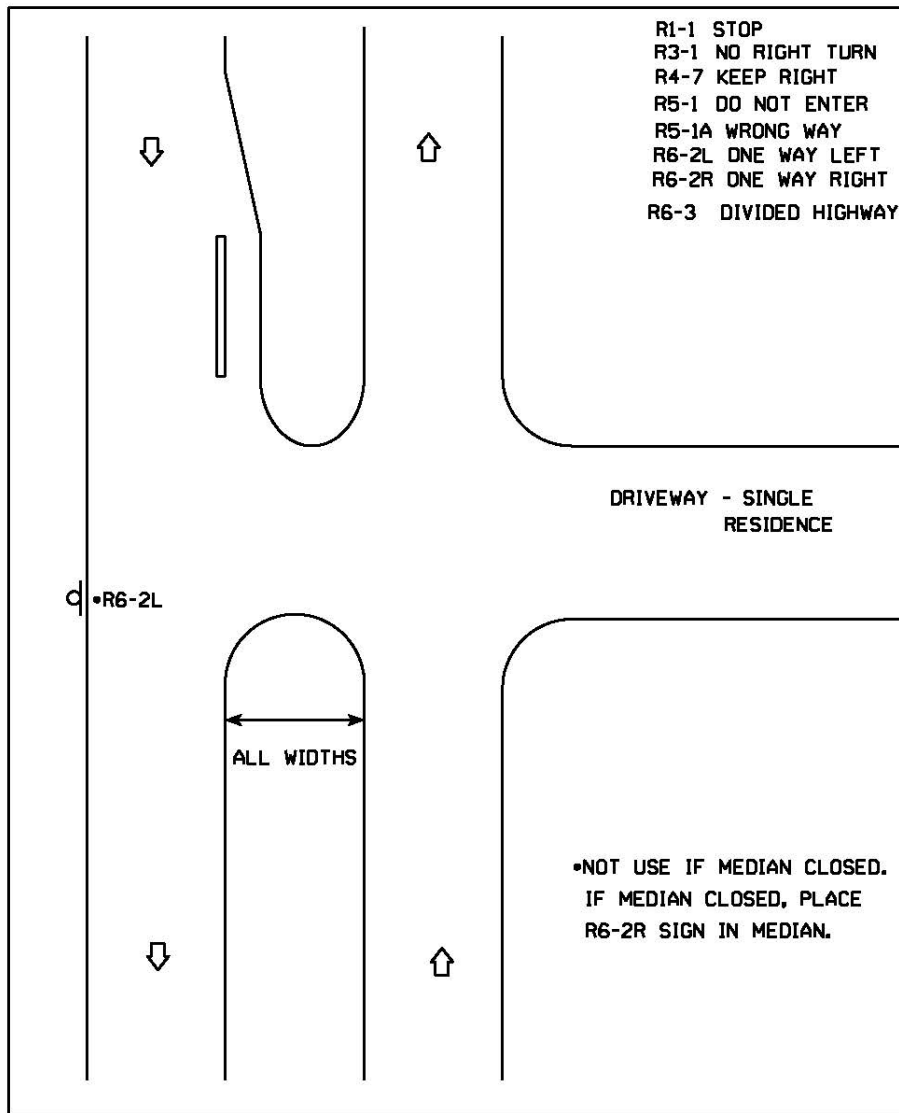


FIG. 9 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

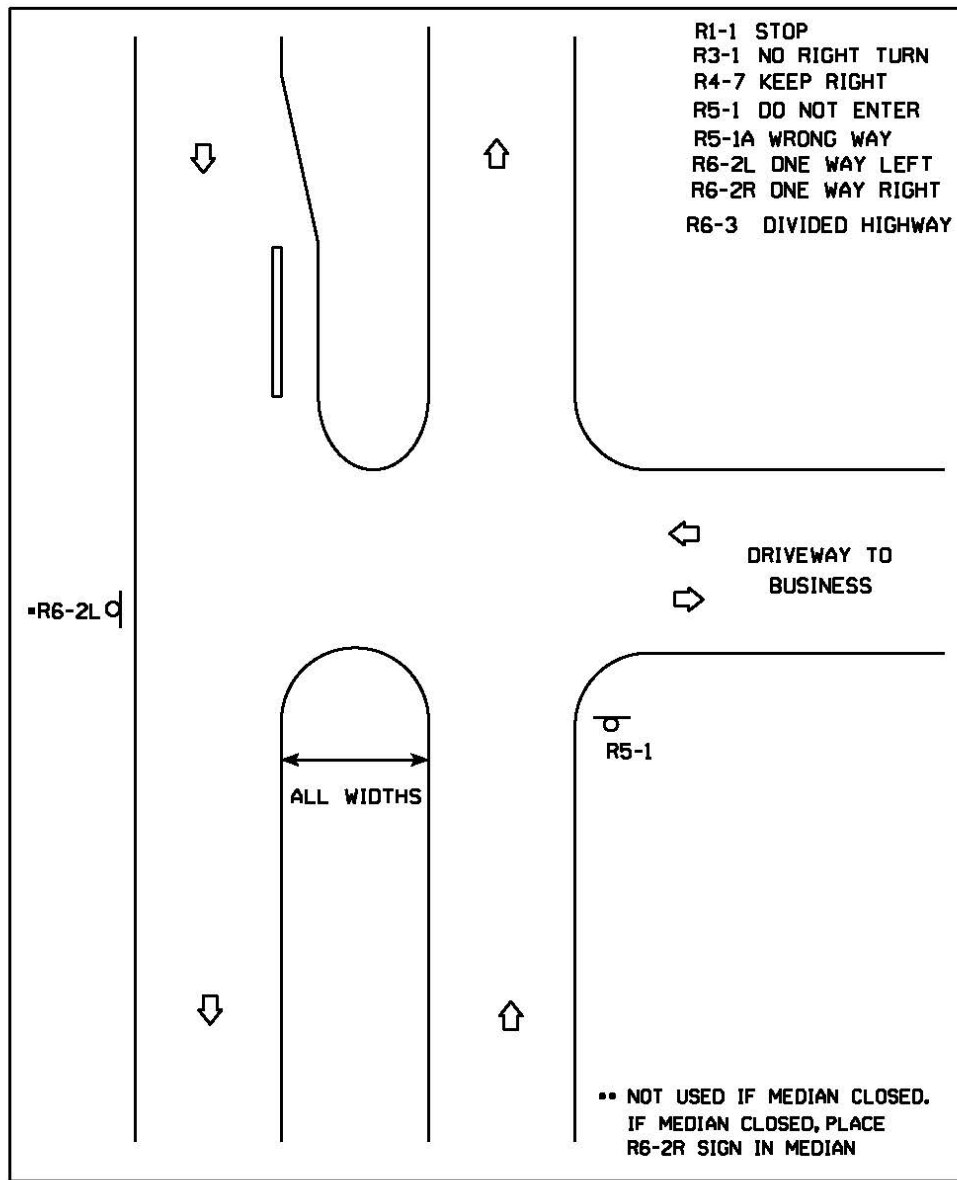


FIG. 10 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

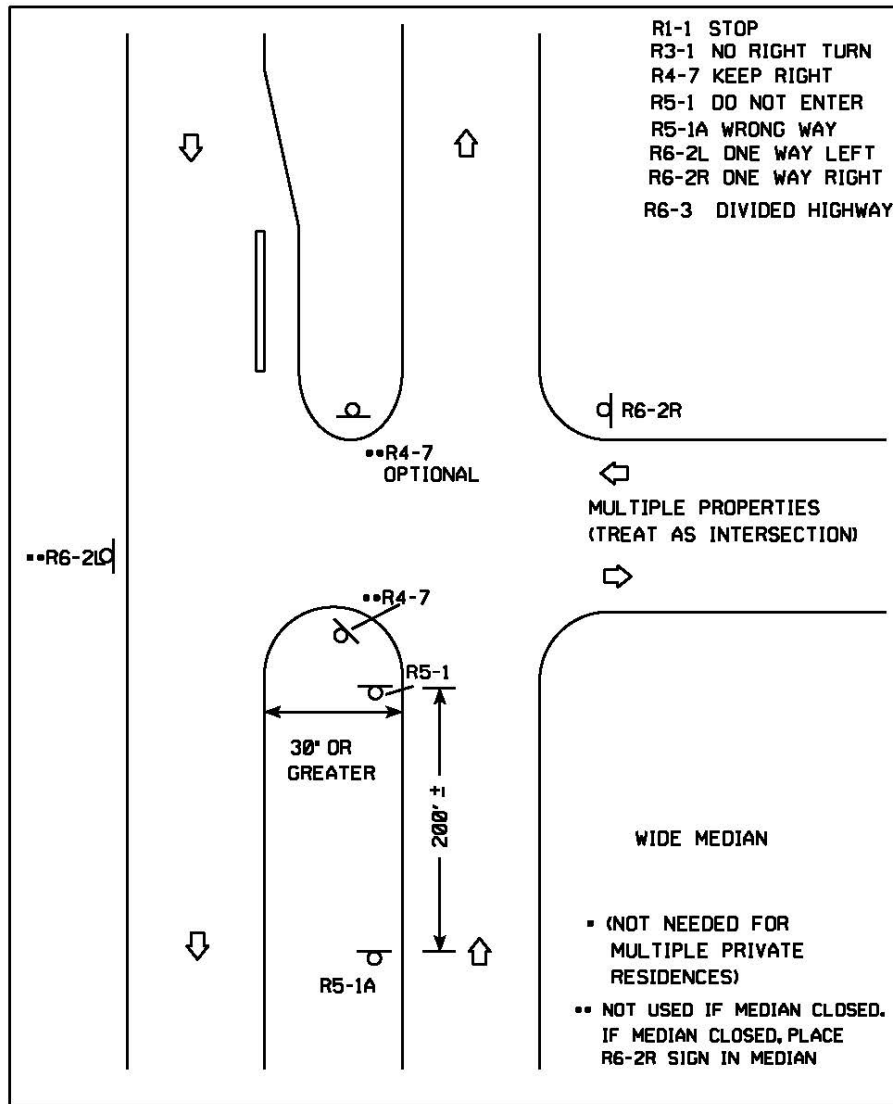


FIG. 11 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

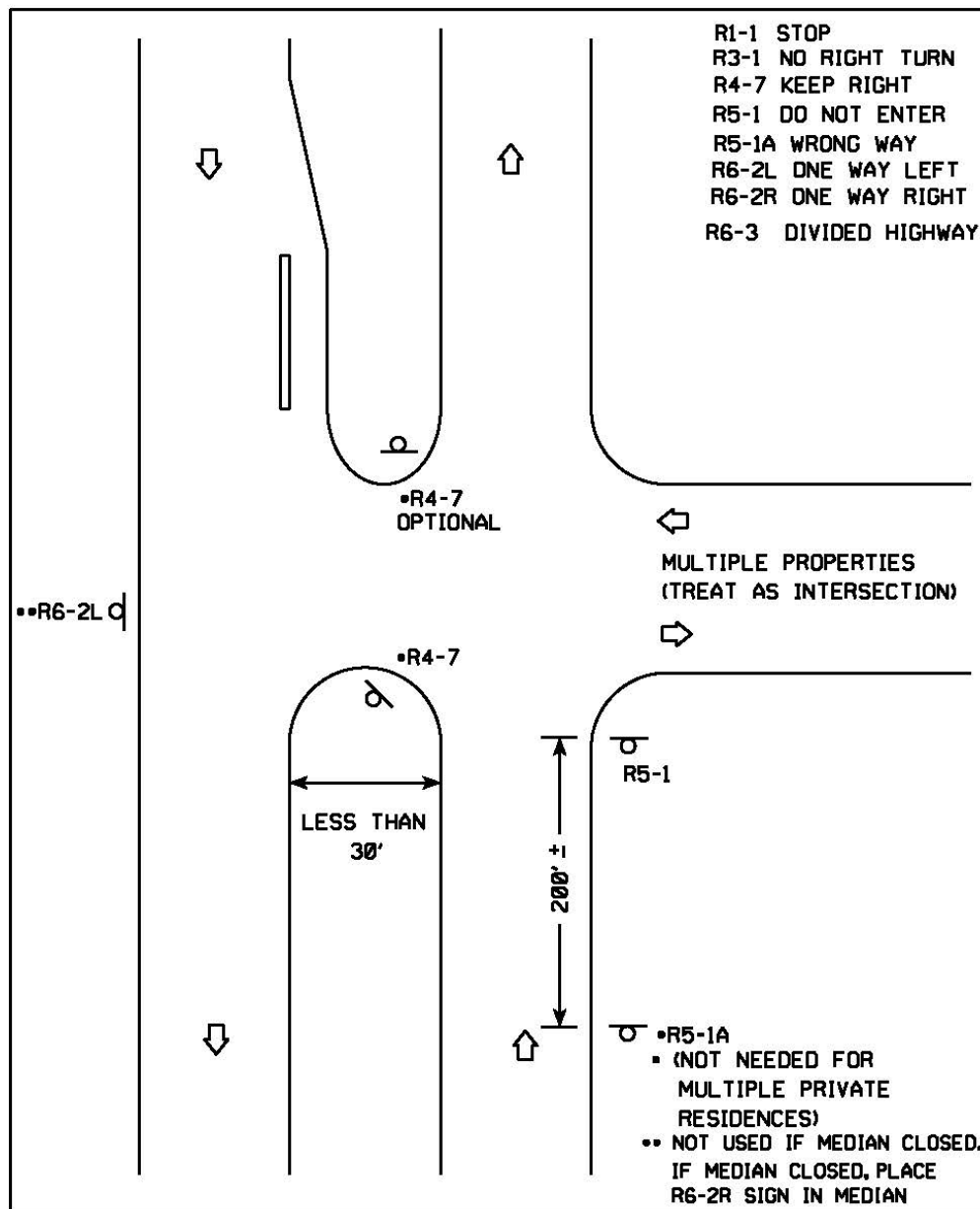


FIG. 12 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

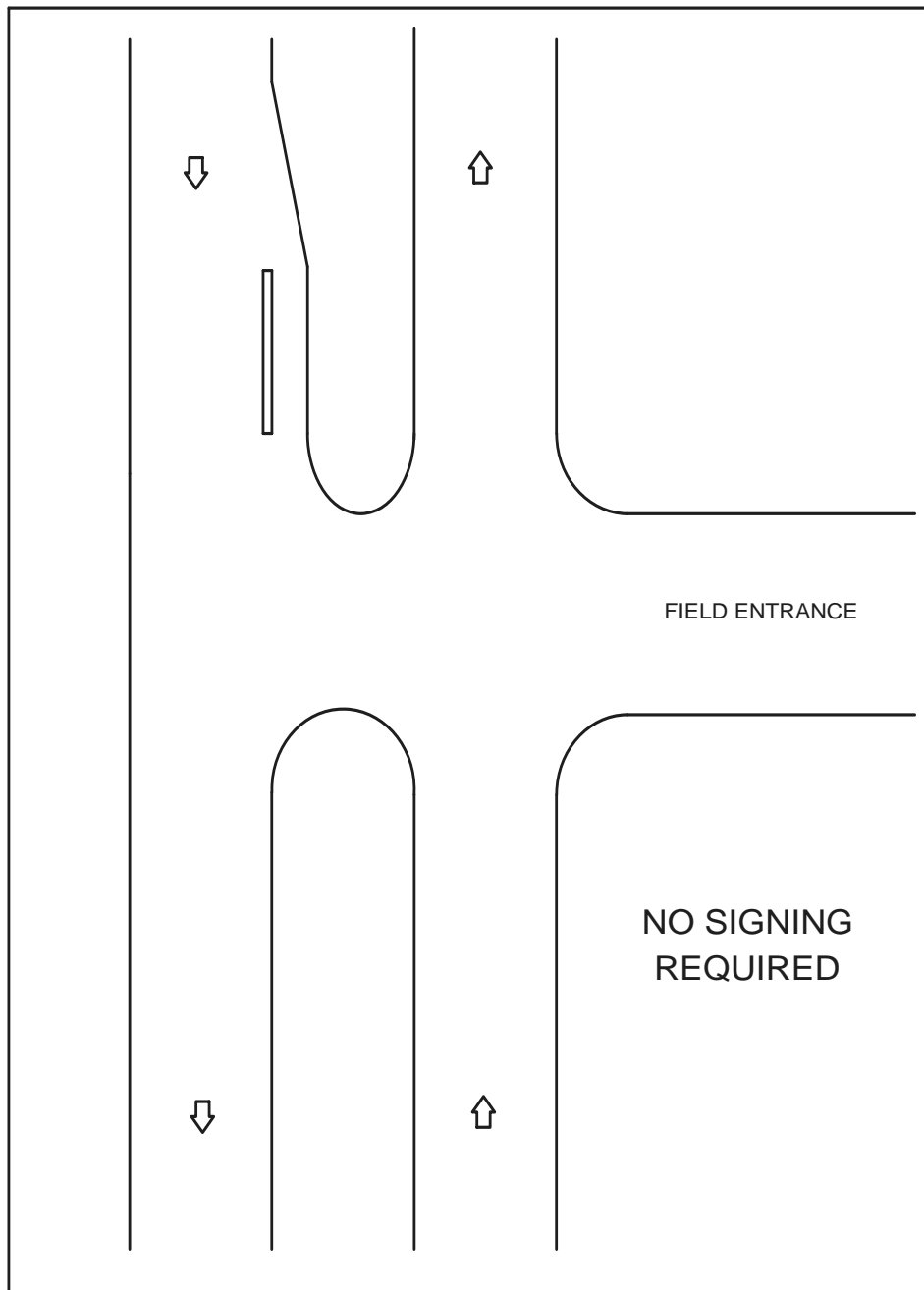


FIG. 13 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
FIELD CONDITIONS MAY DICTATE CHANGES IN
SIGN PLACEMENT.

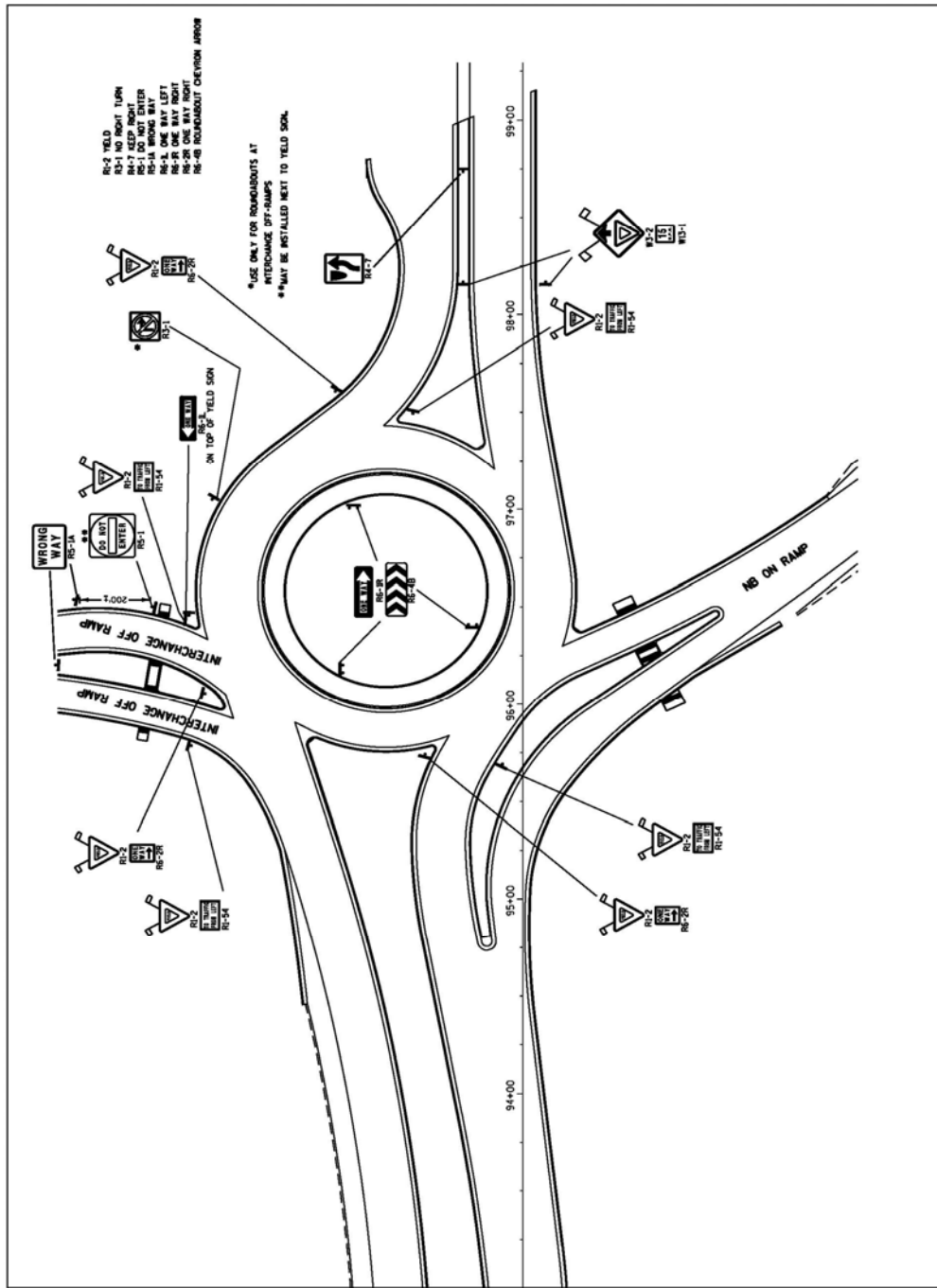


FIG. 14 WRONG WAY SIGNING RELATIVE TO ROUNDABOUT

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT. FIELD CONDITIONS MAY DICTATE CHANGES IN SIGN PLACEMENT

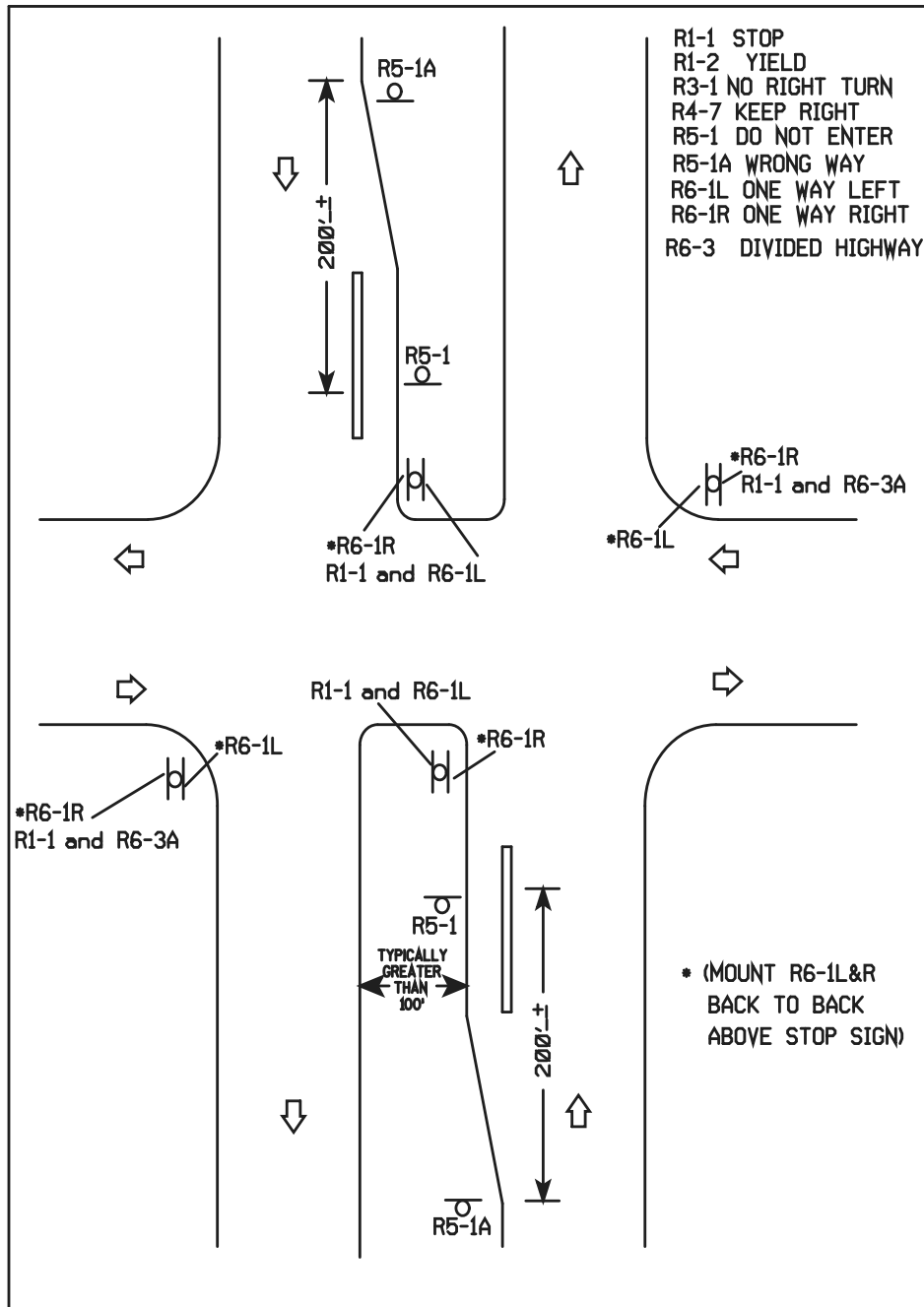


FIG. 15 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

(WIDE MEDIAN WITH STOP OR YIELD SIGN IN MEDIAN)

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.

FIELD CONDITIONS MAY DICTATE CHANGES IN
SIGN PLACEMENT.

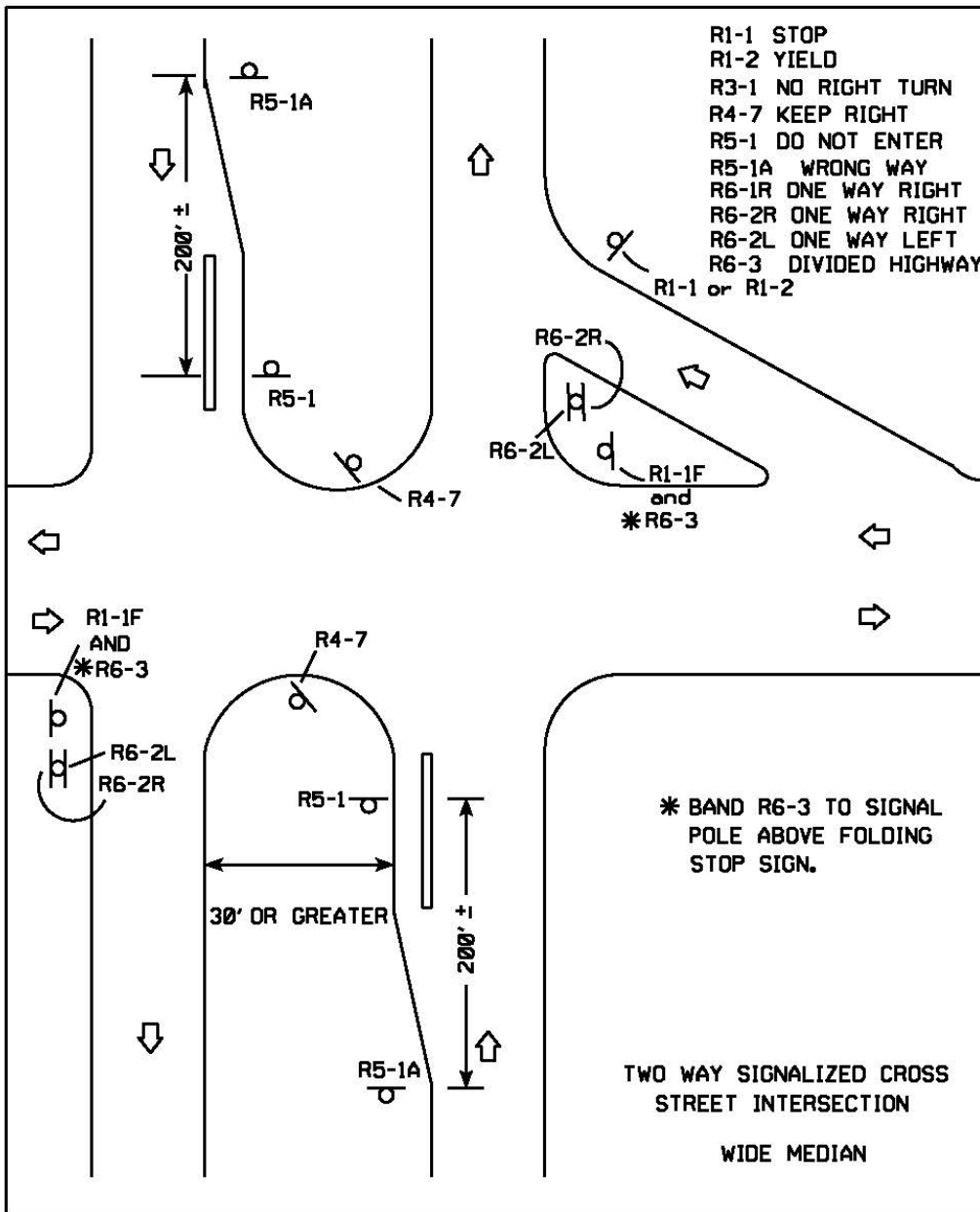


FIG. 16 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

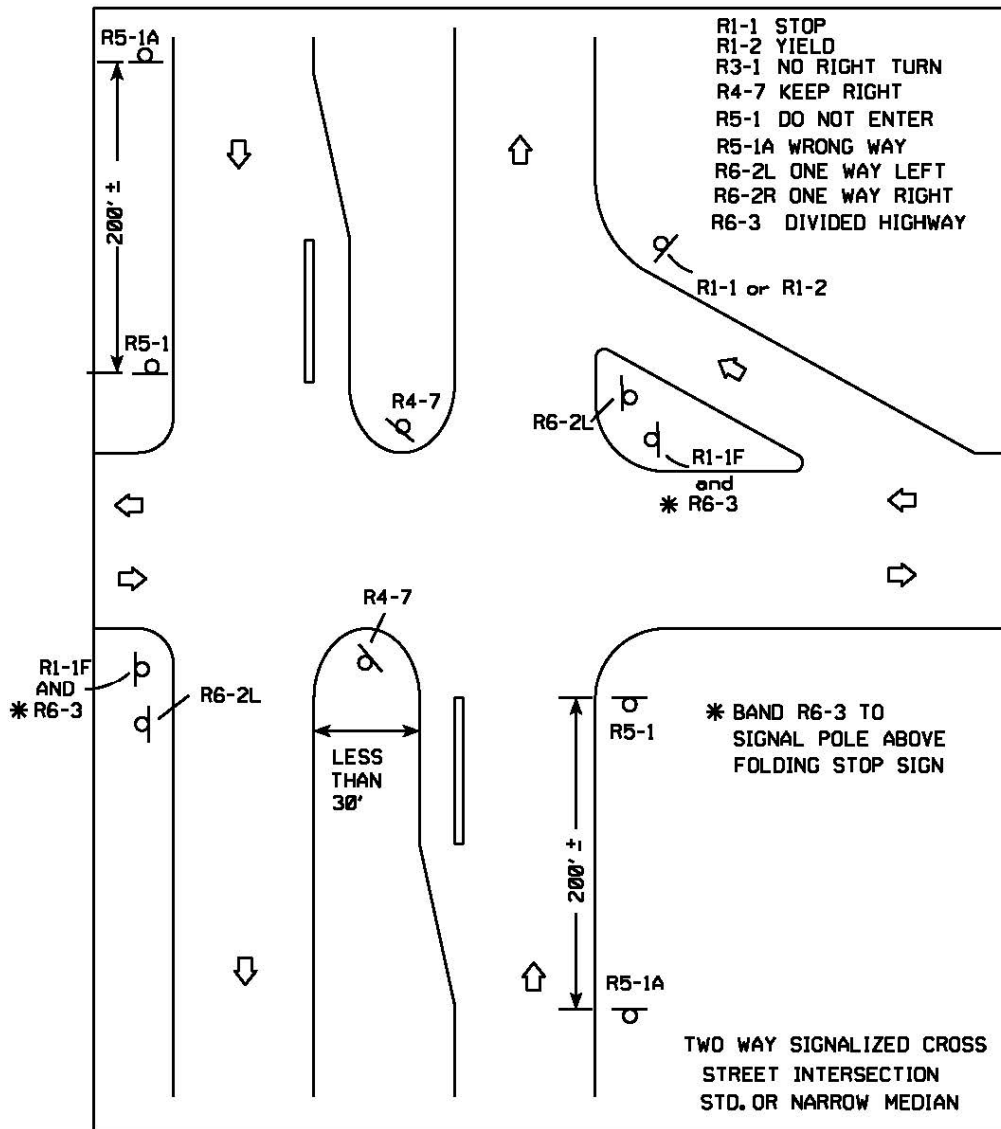


FIG. 17 WRONG WAY SIGNING RELATIVE TO DIVIDED HIGHWAY.

NOTE: SIGNING IS SHOWN AS TYPICAL SIGN PLACEMENT.
 FIELD CONDITIONS MAY DICTATE CHANGES IN
 SIGN PLACEMENT.

2-15-15 Recreational Trail Signing

January 2015

PURPOSE

This policy provides guidance for the installation of guide signs to direct traffic to major access points for public recreational trails. This policy does not address warning signs that *may* apply to locations where the recreational trail crosses a highway.

DEFINITION

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional highways are defined as either divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways can be two-lane or multilane facilities.

POLICY

The following criteria **shall** apply for a trail to be eligible for signing on WisDOT-maintained roadways:

1. Public recreational trails owned and/or managed by the state government **shall** be the only trails that qualify for signing on freeways.
2. Public recreational trails owned and/or managed by the state or county government, or by a multi-state agency or commissions **shall** be the only trails that qualify for signing on expressways.
3. Public recreational trails owned and/or managed by the state or county government, by a multi-state agency or commission, or by a city, village, or township *may* be signed for on conventional highways.
4. All trailblazing signing off the State Trunk Highway system **shall** be in place prior to the installation of any signs on the State Trunk Highway system.
5. The trail **shall** be constructed and maintained to Wisconsin DNR standards, with an improved surface of compacted aggregate or better and be open year round. National Trails, as established by Congress, on the National Trails System with a natural surface *may* qualify for signing, provided the access points to be signed meet all other applicable criteria, including off-street parking facilities.
6. Evidence of poor trail maintenance or inadequate or poor trailblazing signage will be cause to remove any existing signs from the State Trunk Highway system.
7. The message on the signs *should* read "XX State Trail" for state owned trails and "XX Trail" for county, regional, city, village or township trails. The signs **shall** be composed of white lettering on a brown background.
8. For all roadways, only the trail termini will be signed. Intermediate access points *may* qualify for signing. The intermediate access points **shall** be spaced a minimum of 15 miles. A maximum of 2 signs **shall** be installed, one in each direction of travel, for each trail access point to be signed. For freeways and expressways, a directional sign (D1 sign) **shall** be placed on the freeway/expressway ramp to lead to the trail access.
9. Trail termini and intermediate access points *should* have the following amenities:
 - a. Public restrooms or toilets on freeways and expressways, but are optional on conventional highways
 - b. Public, off-street paved or gravel parking facilities
 - c. Trail information
10. Where trail access points from two different trails have the same point of access from the State Trunk Highway, both trail names **shall** be identified on the same sign.
11. These signs **shall** be placed at the closest State Trunk Highway intersections to the trail termini. Trailblazing signing from a conventional State Trunk Highway to another conventional State Trunk Highway will not be allowed.
12. For freeways, expressways, and conventional highways, trail access points **shall** be no more than 5 miles from the nearest exit or State Trunk Highway.
13. The cost for fabrication, installation, and maintenance of any recreational trail signing **shall** be the responsibility of the trail owner or managing organization or agency. WisDOT **shall** coordinate the fabrication, installation, and maintenance of all signs on State Trunk Highways, including ramps, and **shall** be reimbursed for all costs. Installation of signs *may* be performed by WisDOT forces or by permit/letter.

2-15-16 ATV Route Signing

November 2015

PURPOSE

[Section 23.33\(1\)\(c\)](#) Wisconsin Statute defines an all-terrain vehicle (ATV) route as a highway or sidewalk designated for use by ATV operators by the governmental agency having jurisdiction as authorized under this section. In addition, [s. 23.33\(11\)\(am\)\(3\)](#) allows ATV operation on non-interstate highway bridges 1,000 feet in

length or less by ordinance of the county and the municipality in which the bridge is located, regardless of jurisdiction.

At some locations on state trunk highway right of way, local agencies *may* erect signing for the purpose of directing and controlling ATV trail operations. This is permissible unless there is some problem generated by the existence of ATVs at specific locations. Signing for ATV trails and routes is described in [Administrative Code NR 64.12](#) and also described with typical applications illustrated in WDNR's "[Trail Signing Handbook](#)", [2012](#). A copy of this book *should* be kept in each traffic section. This policy will clarify that handbook with regards to ATV use on WisDOT maintained highways.

DEFINITIONS

ATV crossing: A location where an ATV route or trail crosses, but does not run along, a highway.

ATV route: Any roadway or sidewalk properly designated for use by ATV operations per [s. 23.33](#).

ATV trail: A marked corridor on public property or on private lands subject to public easement or lease, designated for use by all-terrain vehicle operators by the governmental agency having jurisdiction, but excluding roadways of highways except those roadways that are seasonally not maintained for motor vehicle traffic.

POLICY

ATV crossing warning signs:

1. ATV crossing warning signs ([W11-50](#)) are shown routinely in the WDNR Trail Signing Handbook. On state maintained highways, these signs **shall** only be installed by WisDOT, and only where warranted due to sight conditions, per the table in Section [2C.46](#) of the MUTCD.
2. WisDOT will assume the installation and maintenance costs for any ATV Trail crossing warning signs installed on the state highway system.

ATV Route guide signs and arrows:

The following policy criteria **shall** be used when ATV Route guide signs are requested from municipalities:

1. ATV Route signs ([D11-10](#)) **shall** be installed immediately downstream from where an ATV Route turns onto a State or US Highway. From a safety standpoint, it is desirable to keep ATVs on the shoulder; however, this *may* cause shoulder rutting issues, especially in locations where ATVs will tend to straddle the paved shoulder/gravel shoulder transition. For this reason, it *may* be desirable to supplement the initial D11-10 signs with "STAY ON PAVEMENT" (R4-55) or "STAY ON SHOULDER" (R4-55-S) signs, mounted directly below the D11-10 sign. Region maintenance *should* be consulted to determine if these signs are necessary. A second D11-10 sign **shall** be installed where the ATV Route turns off of the State or US Highway. This sign **shall** be supplemented with an appropriate [M7 series arrow](#).
2. It *should* be noted that the WDNR Trail Signing Handbook shows a 6" x 12" "directional arrow" above a 6" x 6" ATV symbol sign at locations where the ATV route ends at an ATV trail. This combination of sign **shall not** be installed along ATV routes on State or US Highways. This "directional arrow" sign mimics the design of standard large one-direction (night) arrows. As ATV users will be using some or all of the traffic lane, these signs will be installed at the same offset and mounting height as other traffic signs. This could lead to motorist confusion. ATV routes on State or US Highways ending at ATV trails **shall** utilize the D11-10/M7 sign combinations.
3. The county or local municipality **shall** be required to obtain a permit (see [TEOpS 2-15-3](#)) for these signs from the WisDOT Region Traffic Engineer. The written request *should* contain:
 - a. A copy of both the municipal and county ordinances
 - b. A map showing the ATV Route

The Region Traffic Engineer *should* contact Bureau of Highway Maintenance (BHM), State ROW Permits Engineer, to ensure that the county and municipal ordinances have been reviewed by WisDOT and WDNR. Signs **shall not** be erected until the ordinances are legally in effect. The current BHM contact is [Bob Fasick](#), (608) 266-3438.

4. WisDOT will set up a Professional and Technical Project ID to charge costs to and will coordinate manufacture and installation of the signs. All costs for the installation and maintenance of ATV Route signs **shall** be billed to the county or local municipality. For county requested signs, the Sales to Others process *may* be utilized in lieu of the P&T process.
5. All ATV Route signs, auxiliary arrows and plaques, and ATV crossing signs on State or US Highways

shall be installed on WisDOT standard breakaway supports. Mounting height and offset **shall** follow [sign plate A4-3](#).

Other comments on the WDNR Trail Signing Handbook:

1. Any and all responsibility for signing along trail, off of the state highway, is local, including installation and maintenance.
2. Regarding illustrations in the book:
 - a. Warning signs on the trail when visible from the highway *should* be the minimum size specified.
 - b. Orange markers on the right-of-way would usually be unnecessary except to mark a turn.
 - c. STOP signs are shown too close to the highway. They *should* be back of the snowplowing range, at least 20' from the pavement and desirably more.
 - d. STOP signs *should* be parallel to the highway, and the trail approaching the highway *should* be aligned to be as near to a right angle as possible.
3. On page 14 of the handbook: If requested WisDOT will install and maintain guide signs for trail head parking lots. The signs *should* contain the word "Parking".
4. Trail sign posts on the right of way installed by local agencies **shall** meet the same small support safety standards as those erected by WisDOT.
5. Trail signs **shall not** be attached to any of WisDOT's signposts.

ADDITIONAL INFORMATION

BHM has developed a comprehensive policy on ATV routes and Trails that is available at [HMM 09-10-11](#).

2-15-20 Cemetery Signing

January 2003

PURPOSE

This policy provides guidance for the permitting of signs on WisDOT-maintained roadways directing road users to certain cemeteries. These guidelines apply to conventional highways, expressways, and freeways.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

Conventional highways are defined as either divided or undivided roadway facilities that have no control of access with grade separations at intersections. These highways can be two-lane or multi-lane.

POLICY

The following criteria **shall** apply for a cemetery to be eligible for signing on WisDOT maintained roadways:

1. Only veterans' cemeteries that are exclusively for veterans and that are owned and/or managed by the state or national Department of Veterans Affairs are eligible to be permitted for signing under this policy. The primary function of the facility **shall** be a cemetery. Presently, the Northern Wisconsin Veterans Memorial Cemetery in Spooner and the Southern Wisconsin Veterans Memorial Cemetery near Union Grove are the only two veterans cemeteries that qualify for signage under this policy.
2. All other cemeteries **shall** not be signed on WisDOT maintained roadways.
3. Signing from one conventional State Trunk Highway to another conventional State Trunk Highway will not be allowed. Any necessary signing off of the State Trunk Highway system **shall** be in place prior to the installation of any signs on the State Trunk Highway system.
4. The signs **shall** be white message on green background.
5. On conventional highways, signs *should* be erected a minimum of 500 feet in advance of the intersection or cemetery entrance.
6. On freeways and expressways, signs *should* be erected within one mile in advance of the exit ramp or

side road. Destination signs (D1-1 signs) **shall** be erected at or near the end of the exit ramp or side road approach.

7. For freeways, expressways, and conventional highways, the cemetery **shall** be no more than 5 miles from the nearest exit or State Trunk Highway.
8. The cost for fabrication, installation, and maintenance of this signing **shall** be the responsibility of the cemetery owner or managing organization or agency. WisDOT **shall** coordinate the fabrication, installation, and maintenance of all signs on State Trunk Highways, including ramps, and **shall** be reimbursed for all costs.

2-15-30 Hydrant Signing

November 2015

PURPOSE

Coordination with fire departments has indicated problems with limited identification of fire hydrant locations from the freeway or expressway. This is especially important in areas where the view of fire hydrants from the highway is obstructed. It has been learned that response to freeway or expressway fires can be a two-squad operation. There is response time to the freeway or expressway fire scene, and there is response time to fire hydrants off of the highway right-of-way. The freeway or expressway response crew must coordinate location and hook-up to the hydrant. When location of the hydrant is uncertain, time is lost. The purpose of this guideline is to establish criteria on the usage of fire hydrant location signs and sign identification blades along noise walls.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have full controlled access, by means of grade separation at interchanges only.

Expressways are defined as divided arterial highway facilities that have partial control of access and generally with grade separations at major intersections.

POLICY

The placement of hydrant signs is most critical where the vision of the fire hydrant or local street from the highway (freeway or expressway) is restricted. Sound walls are an excellent example of where vision is completely restricted. Topography of landscape *may* also hinder vision. It is the intent of the Department to install hydrant signs that satisfy the following conditions:

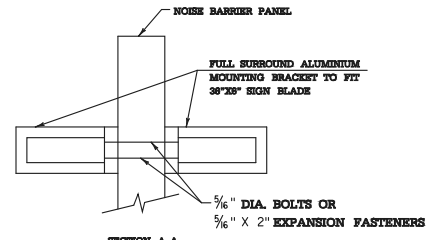
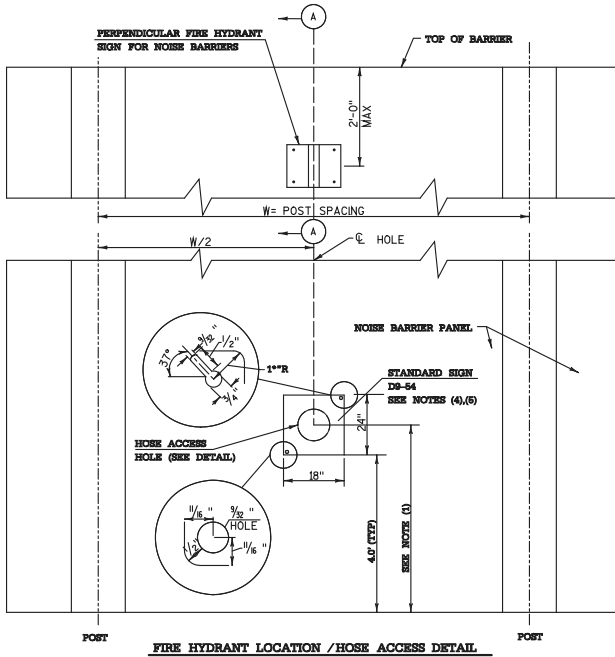
1. At all sound wall installations where the wall creates a visual and physical barrier between the roadway and the hydrant.
2. At locations where topography or landscape create a visual or physical barrier between the highway and the hydrant, the hydrant signs *should* be mounted either on posts or the right-of-way fence on the highway side.
3. At locations where crash experience is above average, and expeditious response is advantageous.
4. At locations where fire hose standpipes have been installed. Signs *should* be mounted on posts near the standpipe access joint.
5. The local fire department or fire district **shall** pay for all costs of the sign, sign blade and all mounting hardware. This includes the costs for initial installation and long-term maintenance. The Department *may* pay for the initial installation provided they are part of a project.

SIGN INSTALLATION

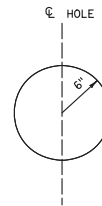
1. The hydrant sign (D9-54 sign) **shall** be placed, with movable capability, over the fire hose access hole (See Figure 1).
2. A two-sided sign blade (D9-54A sign) with blue Type H Reflective sheeting **shall** be placed on all new sound wall installations. Existing sound wall installations without the two-sided blade *should* be retrofitted with the blade as opportunities allow. The sign blade *should* be placed near the top of the sound wall on the highway side, above the fire hose access hole (See Figure 1).

Standard sign plate D9-54 (See Figure 2) has been developed for hydrant signs (See attached sign plate detail). The sign is white on green, containing a fire hydrant symbol and the approximate numerical address of the fire hydrant.

It is strongly encouraged that contact is made with the fire department jurisdictions responding to the freeway or expressway to verify the numerical address of the hydrant.



SECTION A-A
PERPENDICULAR FIRE HYDRANT SIGN FOR NOISE BARRIER



HOSE ACCESS HOLE DETAIL

NOTES:

1. STANDARD SIGNS D9-54 WILL BE FURNISHED BY THE CONTRACTOR. SEE PLAN.
2. THREE STANDARD SIGNS D9-54 TO BE FURNISHED PER STATION. ONE SIGN SHALL BE INSTALLED ON EACH SIDE OF THE BARRIER. ONE ADDITIONAL SIGN TO BE INSTALLED ON FENCE AT RW LINE WITH MESSAGE FACING AWAY FROM FREEWAY.
3. ADDITIONAL FIRE HYDRANT SIGNS SHALL BE ATTACHED TO THE NOISE BARRIER PANEL NEAR THE TOP OF THE BARRIER. SEE DETAIL ABOVE, PAID FOR UNDER "PERPENDICULAR FIRE HYDRANT SIGN FOR NOISE BARRIERS". SEE SPECIAL PROVISIONS.

| Metric equivalent for this sign size | | | | | | | | | | | | |
|--------------------------------------|----|----|-------|----|----|----|-------|-------|-------|--------|-------|----|
| MM | IN | MM | IN | MM | IN | MM | IN | MM | IN | MM | IN | MM |
| 2 | 38 | 24 | 1 1/2 | | | 2 | 1 1/2 | 4 1/2 | 8 1/2 | 13 1/2 | 5 3/8 | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |

NOTES

1. Sign is Type II - Type H Reflective - reference MTS DOT Standard Specification for HIGHWAY and STRUCTURE CONSTRUCTION latest edition.
2. Color:
Background - Green
Message - White - Type H Reflective
3. Message Series - B thru E See Note 5
4. Corners may be square or rounded when base material is plywood. When base material is metal, the corners shall be rounded.
5. Select appropriate message series and adjust spacing to achieve proper balance. Each line is independent, therefore use the maximum series available while still fitting within physical limitations of sign.

ALLERTON 2" E

← 15 1/4 →

BRIARCLIFF 2" C

← 15 1/4 →

* See Note 5

| SR | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | SR | MM |
|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----|-----|
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | 3.0 | .26 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

PROJECT NO: _____ SHEET NO: _____

| |
|---------------------------------|
| STANDARD SIGN |
| 09-54 |
| MICHIGAN DEPT OF TRANSPORTATION |
| APPROVED <i>Chen J. Song</i> |
| DATE 1/15/02 PLATE NO. 02-543 |
| SHEET NO: _____ |

NOTES

1. Sign is Type II - Type H Reflective - reference WIS DOT Standard Specification for HIGHWAY and STRUCTURE CONSTRUCTION latest edition.
2. Color:
Background - GREEN
Message - WHITE (HYDRANT) TYPE H REFLECTIVE
3. Corners may be square or rounded when base material is plywood but borders shall be rounded as shown. When base material is metal, the corners and borders shall be rounded.

Metric equivalent for this sign is:

| SIZE | 1 | 2 | 3 | 4 | 5 |
|------|---|-----------------|---|---|---|
| 1 | | | | | |
| 2 | | 450 mm X 450 mm | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |

| SIZE | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | IN. | MM. |
|------|----|---|-------|---|---|--------|-------|-------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|------|------|
| 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 18 | | 1 1/2 | | | 13 1/2 | 2 1/4 | 5 1/2 | | | | | | | | | | | | | | | | | | | 2.25 | 0.20 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | |
|---|------------------------------|----------------------|-------------|
| PROJECT NO: | PLOT DATE: 20-OCT-2005 08:26 | PLOT BY: D0100K | SHEET NO: E |
| FILE NAME: C:\Users\Project\Project\stb\stb\0254A.DGN | | WISDOT/CADD/SHEET 42 | |

2-15-31 Signing for Low Inlets Along Barrier Walls

March 2011

PURPOSE

County maintenance personnel, first responders, and WisDOT maintenance staff have indicated problems with identification of low inlets along freeway barrier walls. There could be times that the inlets are covered with snow, ice or other debris that makes location difficult. Clogged inlets can present potential traffic safety issues and efficient, rapid location of them is very essential.

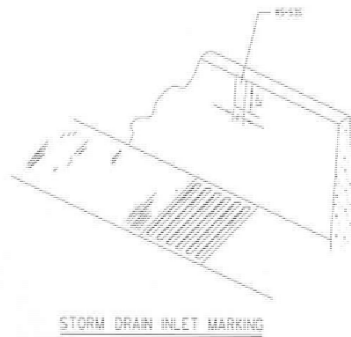
FHWA has indicated that a sign used for marking such inlets would not be considered an official traffic sign. Technically, the sign would not be in the line of sight or directed to passing motorists.

This policy governs the design and placement of signing for low inlets along freeway barrier walls.

POLICY

The sign used for the identification of low inlets along barrier walls is the green object marker (W5-53S) sign. This sign *may* be used, provided the following criteria are met:

1. The request to use the signs **shall** be coordinated with both the WisDOT Region Maintenance Engineer and Traffic Engineer.
2. The signs **shall** be installed on the face of the barrier, near the top to prevent covering by snow. See Figure 1 for typical installation detail.
3. Signs are paid for under the bid item: Signs Reflective Type II.
4. The signs **shall** be manufactured on 0.040" thick aluminum and fastened to the concrete wall with an adhesive with 1 1/2" concrete anchor screws at each corner.
5. Replacement signs for maintenance **shall** be obtained through WisDOT.

Figure 1. Typical Installation of Storm Drain Inlet Marking**2-15-36 Distance Signs, D2-Series and Post-Interstate E8-Series****February 2018****PURPOSE**

The purpose of this policy is to provide guidance for the use of Distance signs on State Highways under Department of Transportation jurisdiction. This policy guidance will address the selection of destinations, consistent determination of appropriate distances, sign design, and typical Distance sign placement.

General guidance on selection of destinations can be found in the MUTCD Sections [2D.37](#) and [2E.35](#). Specific guidance on the selection of destination cities can be found in [TEOpS 2-15-5](#).

Guidance on the location of Distance signs is found in MUTCD Sections [2D.38](#) and [2E.39](#).

This policy does not apply to Interchange Sequence signs, which are addressed in MUTCD Section [2E.36](#).

B. Definitions

Distance Signs are defined as guide signs displaying a sequence of one to three destinations ahead with the distance to reach those destinations.

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate Highways are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional Highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

National Control Cities are Chicago, Milwaukee, Beloit, Rockford, Janesville, Madison, Wisconsin Dells, La Crosse, Albert Lea, Eau Claire, St. Paul, Sheboygan, and Green Bay.

Regional Control Cities are defined as

1. Urban areas in Wisconsin or within 60 miles of the state line with a population in the most recent decennial census of 30,000 or more,
2. Other communities, such as Sturgeon Bay, Woodruff, Minocqua, and Lake Geneva, which are approved by the State Traffic Engineer based on their character as widely known tourism destinations, and
3. Urban areas on or north of Highway 64 with a population exceeding 3500, and urban areas south of Highway 64 with a population exceeding 10,000.

Major Crossroads or Side Roads, in most cases, *should* be state highways, but *may* be a county highway or local arterial serving a nearby community.

POLICY**General Guidance**

1. The combination Destination Direction and Distance signs, such as is designated D1-1a, D1-2a, or D1-3a in MUTCD, **shall not** be used on state highways.
2. Unincorporated communities **shall not** be displayed on Distance signs unless the community is

designated a Regional Control City.

3. Traffic generator supplemental sign destinations **shall not** be displayed on Distance signs.
4. The sign design format for distance signs **shall** use upper and lower case letters.
5. The letter sizes **shall** be appropriate for the highway class; minimum 6-inch/4½-inch on conventional highways and minimum 8-inch/6-inch on expressways and freeways.

The selection of destinations **shall** be solely for the purpose of guidance and information for the non-local state highway driver, and **shall not** be used to promote communities, facilities, or preferential routes.

The first line of the sign **shall** designate the next selected “destination” in the direction of travel. If used, a second line of the sign *may* designate the second, or an interim, destination of importance in the direction of travel. The bottom line **shall** designate a National Control City or Regional Control City or the last incorporated city or village of the greatest significance, in that order of priority.

Distances **shall** be rounded up or down, as appropriate, to display the even mile.

Specific Guidance – Conventional Highways

The first destination on a Distance sign on a conventional state highway **shall** display either the next incorporated community (city or village), or the next major crossroad or side road, whichever is deemed the most beneficial information for the driver.

If used, the second line of the Distance sign *may* display the second major crossroad or a subsequent incorporated community served by the state highway. Selection of the community *may* be guided by use of the comparative population and distance formula in [TEOpS 2-15-5](#). Selection *may* also be varied on successive Distance signs to display alternative communities served by the route.

The bottom line of a Distance sign on a state highway **shall** designate a National Control City or Regional Control City or the last incorporated city or village of the greatest significance, in that order of priority. The bottom line control city *should* be the same on all successive Distance signs along the route until that city is reached.

If the conventional state highway does not enter the corporate limits of a community, the community **shall not** be displayed on the Distance sign, but *may* appear on a Direction sign (D1-series) at the appropriate location.

Distances to a crossroad **shall** be rounded to the nearest even mile.

Distances to a community *may* be measured differently depending on the size of the community and how the state highway passes through it.

1. If the community is not very large and the highway serves the central business district, the distance *should* be measured to that “downtown” area and *may* be rounded down.
2. If the highway does not serve the downtown, the distance *may* be measured to the municipal limits or a major crossroad within the municipal limits and *may* be rounded up.
3. If the city is large, the distance *may* be measured to a major crossroad or municipal feature within the city limits.

Distance signs *should* be installed downstream from rural interchanges and STH/USH intersections, following the J4 and R2-1 signs. Distance signs are typically not installed within incorporated city or village limits. A distance sign *should* be installed where a conventional highway exits the limits of the last contiguous incorporated city or village, across from the I2-3. Distance signs *should not* be installed where the highway leaves an unincorporated community, unless the community is designated a Regional Control City.

Specific Guidance – Expressways

The first destination on a Distance sign on an expressway **shall** display either the next incorporated community (city or village), or the next major crossroad or interchange, whichever is deemed the most beneficial information for the driver.

If used, the second line of the Distance sign *may* display the second major crossroad or interchange or a subsequent incorporated community served by the state expressway. Selection of the community *may* be guided by use of the comparative population and distance formula in [TEOpS 2-15-5](#). Selection *may* also be varied on successive Distance signs to display alternative communities served by the route.

The bottom line of a Distance sign on an expressway **shall** designate a National Control City or Regional

Control City or the last incorporated city or village of the greatest significance, in that order of priority. The bottom line control city *should* be the same on all successive Distance signs along the route until that city is reached.

If the state expressway does not enter the corporate limits of a community, the community **shall not** be displayed on the Distance sign, but *may* appear on a Direction sign (D1-series) or Exit sign (E1- or E4-series) at the appropriate location.

Distances to a crossroad or interchange **shall** include the exit ramp and **shall** be rounded to the nearest even mile.

Distances to a community *may* be measured differently depending on the size of the community and how the state expressway passes through it.

1. If the community is not very large and the highway serves the central business district, the distance *should* be measured to that “downtown” area and *may* be rounded down.
2. If the highway does not serve the downtown, the distance *may* be measured to the municipal limits or an interchange or major crossroad within the municipal limits and *may* be rounded up.
3. If the city is large, the distance *may* be measured to an interchange or major crossroad or municipal feature within the city limits.

Distance signs should be installed downstream from rural interchanges and STH/USH intersections, following the J4 and R2-1 signs. At interchanges, a Distance sign *should* be installed on the mainline downstream from the on-ramp, after the J4 and R2-1. Where multiple interchanges serve the same community, a Distance sign *should* only be installed after the last interchange serving that community. Where less than 3 miles exists between the on-ramp taper point and the next off-ramp theoretical gore, the Distance sign *may* be omitted.

Specific Guidance – Freeways

The first destination on a Distance sign on a freeway **shall** display either the next interchange, or the next incorporated community (city or village), whichever is deemed the most beneficial information for the driver.

If used, the second line of the Distance sign *may* display the second interchange or a subsequent incorporated community served by the freeway. Selection of the community *may* be guided by use of the comparative population and distance formula in [TEOpS 2-15-5](#). Selection *may* also be varied on successive Distance signs to display alternative communities served by the route.

The bottom line of a Distance sign on a freeway **shall** designate a National Control City or Regional Control City or the last incorporated city or village of the greatest significance, in that order of priority. The bottom line control city *should* be the same on all successive Distance signs along the route until that city is reached.

If the freeway does not enter or pass within one mile of the corporate limits of a community, the community **shall not** be displayed on the Distance sign, but *may* appear on an Exit sign (E1- or E4- or E9-series) at the appropriate location.

If the freeway does pass within one mile of the corporate limits of a community, the community *may* be displayed on the Distance sign, and *may* appear on an Exit sign (E1- or E4- or E9-series) at the appropriate location.

Distances to an interchange **shall** include the exit ramp to the crossroad and **shall** be rounded to the nearest even mile.

Distances to a community *may* be measured differently depending on the size of the community and how the freeway serves it.

1. If the community is not very large and the freeway serves the central business district, the distance *should* be measured to a “downtown” interchange and *may* be rounded down.
2. If the freeway does not serve the downtown, the distance *may* be measured to the municipal limits or a major interchange within the municipal limits and *may* be rounded up.
3. If the city is large, the distance *may* be measured to a major interchange or municipal feature within the city limits.

At interchanges, a Distance sign *should* be installed on the mainline downstream from the on-ramp, after the J4 and R2-1. Where multiple interchanges serve the same community, a Distance sign *should* only be installed after the last interchange serving that community. Where less than 3 miles exists between the on-ramp taper point and the next off-ramp theoretical gore, the Distance sign *may* be omitted.

2-15-51 Routine Sign Replacement Criteria**January 2015****PURPOSE**

Over time the visual characteristics of signs deteriorate as a result of weather, age and ultraviolet radiation, resulting in reduced legibility performance day and/or night. As a result, signs have to be changed periodically as part of a routine sign replacement. There are a number of mechanisms to accomplish the replacement of signs on the WisDOT system. Often questions arise as to when signs *should* be changed, who *should* change the signs and what criteria *should* be used in determining replacement. Therefore, it is necessary to have clear, consistent guidelines for the routine replacement of signs on state highways.

FEDERAL HIGHWAYS MINIMUM SIGN RETROREFLECTIVITY VALUES

Section [2A.08](#) of the MUTCD requires all units of government to use an assessment or management method that is designed to maintain the retroreflectivity of signs at or above the levels prescribed in the MUTCD Table 2A-3. To maintain compliance with the minimum sign retroreflectivity values in the MUTCD, WisDOT utilizes the following approved assessment and management methods:

1. Blanket Replacement. All signs in an area/corridor are replaced at specified intervals. This commonly takes place during improvement projects.
2. Expected Sign Life. Age of the sign is tracked and the sign is replaced when it meets its expected life. Current WisDOT expected sign life period is 12 years.
3. Control Signs. Replacement of signs in the field is based on the performance of a sample of control signs. The data from the control signs can provide engineering support to the Expected Sign Life method. Over time the Expected Sign Life replacement cycle *may* be revised based on data from the Control Signs test deck, which is located at the Madison Sign Shop yard.

DETAILED SIGN REPLACEMENT POLICY**General Sign Replacement due to age/condition of sign**

1. The Department's Sign Inventory Management System (SIMS) **shall** be used to track inventory data on signs that include manufacture date of sign, sign sheeting code and condition of sign.
2. Sign date and sheeting code tags **shall** be placed on the upper right corner on the back of Type II signs by the sign manufacturer or contractor. Type I signs **shall** have the sign date and sheeting code tag placed on the lower right corner on the back of the sign. The WisDOT Central Sign Shop provides all date and sheeting code tags to sign manufacturers and contractors.
3. In general, signs *should* be replaced on a twelve year cycle, following the priority established by the Bureau of Traffic Operations on an annual basis.
4. In general, signs needed for let projects will not be supplied through the Region Sign Shops or Central Sign Shops. The exception to this would be if there is an unexpected lack of signs by the contractor that *may* otherwise cause a delay in the completion of the project or needed for safety or operational issues. Detailed guidance is given below on the sign replacement criteria for let projects.
5. County Highway Departments, through Traffic Maintenance Agreements, *should* handle all of the other routine Type II sign replacements where a let project is not anticipated any time soon.
6. WisDOT **shall** provide all signs to the County Highway Departments. There are statewide procurement contracts to handle this. Counties **shall not** furnish signs, other than TODS or TRANS 200 arrow boards that are covered by other policies.
7. Routine Type I sign replacements *should* be performed by Let Contract. The statewide open-end signing contractor *should* only be used for knock-down repairs and replacements of Type I signs, Type I or Type II Supplemental Traffic Generator sign installations or for safety or operational issues where the county cannot get to the site in the timeframe needed.
8. Any signs or posts that are damaged, illegible, leaning, not in proper orientation to the roadway *should* be repaired or replaced as soon as opportunities permit.

Sign Replacement Due to Changes in Sign Standards

1. Signs no longer meeting mounting height, size, message, letter size or sheeting material criteria *may* be replaced through the following methods:

- a. Let Project or refurbishment project in the area.
- b. Knockdown, storm or vandalism damage that would cause the sign and/or posts to be replaced.
2. Examples of signs not meeting standards would include:
 - a. Too low of mounting height.
 - b. Too close to roadway.
 - c. Wrong size sign used for roadway.
 - d. Wrong letter size used on sign.
 - e. Signs containing Engineer Grade sheeting.
 - f. Change of Standard in the MUTCD resulting in a compliance period.
 - g. Change of Signing Policy in the Traffic Guidelines Manual.
3. If there is a safety issue/concern due to a sign not conforming to standards, the sign **shall** be replaced or removed as soon as practical. An example would be a restriction of motorist visibility due to an improper mounting height.
4. Analysis of intersection crash data *may* be used to help determine if sign standards attributed to any safety issues.
5. The methods of sign replacement *should* be followed as explained in the General Sign Replacement due to age/condition of sign part of this policy.

Sign Replacement as part of Let Projects

When a Let project will take place in the area in the near future, the Region *should* strive to include all Type I and Type II sign replacements as part of the project. Typical Let projects *may* include roadway reconstruction, pavement overlays, base patching, joint repair and slurry seal projects. Typically the signs on the whole segment of the project would be replaced; however engineering judgment will have to be exercised on the part of the Region to determine the feasibility of this type of replacement.

Below are guidelines that *should* be followed to help determine if replacement of signs on a let project is feasible.

Type I signs

1. Overhead Type I guide signs *should* be replaced in all let projects. The recently published FHWA minimum sign retroreflectivity standards do not permit the usage of Engineer Grade or Encapsulated Lens high intensity sheeting for overhead guide signs. Exceptions to replacement of overhead mounted Type I guide signs can be made if the overhead Type I guide signs are prismatic high intensity sheeting or above and there is another let project programmed or scheduled on the same roadway segment within the next five years. Any signs not conforming to WisDOT and MUTCD policies **shall** be replaced in the let project. **Any exceptions to replacement of Type I signs shall be coordinated with the Region Traffic Engineering Supervisor.**

All lighted overhead signs **shall** be replaced in the let project unless the signs already contain Type SH reflective sheeting.
2. In general, ground mounted Type I guide signs *should* be replaced in all let projects. Exceptions to replacement of ground mounted Type I guide signs *may* be made if signs that will be replaced in another let project that is programmed or scheduled on the same roadway segment within the next five years. Any signs not conforming to WisDOT and MUTCD policies **shall** be replaced in the let project. **Any exceptions to replacement of Type I signs shall be coordinated with the Region Traffic Engineering Supervisor.**
3. Galvanized steel I-beams *should* only be replaced if Type I sign is not at the proper offset (30 foot desirable / 17.5 foot minimum from edge line to edge of sign) or if the new Type I sign is larger. All corten steel I-beams and bases **shall** be replaced.
4. Steel I-beams and bases that are re-used *should* have the base bolts replaced by utilizing bid item 635.0300 (Sign Supports Replacing Base Connection Bolts).

Type II signs

1. All Type II signs *should* be replaced in all let projects. The recently published FHWA minimum sign retroreflectivity standards do not permit the usage of Engineer Grade on warning and guide signs. It is also WisDOT policy to not use Engineer Grade on any signs, including regulatory signs.
2. **Any exceptions to replacement of Type II signs shall be coordinated with the Region Traffic Engineering Supervisor.** Exceptions for replacement of Type II signs *may* be made if all the following criteria are met:
 - a. If signs that will be replaced in another let project that is programmed or scheduled on the same roadway segment in the next five years.
 - b. If existing Type II signs are not damaged or do not have any other material defects.
 - c. If sign size, mounting height and lateral offset still meet WisDOT standards.
 - d. If sign message still conforms to WisDOT and MUTCD policies and minimum FHWA/MUTCD retroreflectivity requirements.

2-15-52 Maintenance of Signs and Sign Post Designs

September 2014

PURPOSE

This policy establishes maintenance responsibility for signs and sign post designs on state trunk highways and crossroads intersecting state maintained highways, either by at-grade intersections or service interchanges. In addition, roundabouts often times add complexity for the responsibility of sign maintenance, especially for local and county roadway approaches. DOT improvement projects often include signs that are installed on county highways and local roads. Because the local unit did not install the signs, there are often questions about the responsibility for maintenance, and many of these signs are left to deteriorate. On several occasions the local unit requests a special type of signpost to be used on state maintained highways through their community. As a result, questions arise as to what type of signposts are acceptable, who would maintain the posts and potential liability issues. Therefore, it is necessary to have clear, consistent guidelines for the maintenance of signing, and designs of signposts, on state maintained highways and at locations of local crossroads intersecting state maintained highways.

SIGN MAINTENANCE POLICY

WisDOT is responsible for maintenance of permanent signs on all state trunk highways. As part of its responsibility, WisDOT *may* contract for services to accomplish the maintenance and *may* require that others fund the costs, for example costs of supplemental traffic generator signs, as approved in [TEOpS 2-15-3](#).

Should WisDOT allow a local unit of government to erect or maintain any signing, a permit in the form of a letter **shall** be signed by a representative of the local unit of government and the Region's Traffic Supervisor.

In addition, WisDOT is responsible for maintenance of certain other permanent signs on connecting roadways, local streets and business highways described below. It *should* be noted that this policy is not all-inclusive.

Intersecting and Interchanging Roadways (excluding roundabouts)

1. On local public roadways intersecting state maintained highways, WisDOT will maintain the STOP sign and directional assembly (J3 or J13 assembly), adjacent to the STOP sign.
2. On county roadways intersecting state maintained highways, WisDOT will maintain the STOP sign and directional assembly (J3 or J13 assembly), adjacent to the STOP sign.
3. On local and county roadway interchanges with state maintained highways, between the junction assembly (J1 sign) and the ramp, WisDOT will maintain the route markers and destination signs (D1 signs), including the junction assembly.
4. On local and county roadway interchanges with state maintained highways, between ramp to ramp, WisDOT will maintain all signs. An exception to this would be a special agreement with the local unit of government/county or if WisDOT would not have jurisdiction of the intersecting roadway.
5. On state and U.S. highway interchanges with state maintained highways, WisDOT will maintain all the signs.
6. All advanced signing on local and county roads that intersect state maintained highways **shall** be the responsibility of the county/local unit of government to maintain, regardless of who installed it originally.

7. WisDOT will not maintain street name signs at the intersection.
8. For blinker stop signs and blinker stop ahead signs, refer to the separate policy for criteria and permits.

Roundabouts

1. On all roundabouts with at least one WisDOT maintained approach roadway, WisDOT will maintain, at a minimum, the following signs:
 - a. Chevron bank (R6-4b)
 - b. One Way signs (R6-1R and R6-2R)
 - c. Yield signs (R1-2)
 - d. To Traffic From Left Plaque (R1-54)
 - e. Splitter island signs (J-3 or D1 series)
2. On state trunk highway approaches, including interchange ramps, WisDOT will maintain all signs, including overhead sign supports (See Figure 2).

On county and local road approaches, in addition to the Yield sign (R1-2), To Traffic From Left Plaque (R1-54) and One Way sign (R6-2R), WisDOT will also maintain any overhead guide signs that have an Interstate, U.S. or State highway shield on them, including their associated overhead sign support(s) (See Figures 3A and 3B). The county and/or local unit of government would maintain all other signs and associated sign structures on their approaches, including overhead regulatory lane control signs and the ground mounted map sign (D1-62 sign).

3. For roundabouts on Connecting State Highways, WisDOT will maintain any overhead guide signs that have an Interstate, U.S. or State highway shield on them, including their associated overhead sign support(s). For any overhead guide signs that exclusively contain business route signing, the local unit of government would maintain the sign and associated overhead sign support. WisDOT will also maintain any splitter island signs that have a U.S. or State route shield (J-3 or D1 series) and any U.S. or State reassurance marker (J4 series). All other signs in the roundabout on connecting highways **shall** be maintained by the local unit of government.
4. For roundabouts with county highway and/or local road approaches, it is recommended that early in the design process, a Maintenance Agreement be developed. By having the Maintenance Agreement developed early in the design process, the county or local unit of government will clearly have knowledge of what they are to maintain.

Some particular items that *should* be included in the Maintenance Agreement would include:

- a. Specific signs that WisDOT would maintain and what the locals/county would maintain. This would also include signposts.
- b. Specific overhead sign supports (if any), that WisDOT would maintain and what the locals would maintain.
- c. Recommended inspection frequencies for overhead sign supports that the locals would maintain.

Connecting Highways and Local Streets

1. On connecting highways WisDOT maintains only route markers and trailblazer assemblies, including overhead guide signs that contain interstate, U.S. and State route shields and their associated overhead sign supports or sign bridges. For any overhead guide signs that exclusively contain business route signing, the local unit of government would maintain the sign and associated overhead sign support.
2. On local streets, upon coordination with the local unit of government, WisDOT would maintain only those trailblazer assemblies that are installed and/or approved by WisDOT.

Business Route Signing

1. For business routes located on state maintained highways, WisDOT will install and maintain all route markers.
2. When business routes of state highways are marked over county highways, local streets or highways, WisDOT *may* initially install route markers, but will not be responsible for their maintenance. The installation and maintenance of all other signs **shall** be the responsibility of the local unit of government.

3. Expanded guidance on the usage of business route signing is included in [TEOpS 2-4-19.1](#).

SIGN POST DESIGN POLICY ON STATE MAINTAINED ROADWAYS

1. On state maintained roadways, 4"x6" wood posts and 2"x2" square steel posts are typically used for sign posts. Municipalities *may* be allowed to install signs on customized posts. The municipality **shall** pay for the cost of the customized posts.
2. Any customized posts allowed **shall** be NCHRP 350 or MASH crash compliant. The municipality **shall** provide WisDOT a copy of the certification letter from the Federal Highway Administration.
3. A permit for non-standard sign supports **shall** be filled out by the municipality and signed by the City/Village Engineer or Director of Public Works or Official Governmental Representative and, upon approval, the WisDOT Region Traffic Operations Engineer. A sample Application/Permit form is shown in Figure 4.
4. Municipalities *may* be allowed to paint the posts a neutral color that does not detract from the face of the sign. Acceptable neutral colors are black, brown or dark green.
5. Red, white and orange colors **shall not** be used for signposts. A yellow color *may* only be used if the color is to mark a truck route. The municipality **shall** be required to have a local ordinance in place before painting the posts.
6. For any painted sign posts requiring replacement by WisDOT, the municipality will be responsible for re-painting signposts. Any customized signposts requiring immediate replacement by WisDOT will be replaced with 2"x2" square steel posts or 4"x6" wood posts. The municipality *may* later replace the DOT installed post with a NCHRP 350 or MASH crash compliant customized post at their cost.
7. Municipalities **shall not** paint the backside of the signs.
8. Signs installed on customized sign posts **shall** meet WisDOT/MUTCD design and size standards. WisDOT **shall** provide the municipality with all state-owned signs to be installed on customized sign posts. WisDOT *may* require the municipality to replace signs due to age or damage of signs or changes to sign design standards. WisDOT reserves the right to replace existing signs on customized posts owned by the municipality.
9. Sign installation and placement **shall** be to WisDOT standards. See Standard Sign Plates A4-3 and A4-4 for sign mounting height and lateral offset.
10. Existing customized posts on state maintained highways which are not NCHRP 350 or MASH crash compliant **shall** be replaced immediately with 2"x2" square steel posts, or 4"x6" wood posts. The municipality *may* later replace the DOT installed post with a NCHRP 350 or MASH crash compliant customized post at their cost.
11. Wood 4"x6" posts **shall** have 1 ½" diameter breakaway holes drilled into the 6-inch face of the post, (see figure 1). Breakaway holes are not required in 4"x6" wood posts if the post is mounted behind beam guard or concrete barrier.

Figure 1

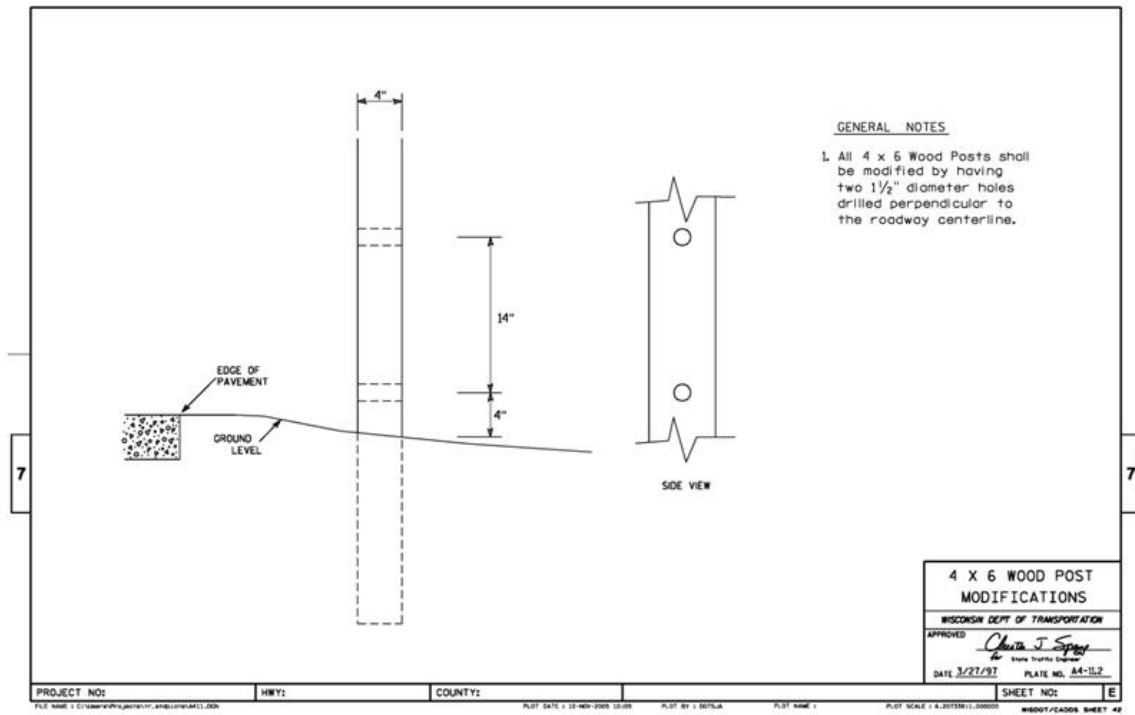


Figure 2. Interchange Roundabout

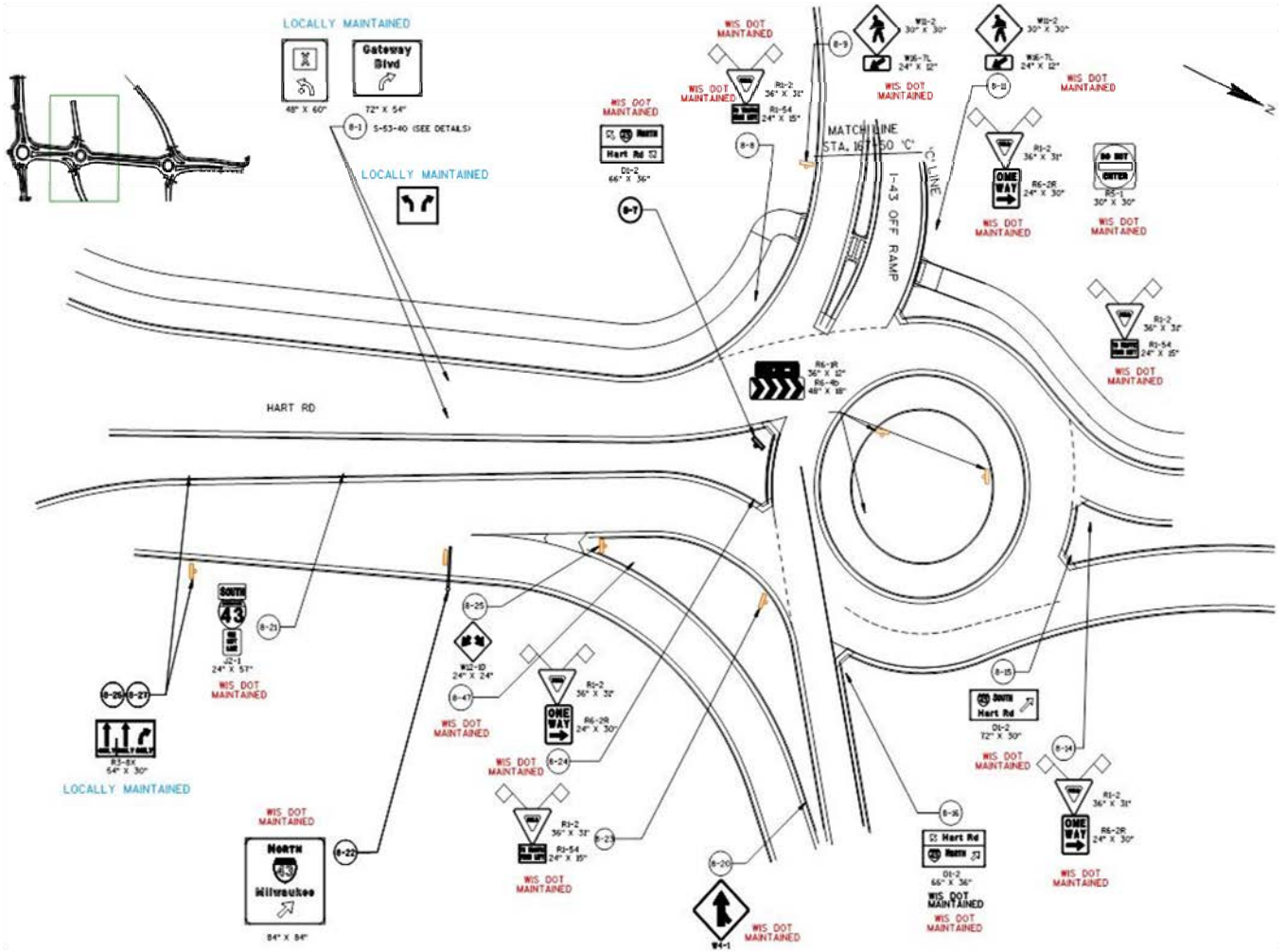


Figure 3A. County Highway / State Highway Roundabout
 (Signing for local roads is the same as County Highway signing)

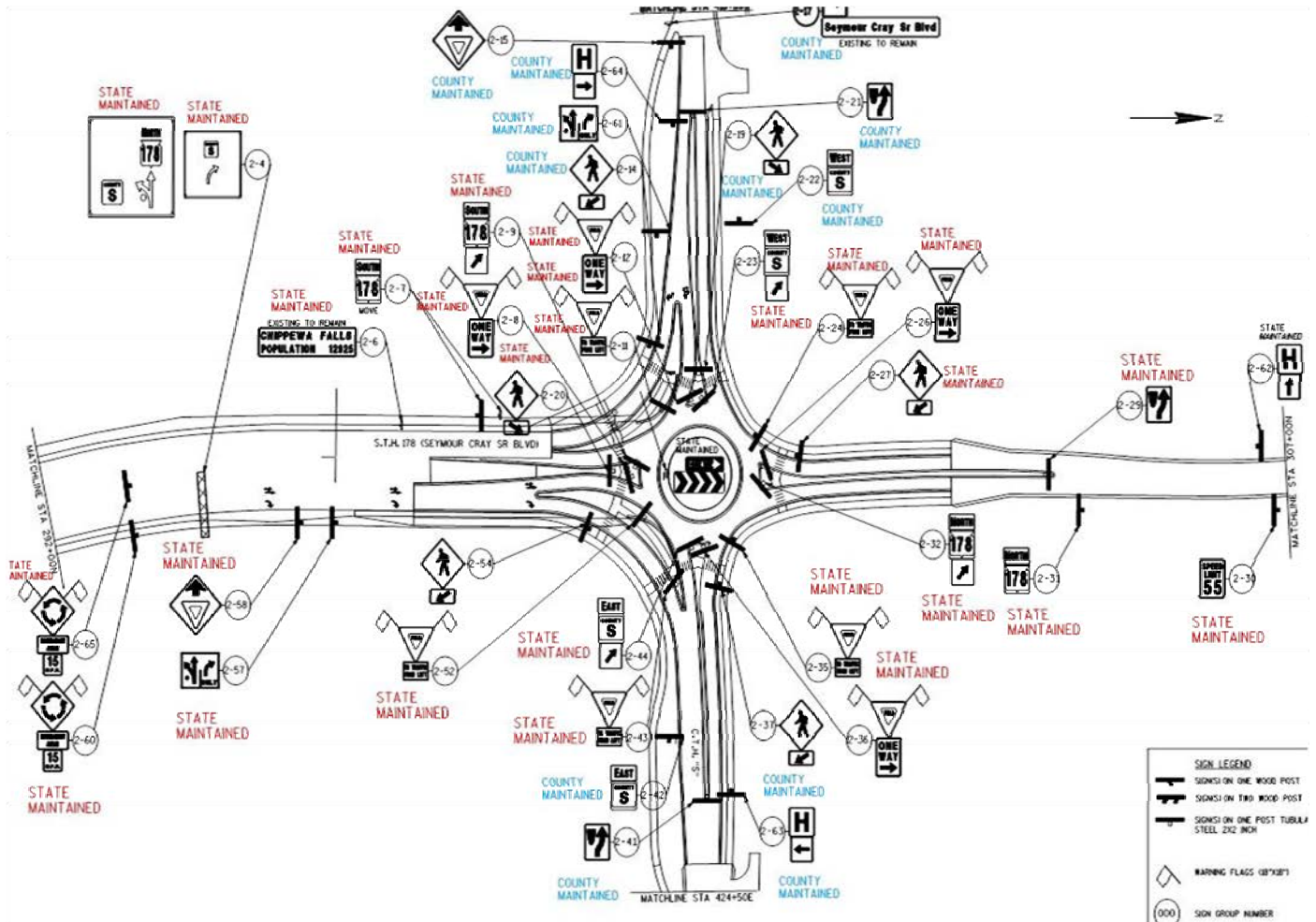


Figure 3B. County Highway / State Highway Roundabout
 (Signing for local roads is the same as County Highway signing)

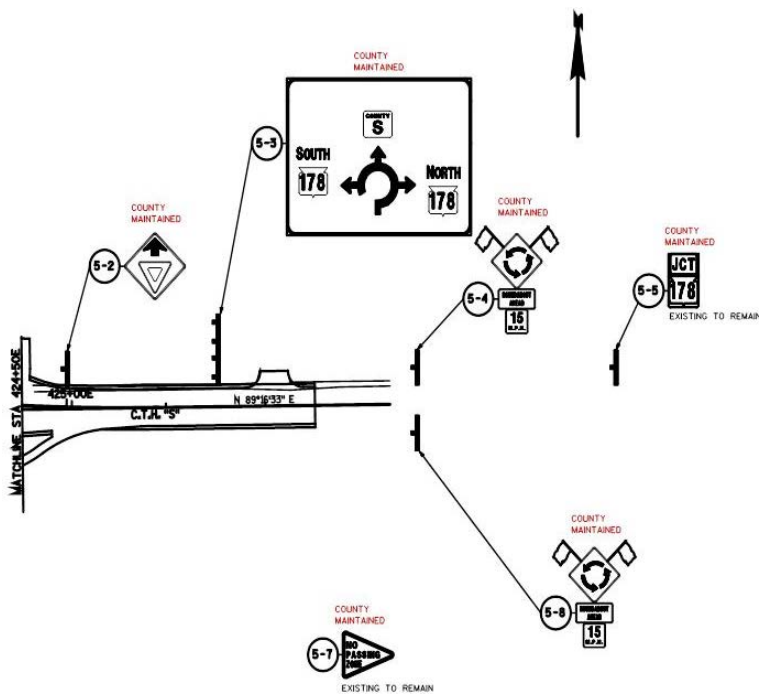


Figure 4. Custom Sign/Post Installation Permit**APPLICATION/PERMIT FOR CUSTOM SIGN POSTS**Wisconsin Department of Transportation
7/2014

When approved, this permit documents the terms and conditions of use by the municipality for installation and/or maintenance of custom sign posts on highways under the jurisdiction of the Wisconsin Department of Transportation. The applicant must obtain this approved permit prior to installation of custom sign posts.

Submit the completed application to the WisDOT Regional Office that has maintenance jurisdiction of the state trunk highway in the county where the posts will be located. A single application may be made for all installations along a continuous segment of highway.

| | |
|--|-------------------------------|
| Applicant (City, Village, Town): | County: |
| Mailing Address: | Area Code-Telephone Number: |
| | Email Address or FAX Number: |
| Highway (STH/USH): | Local Street Name of STH/USH: |
| Installation Limits: | |
| From: | To: |
| Installation Type | |
| <input type="checkbox"/> Improvement Project Agreement – Project ID: | |
| <input type="checkbox"/> Installation by Permit – Permit to Work on Highway Right-of-Way (WisDOT form DT1812) required | |
| Locations: | Items to Install: |
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Installation Conditions

1. Terms and conditions of this application/permit shall be in conformance with WisDOT Traffic Guidelines Manual Policy 2-15-52 *Maintenance of Signs and Sign Post Designs*. By entering into this agreement, the Municipality agrees to the terms and cost arrangements in this policy document.
2. For permit requests or sign replacement, WisDOT shall furnish all standard state-owned signs to the municipality for installation on custom posts. For let project installations, the custom posts will be installed as part of construction let plans as non-participating item.
3. All custom sign posts shall be NCHRP 350 or MASH crash compliant. A copy of the certification letter from the Federal Highway Administration shall be attached to this application for each manufacturer's model and style of custom post used.
4. Replacement of custom posts from a different manufacturer or model shall require a new permit/application.
5. The applicant shall retain a copy of this permit and supporting documentation for future reference.
6. Custom post details shall be attached to this application. Region Traffic Operations Engineer shall approve final post design.
7. Region Traffic Operations Engineer shall approve final sign locations. For Improvement Project Agreements, these locations shall be included on the final construction plans.
8. The municipality shall be responsible for costs for removal should future highway projects require the removal of the custom posts.
9. Sign installation and placement shall be to Wisconsin Manual of Uniform Traffic Control Devices and WisDOT standards.
10. This application shall be signed by the City/Village Engineer or the Director of Public Works or Official Governmental Representative.

X

Authorized Representative

Date

Print Name

Title

Approved for the Wisconsin Department of Transportation

Permit Number = Region (NC, NE, NW, SE, SW) – County Number – Permit Number in county

Permit Number

X

Region Traffic Operations Engineer

Date

Print Name

Area Code-Phone Number

INDEMNIFICATION

The Applicant shall save and hold the State, its officers, employees, agents, and all private and governmental contractors and subcontractors with the State under Chapter 84 Wisconsin Statutes, harmless from actions of any nature whatsoever (including any by Applicant itself) which arise out of, or are connected with, or are claimed to arise out of or be connected with any of the work done by the Applicant, or the construction or maintenance of facilities by the Applicant, pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, (1) while the Applicant is performing its work, or (2) while any of the Applicant's property, equipment, or personnel, are in or about such place or the vicinity thereof, or (3) while any property constructed, placed or operated by or on behalf of Applicant remains on the State's property or right-of-way pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way; including without limiting the generality of the foregoing, all liability, damages, loss, expense, claims, demands and actions on account of personal injury, death or property loss to the State, its officers, employees, agents, contractors, subcontractors or frequenters; to the Applicant, its employees, agents, contractors, subcontractors, or frequenters; or to any other persons, whether based upon, or claimed to be based upon, statutory (including, without limiting the generality of the foregoing, worker's compensation), contractual, tort, or whether or not caused or claimed to have been caused by active or inactive negligence or other breach of duty by the State, its officers, employees, agents, contractors, subcontractors or frequenters; Applicant, its employees, agents, contractors, subcontractors or frequenters; or any other person. Without limiting the generality of the foregoing, the liability, damage, loss, expense, claims, demands and actions indemnified against shall include all liability, damage, loss, expense, claims, demands and actions for damage to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way in the past or present, or that are located on any highway or State property or right-of-way with or without a permit issued by the State, for any loss of data, information, or material; for trademark, copyright or patent infringement; for unfair competition or infringement of personal or property rights of any kind whatever. The Applicant shall at its own expense investigate all such claims and demands, attend to their settlement or other disposition, defend all actions based thereon and pay all charges of attorneys and all other costs and expenses of any kind arising from any such liability, damage, loss, claims, demands and actions.

Any transfer, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right-of-way pursuant to this

permit shall not release Applicant from any of the indemnification requirements of this permit, unless the State is notified of such transfer in writing. Any acceptance by any other person or entity, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right-of-way pursuant to this permit, shall include acceptance of all of the indemnification requirements of this permit by the other person or entity receiving ownership or control.

Notwithstanding the foregoing, a private contractor or subcontractor with the State under Chapter 84 Wisconsin Statutes, that fails to comply with sections 66.047 and 182.0175 Wisconsin Statutes (1985-1986), remains subject to the payment to the Applicant of the actual cost of repair of intentional or negligent damage by the contractor or subcontractor to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, and remains subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the contractor or subcontractor.

Notwithstanding the foregoing, if the State, or its officers, employees and agents, fail to comply with sections 66.047 and 182.0175 Wisconsin Statutes (1985-1986), the State or its officers, employees and agents, remain subject to the payment to the Applicant of the actual cost of repair of willful and intentional damage by the State, or its officers, employees and agents, to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, and remain subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the State, its officers, employees and agents.

No indemnification of private contractors or subcontractors with the State under Chapter 84 Wisconsin Statutes, shall apply in the event of willful and intentional damage by such private contractors or subcontractors to the property, lines and facilities of the Applicant located on the highway right-of-way pursuant to this permit or any other permit issued by the State for the location of property, lines or facilities on highway right-of-way.

PURPOSE

Quite often, a highway bypass is constructed to divert traffic around a community, thus reducing traffic congestion and increasing traffic safety within the community. However, bypasses have the potential to

experience more crashes than expected when designed, due primarily to several human factors issues. Even when designed to the proper geometrics, drivers *may not* be mentally prepared for the increased speed of traffic on the bypass and the quick decisions that need to be made, as a result of the increased speed. This has led to several angle type collisions, primarily at intersections.

In February 2006, FHWA prepared a report for WisDOT that outlines several enhancements that *should* be made to increase safety at bypasses. Several of these enhancements include signing improvements. This policy provides requirements and guidance to the proper usage of signs for new bypasses on state maintained highways.

DEFINITIONS

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate Highways are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional Highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

A Bypass is defined as a new route that diverts traffic around a community and re-connects to the existing routes on the outskirts of the community (See Figure 1).

POLICY

Sign Sizes

1. For all bypasses, regulatory, warning and school signs **shall** be minimum size code 3.
2. Route assemblies *should* be minimum size code 2 for conventional highways and minimum size code 3 for four lane divided and expressway bypasses.
3. Advance crossroad name signs (M1-94 sign) **shall** be size code 3 (8" upper case / 6" lower case) for all conventional highway bypasses 45 mph and higher and all four lane and expressway bypasses. Advance crossroad name signs (M1-94 sign) *may* be size code 2 (6" upper case / 4 ½" lower case) for conventional highway bypasses, less than 45 mph.

Regulatory Sign Installations

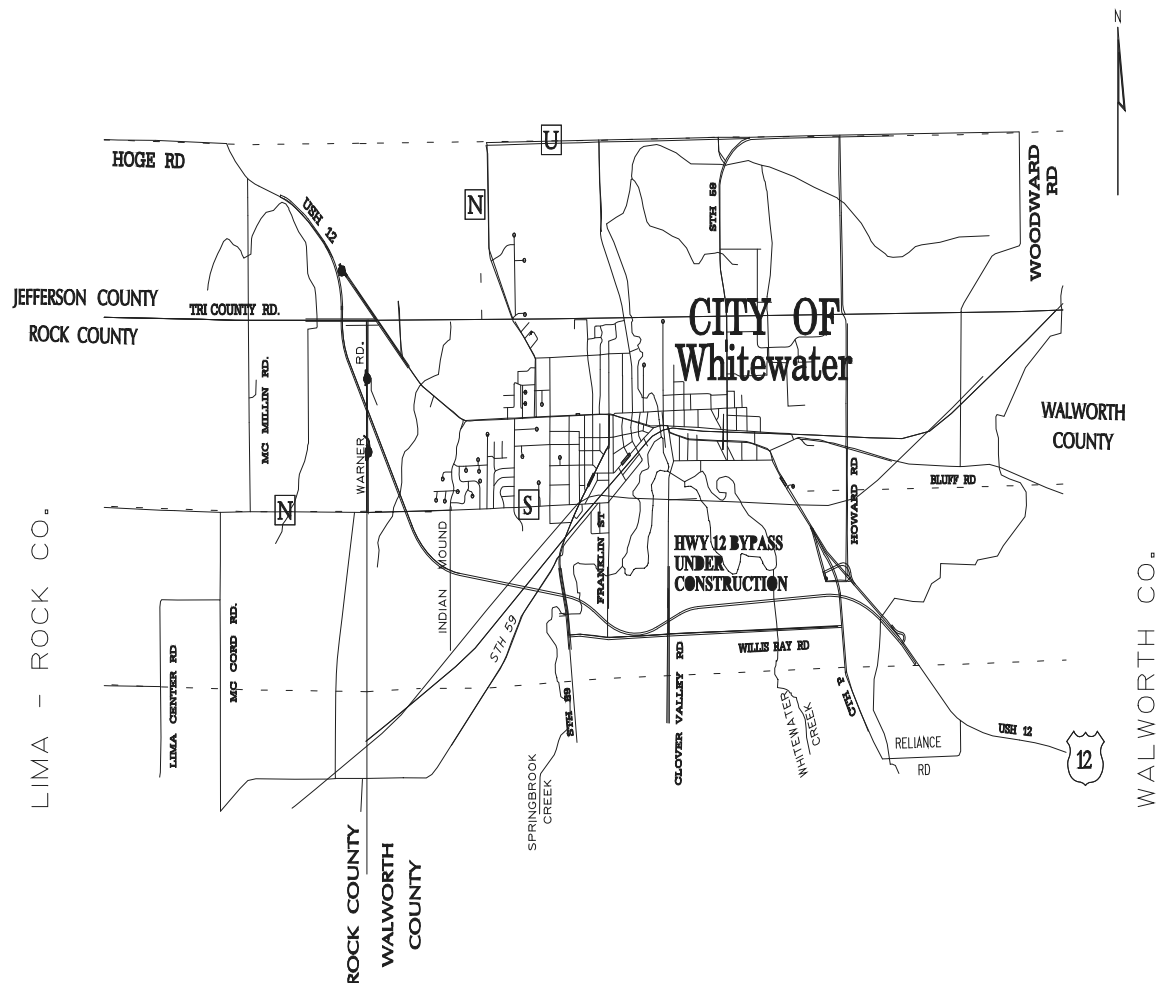
1. Double up STOP signs (R1-1 signs) at all side roads (right and left signs). 200' minimum of centerline on the side road **shall** be used.
2. STOP signs (R1-1 signs) **shall** be installed in the pork chop islands or in the median island.
3. For median widths greater than 40' (measured from median edge of travel lane to median edge of travel lane), STOP (R1-1 signs) or Yield (R1-2 signs) signs *should* be installed as appropriate at the second crossroad intersection (in the median) of a four-lane bypass. Typically for median widths 30' or less, the Yield sign is used in the median to discourage any long trucks from hanging over into the adjacent travel lanes.
4. Cross Traffic Does Not Stop signs (R1-52C sign) **shall** be installed below all STOP signs (R1-1 sign) on both two lane and four lane bypasses. For four lane bypasses, the Cross Traffic Does Not Stop sign (R1-52C sign) *should* be placed below the Divided Highway sign (R6-3 or R6-3a sign).
5. The One-Way sign (R6-1 sign) **shall** be used for all divided bypasses. The R6-1 One-Way signs **shall** be placed above the STOP sign (R1-1 sign). Refer to [TEOpS 2-15-12](#) (Wrong-Way Prevention) for additional criteria on Wrong Way signing.
6. Temporary orange warning flags *may* be added to all STOP signs (R1-1 sign). The flags *should* remain in place until the end of their useful life.
7. The Divided Highway Now Open – Use Proper Lane sign (R3-57 sign) *should* be installed 300–500 feet in advance of the intersection on side roads for divided highway bypasses. The sign **shall** remain in place for up to a year and then removed.

Warning Sign Installations

1. Supplemental roadway name plaques below the crossroad warning signs (W2-1 and W2-2 signs) **shall not** be used. The crossroad warning sign and advanced crossroad name sign **shall** be on separate

- installations and spaced properly.
2. Crossroad warning signs *may* be installed at mainline intersections, regardless of sight distance issues.
 3. STOP Ahead or Signal Ahead signs **shall** be used on all side roads, regardless of sight distance. STOP Ahead or Signal Ahead signs *may* be doubled up.
 4. Temporary orange warning flags *may* be added to all STOP Ahead signs and Signal Ahead signs. The flags *should* remain in place until the end of their useful life.
 5. The Two-Way Traffic warning sign (W6-3 sign) **shall** be used if a two-lane bypass is graded or paved for a four-lane capacity that could make it appear like a four lane highway. The Two-Way Traffic warning sign (W6-3 sign) *should* be placed after major intersecting side roads or at least at two mile intervals and *should not* be doubled up.

Figure 1. Sample of New Bypass Highway



2-15-55 Signing for J Turns

December 2011

BACKGROUND

The usage of the Restricted Crossing U-Turn (RCUT), or also referred to as a “J” turn intersection, has been a low cost intersection safety improvement method that was introduced in the early 1980’s. A characterization of a “J” turn intersection is the prohibition of left turn and through movements from side street approaches. Instead, these side street movements are accommodated by requiring drivers to make a right turn onto the main highway, and then make a U-turn at a median opening downstream. Left turns from the main roadway onto the sideroad *may* be allowed to remain at the existing sideroad intersection, or, in the case of a full median closure, *may* be executed by making a U-turn at the downstream median opening and then turning right onto the sideroad.

The Federal Highway Administration has indicated several advantages in the "J-turn" concept over grade-separated interchanges and at-grade intersections. Some of these advantages include increased safety, better operational issues, lower construction costs and less right-of-way impacts. Other states that have implemented the J-turn concept have seen significant safety benefits by eliminating the "far side" right angle crash.

PURPOSE

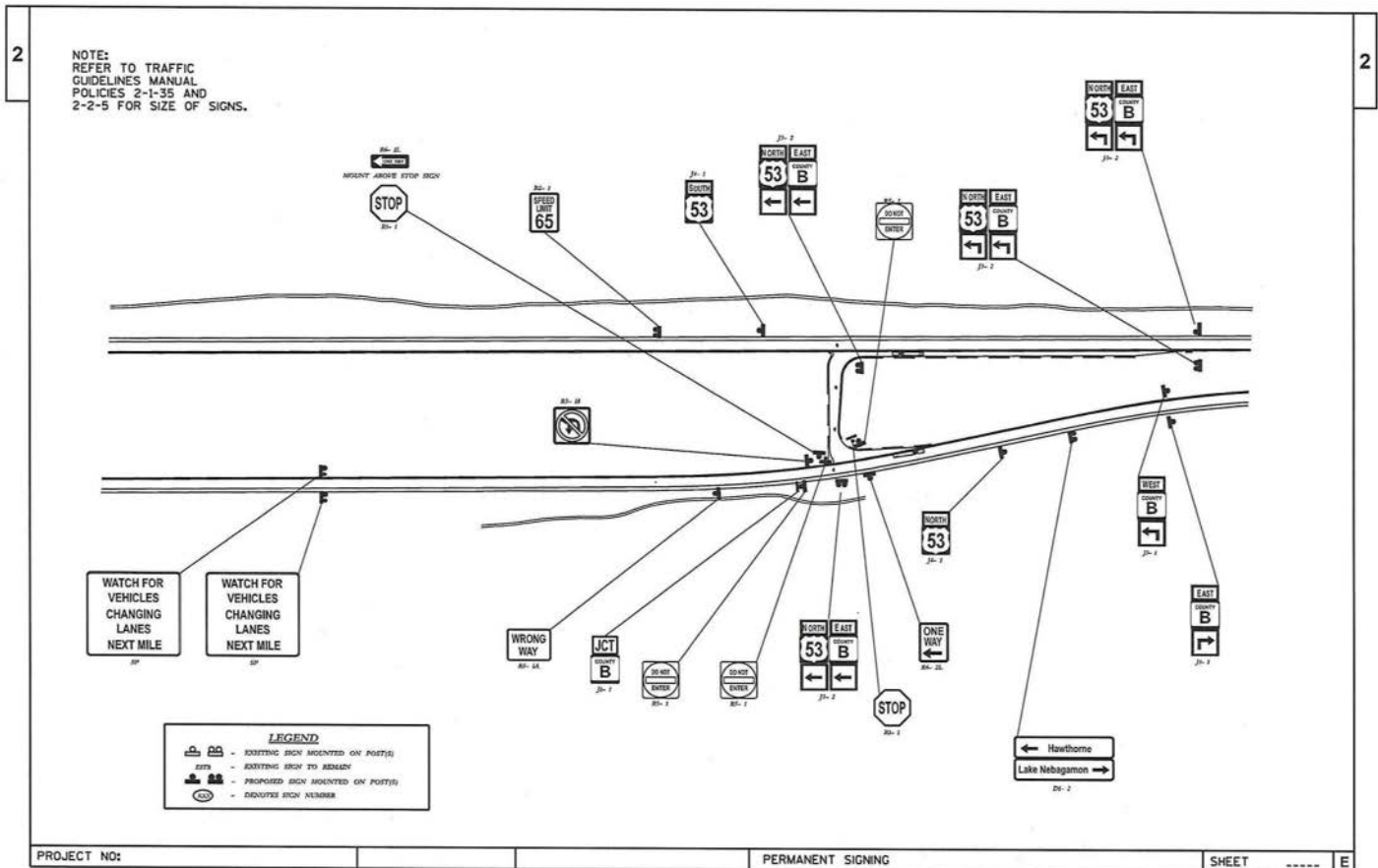
Currently the Federal MUTCD does not contain guidance on the signing of "J" turn intersections. As the construction of "J" turn intersections increases, it is critical to have a consistent signing practice for motorist expectations. The signing can be accomplished utilizing traditional regulatory, warning and guide signs outlines in the MUTCD.

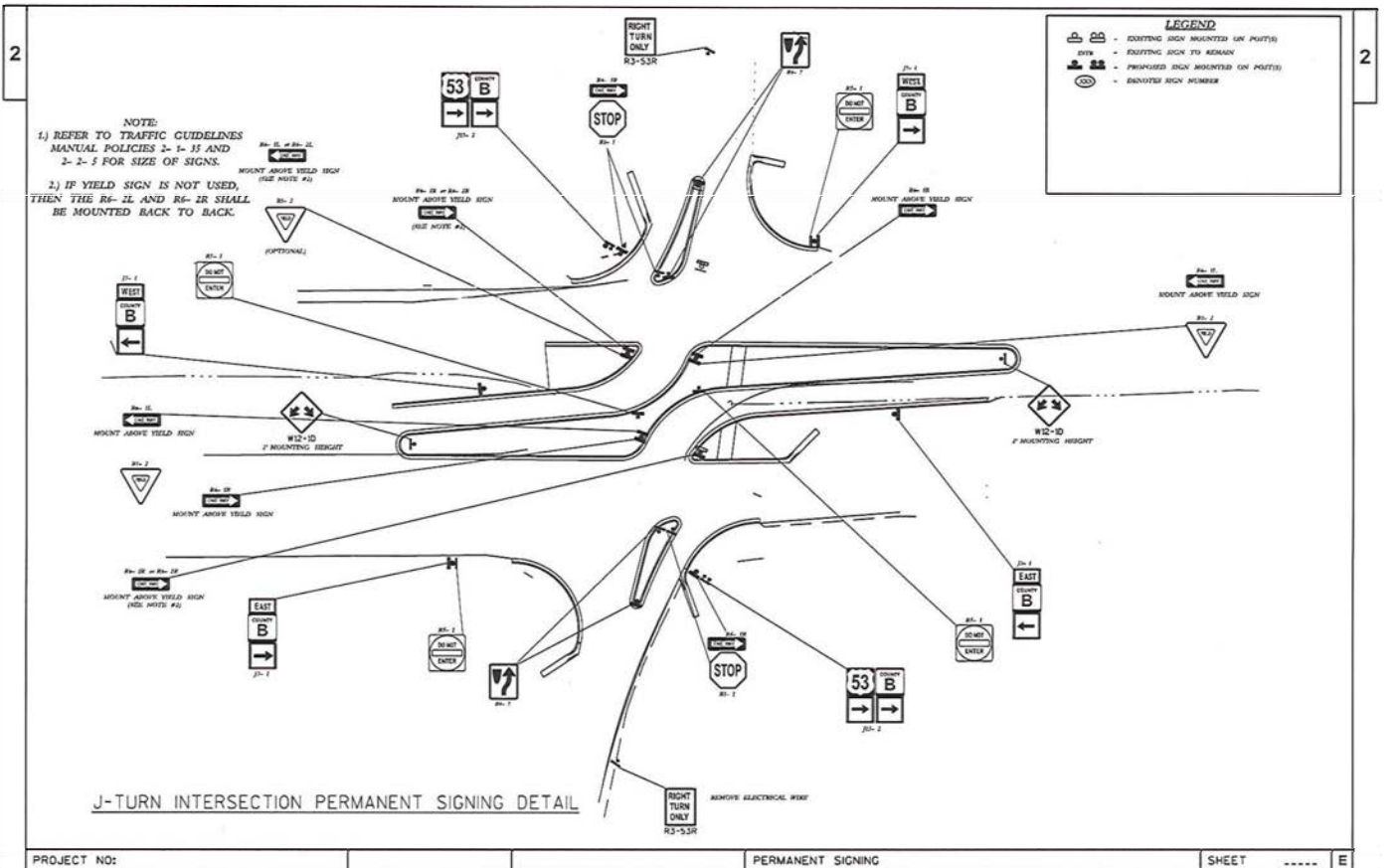
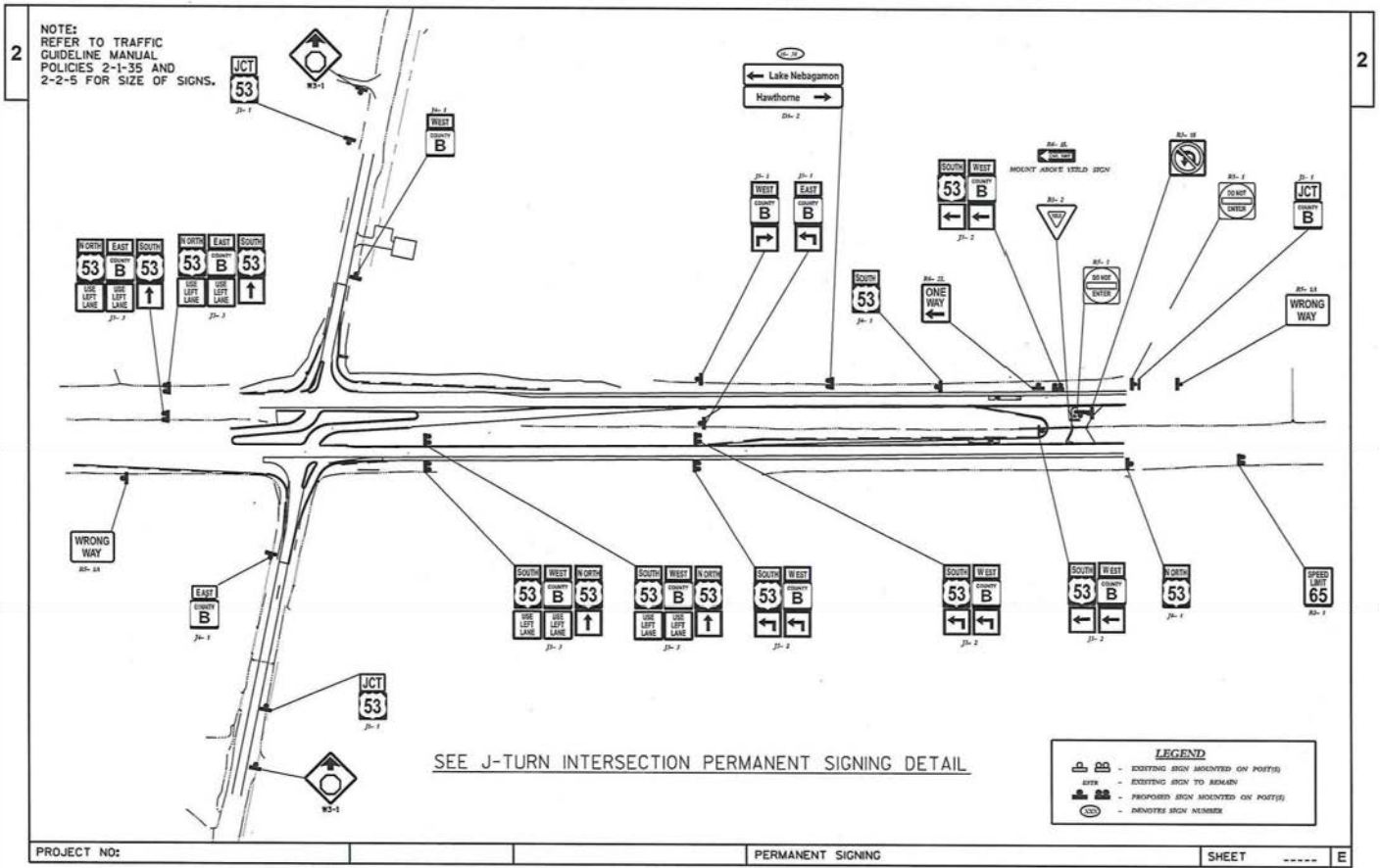
Below are guidelines that *should* be followed for the signing of "J" turn intersections:

GUIDELINES

The attached typical signing plan *should* be sufficient for most intersections of this type.

1. For numbered or lettered routes, advance directional and directional assemblies *should* be used. For routes that are not numbered or lettered, advanced street name signs *should* be used.
2. On divided roadways with posted speeds of 45 mph or greater or inadequate sight distance, advanced warning signs WATCH FOR VEHICLES CHANGING LANES NEXT MILE *may* be used as a warning to motorists for turning traffic.
3. [TEOps 2-15-12](#) **shall** be followed for placement of Wrong Way signing.





2-15-56 Signing for Diverging Diamond Interchanges**BACKGROUND**

The usage of the Diverging Diamond Interchange (DDI) is a relatively new development in highway design in the United States. DDIs allow free-flow left turns from the crossroad to the freeway on-ramps. This is accomplished by crossing traffic on the crossroad from the right-hand side to the left-hand side through the interchange area.

Several advantages in the DDI concept over traditional diamond interchanges include increased safety, increased capacity of left turn movements, and less right-of-way impacts.

PURPOSE

Currently the Federal MUTCD does not contain guidance on the signing of DDIs. As the construction of DDIs increases, it is critical to have a consistent signing practice for motorist expectations. The signing can be accomplished utilizing traditional regulatory, warning and guide signs outlined in the MUTCD.

Below are guidelines that *should* be followed for the signing of DDIs:

GUIDELINES

The attached typical signing plans *should* be sufficient for most interchanges of this type. Figure 1 shows a DDI with the crossroad over the freeway, and Figure 2 shows a DDI with the freeway over the crossroad.

Field review of signing is critical before opening the DDI to traffic. Signing *should* be adjusted to ensure that wrong way prevention signs (Do Not Enter, No Left/Right/U-turns) are positioned to minimize the possibility of confusion for drivers.

Single-lane Crossroad Approach to DDI

1. The double reverse curve warning sign (W24-1) *should* be used on all approaches to DDIs. The W24-1 sign **shall** be used on approaches to DDIs with safe operating speed less than posted/statutory speed of the roadway.
2. R3-50A signs *should* be installed above all through lanes on the signal mast arms within the DDI.
3. [TEOpS 2-15-12](#) **shall** be followed for placement of Wrong Way signing. Sign plate R3-4R (reverse no U-turn) has been developed for use at the signals within the DDI.
4. [TEOpS 2-4-44](#) *should* be followed for placement of guide signs.

Multilane Crossroad Approach to DDI

1. The double reverse curve warning sign (W24-1L) *should* be used on all approaches to DDIs. The W24-1L with an advisory speed sign (W13-1P) **shall** be used on approaches to DDIs with safe operating speed 10 mph or more less than posted/statutory speed of the roadway. When a W24-1 is used, an appropriate supplementary plaque ("All Lanes", "Left 2 Lanes", etc.) **shall** be placed below the W24-1L.
2. R3-50A signs **shall** be installed above all through lanes on the signal mast arms within the DDI.
3. [TEOpS 2-15-12](#) **shall** be followed for placement of Wrong Way signing. Sign plate R3-4R (reverse no U-turn) has been developed for use at the signals within the DDI.
4. Approaching the DDI, advance overhead lane selection guide signs (E6 series) **shall** be used.
5. For DDIs with the crossroad over the freeway, J2 and D1-7x series signs *should* be used within the DDI. For DDIs with the freeway over the crossroad, overhead guide signs **shall** be used in place of the J2 series signs.
6. If overhead guide signs are used within the DDI, D1 or J3 series signs *may* be used at the on-ramp terminal within the DDI.

Figure 1.

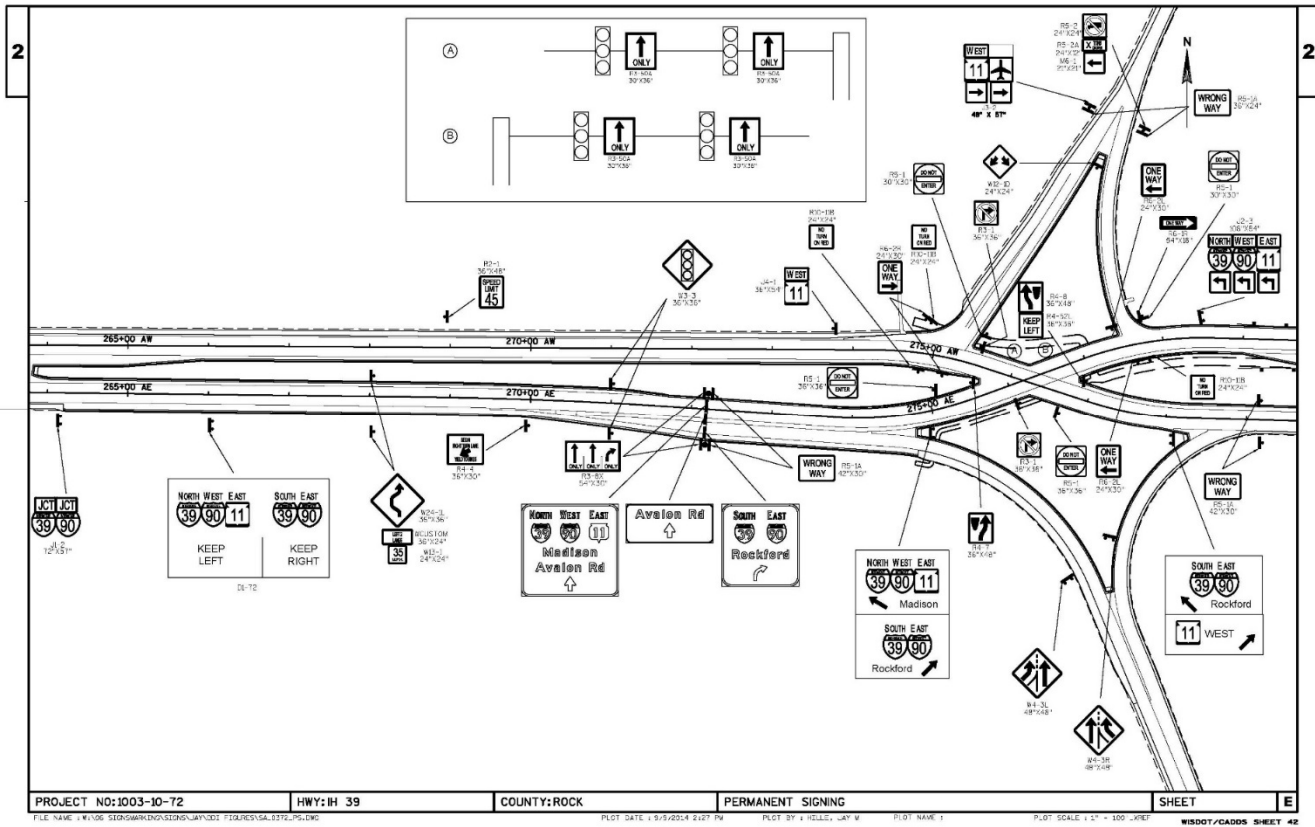


Figure 1. Continued

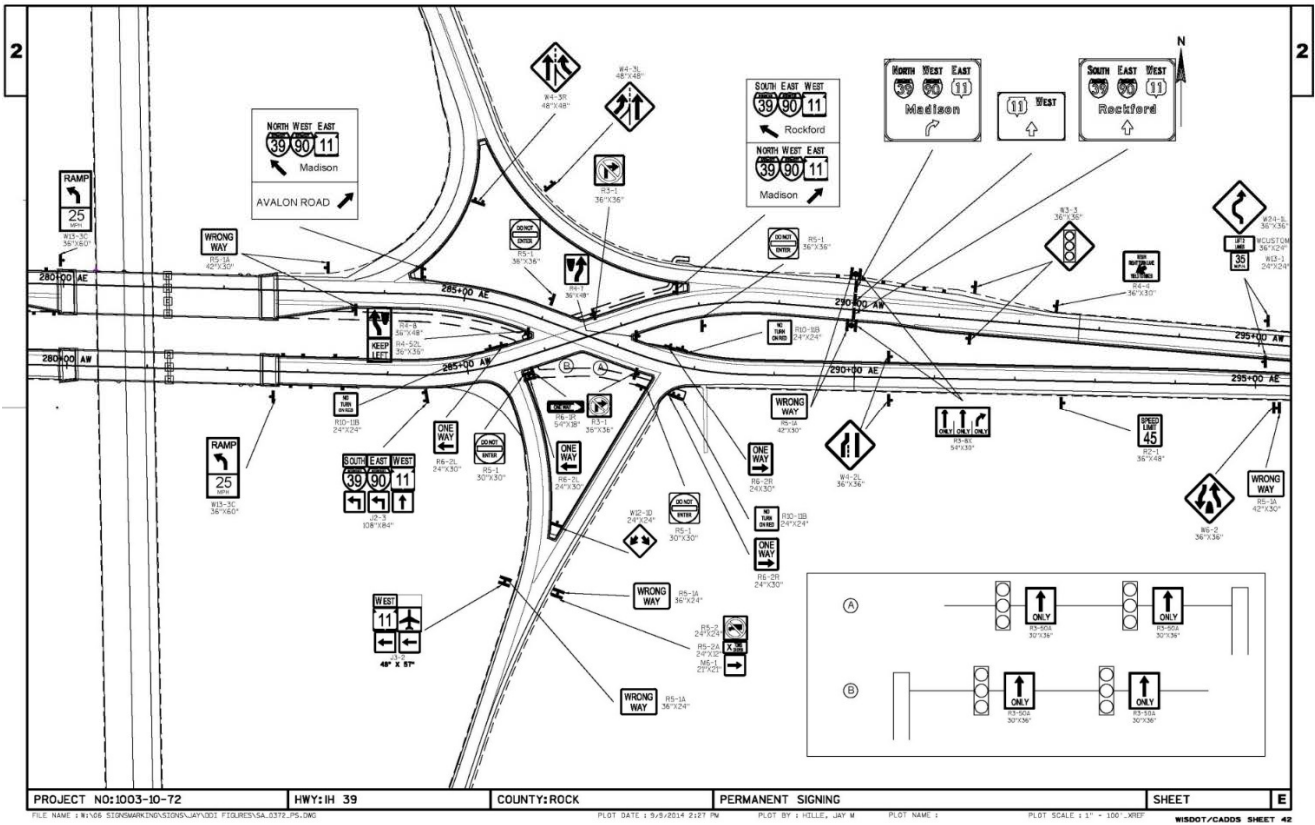


Figure 1. Continued

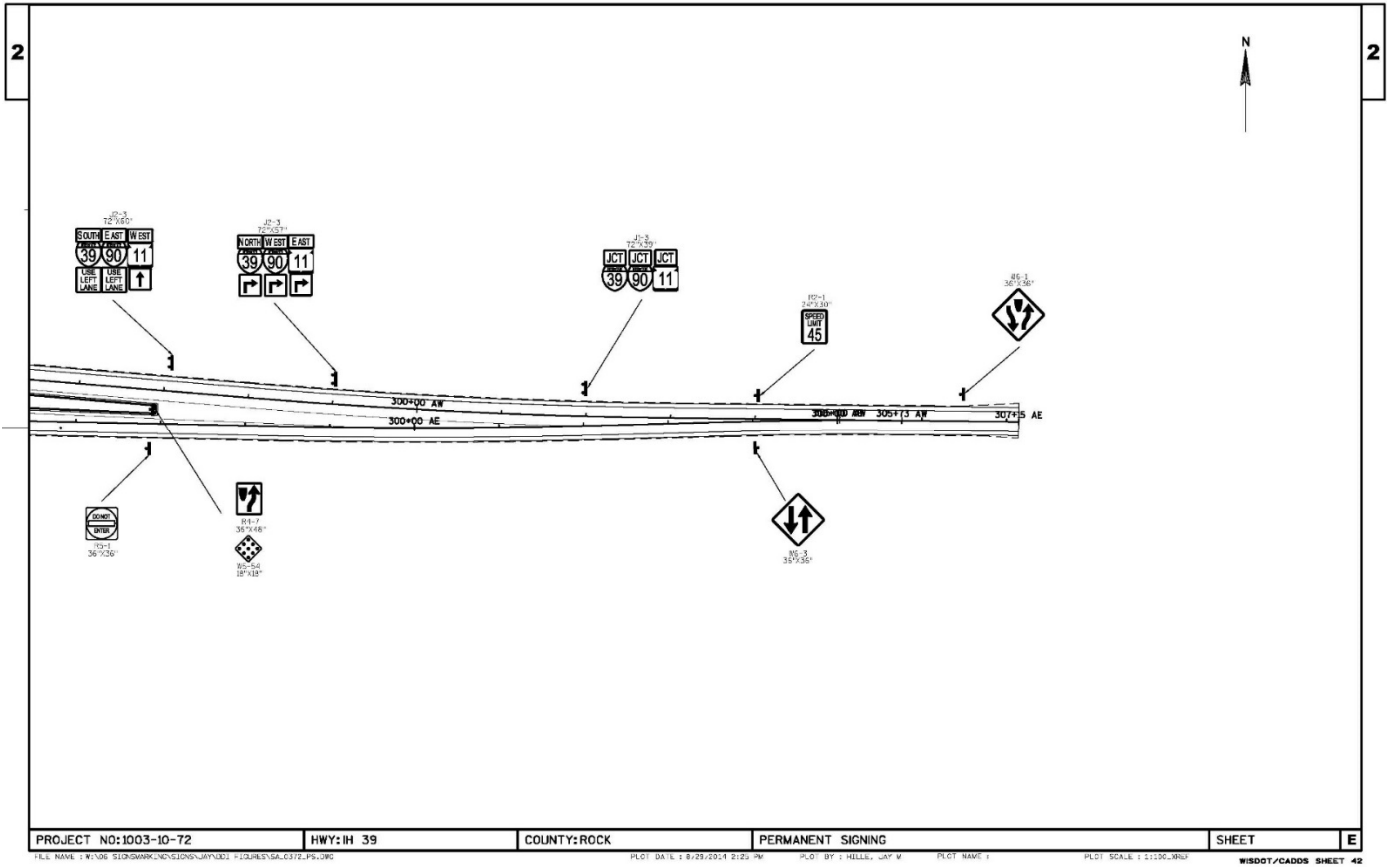


Figure 2.

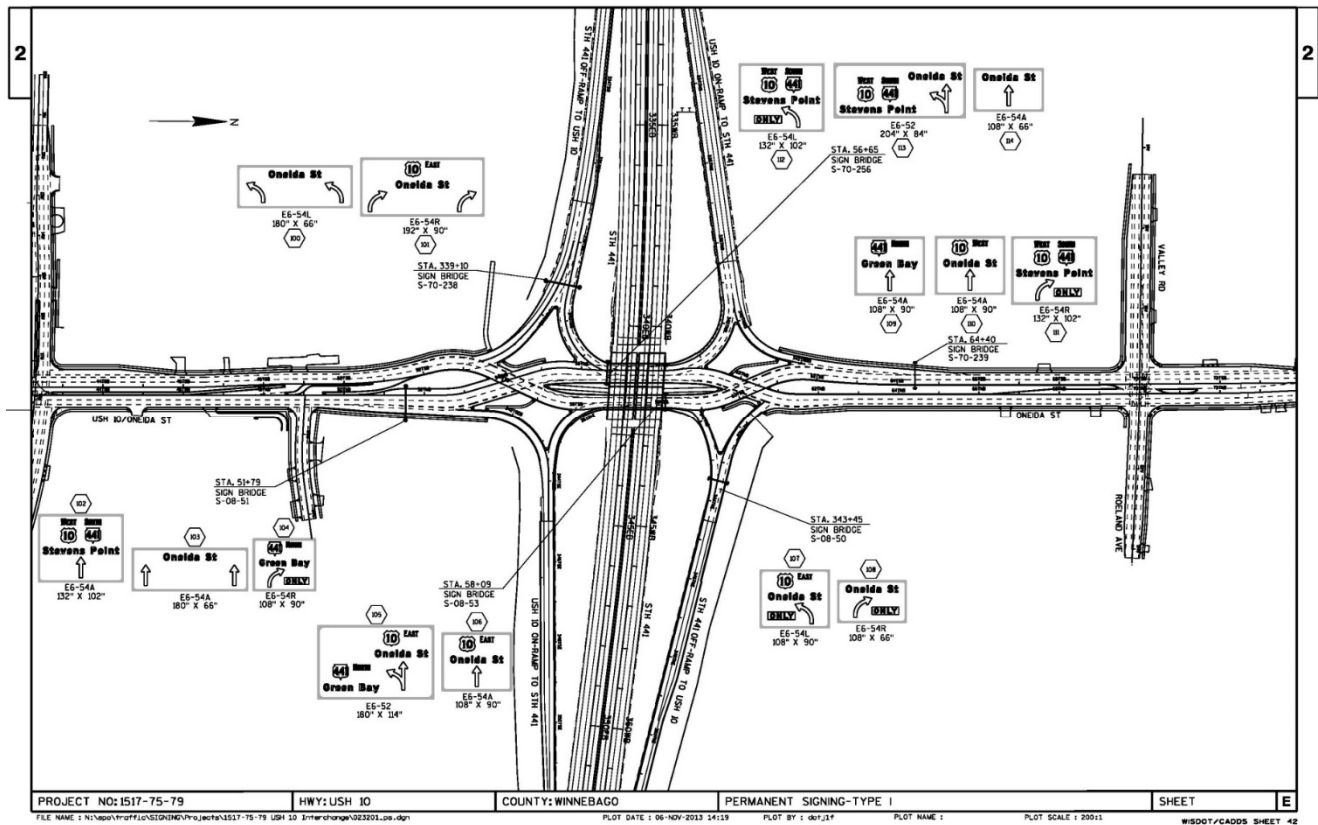


Figure 2. Continued

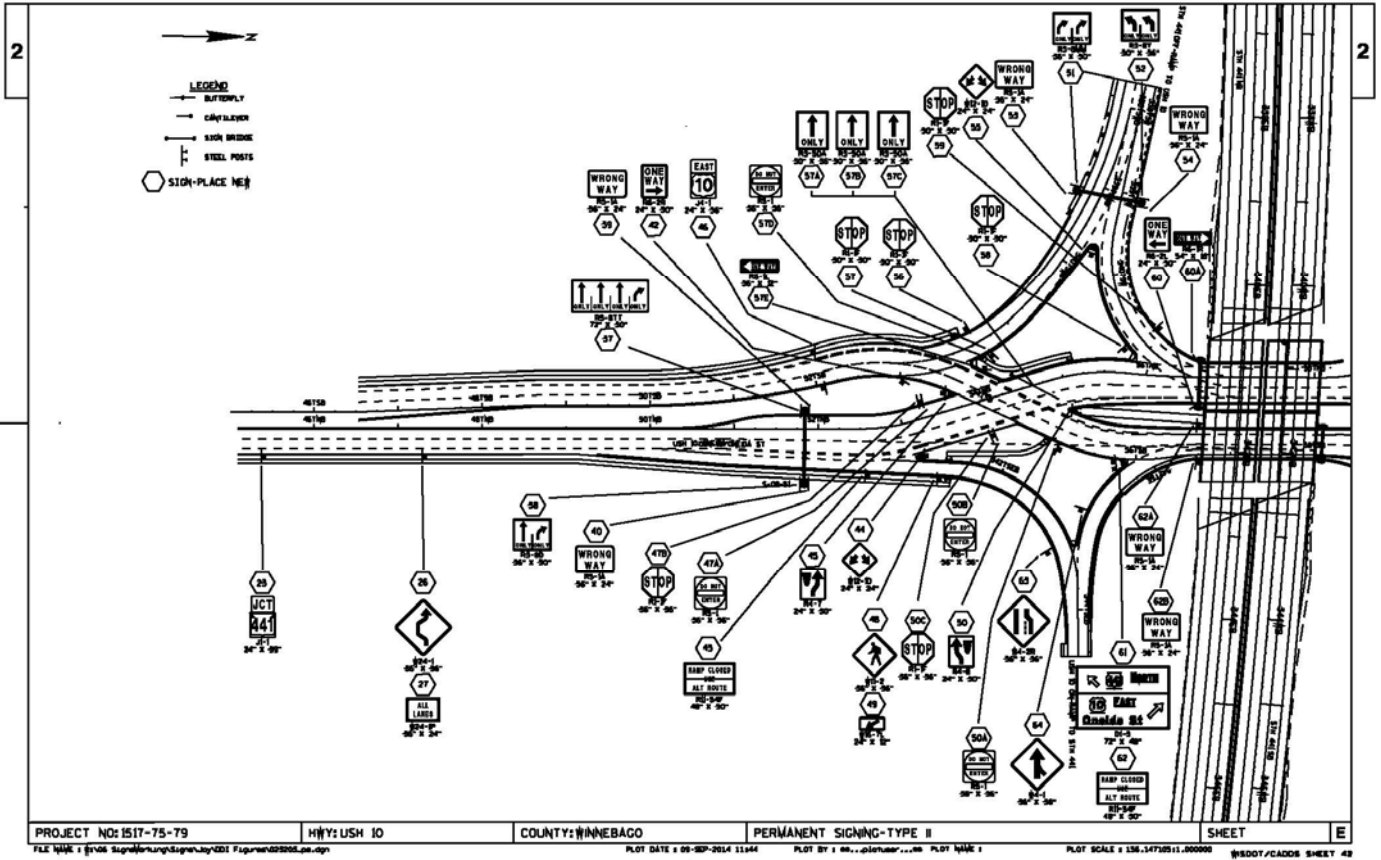
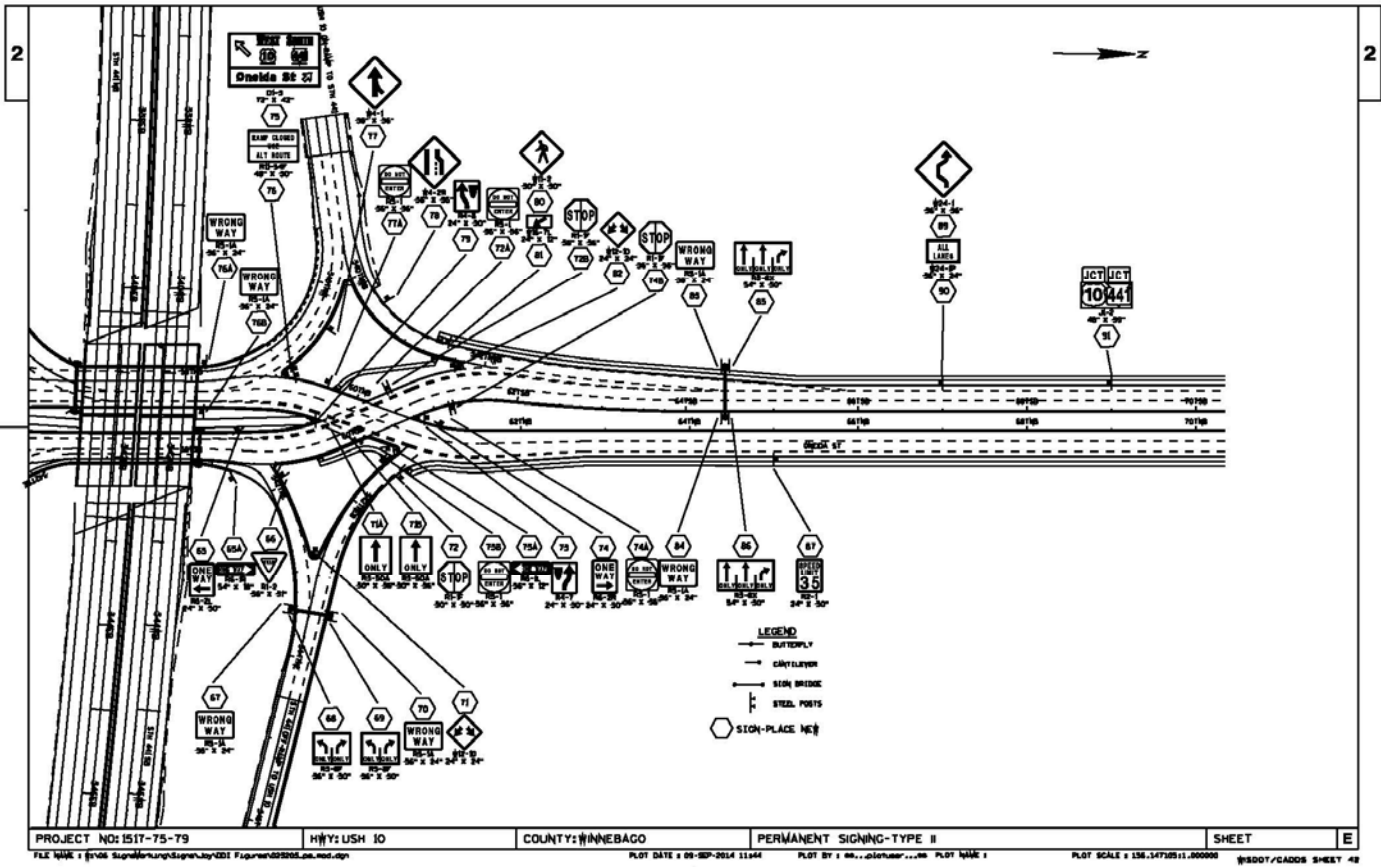


Figure 2. Continued



2-15-58 Specific Information Signs**April 2017****PURPOSE**

The purpose of this policy is to provide consistent statewide direction for the permitted use of Specific Information Signs under Wisconsin Administrative Code Chapter Trans 200.06 and [Wisconsin Statute 86.195](#).

The Specific Information Signs (SIS) have the business's logos on blue signs. These **shall** only be permitted on SIS highways.

DEFINITIONS

SIS Highway: SIS Highway *may* be a major highway, interstate, freeway, or expressway and are approved by the state legislature. In Trans 200.03, Chapter 86.195 contains all SIS approved highways. (<https://docs.legis.wisconsin.gov/statutes/statutes/86/195/6/a>)

POLICY

In addition, the following DOT qualifying considerations **shall** be met.

Gasoline

1. Businesses **shall** be open a minimum of 16 hours per day, seven days a week for freeways and expressways.
2. Businesses **shall** be open a minimum of 12 hours per day, seven days a week for other highways.
3. Businesses **shall** provide a restroom, drinking water, and a public telephone.
4. Businesses **shall** provide vehicle services including fuel, oil and water.
5. Businesses **shall** be within three miles of the exit unless no businesses are within the same category the maximum distance *may* be extended to 15 miles.

Food

1. Businesses **shall** be open five days per week and open from at least 10 a.m. to 7 p.m.
2. Businesses **shall** have licensing and approval where required.
3. Businesses **shall** have at least 50 percent of the gross receipts from food and non-alcoholic beverages.
4. Businesses **shall** have a public telephone.
5. Businesses **shall** be within three miles of the exit unless no businesses are within this category the maximum distance *may* be extended to 15 miles.

Lodging

1. Businesses **shall** have licensing and approval where required.
2. Businesses **shall** have adequate sleeping accommodations.
3. Businesses **shall** be within three miles of the exit unless no businesses are within this category the maximum distance *may* be extended to 15 miles.

Camping

1. Businesses **shall** have licensing and approval where required.
2. Businesses **shall** have restrooms, drinking water, and a public telephone.
3. Businesses **shall** have adequate parking accommodations.
4. Businesses **shall** be within three miles of the exit unless no businesses are within this category the maximum distance *may* be extended to 15 miles.

Tourist Attractions

1. The primary purpose **shall** be to provide amusement, historical, cultural, or leisure activities to the public.
2. The business **shall** have regional significance and adequate parking accommodations.
3. Businesses **shall** be within 30 miles of the exit.

4. Applications **shall** be sent to BTO and forwarded onto the Advisory Council for approval.

Installation of Specific Information Signs

Contact Interstate Logos for an application.

4918 Triangle St.

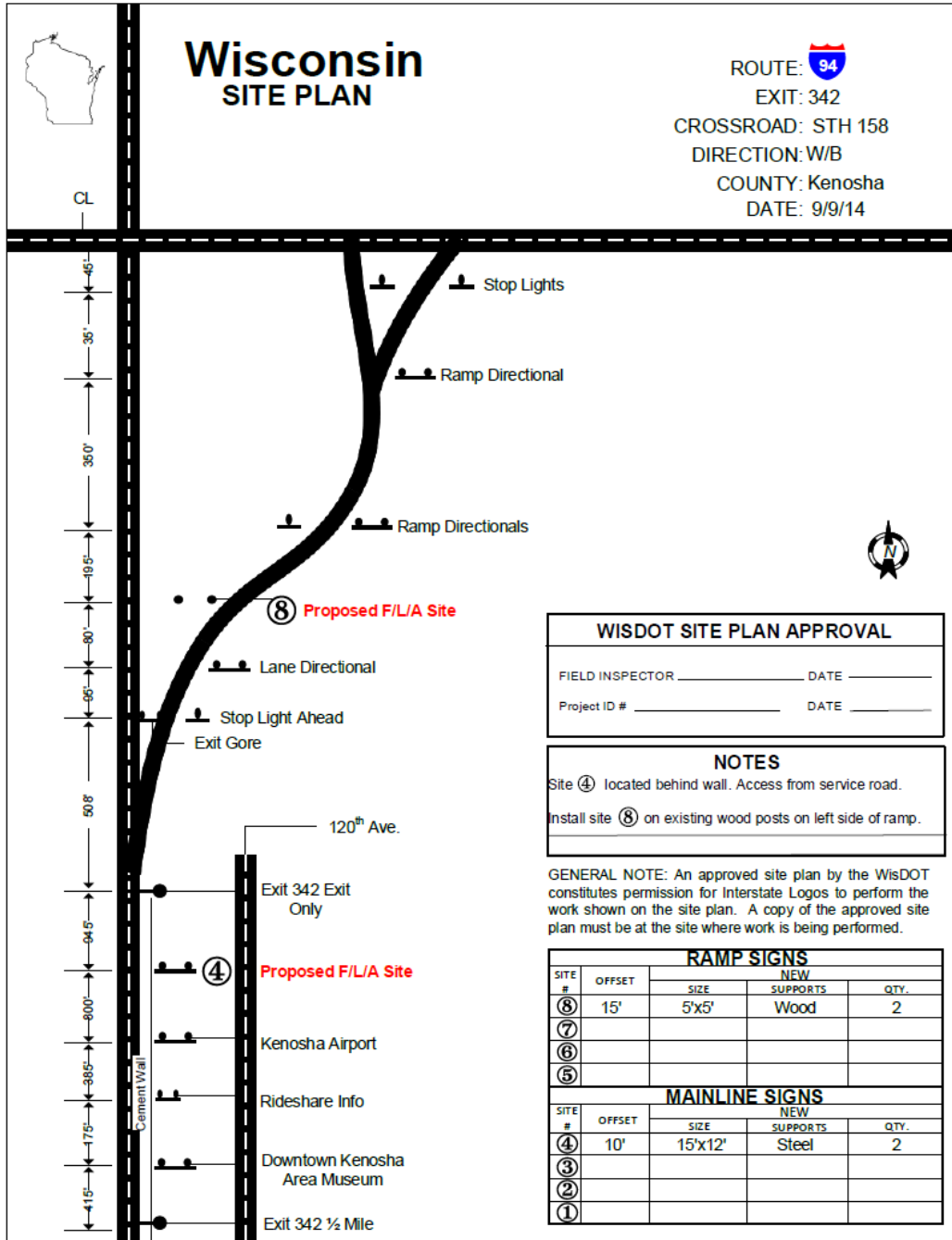
McFarland, WI 53558

(844) 496-9163 or (608) 579-1570

www.wisconsin.interstatelogos.com

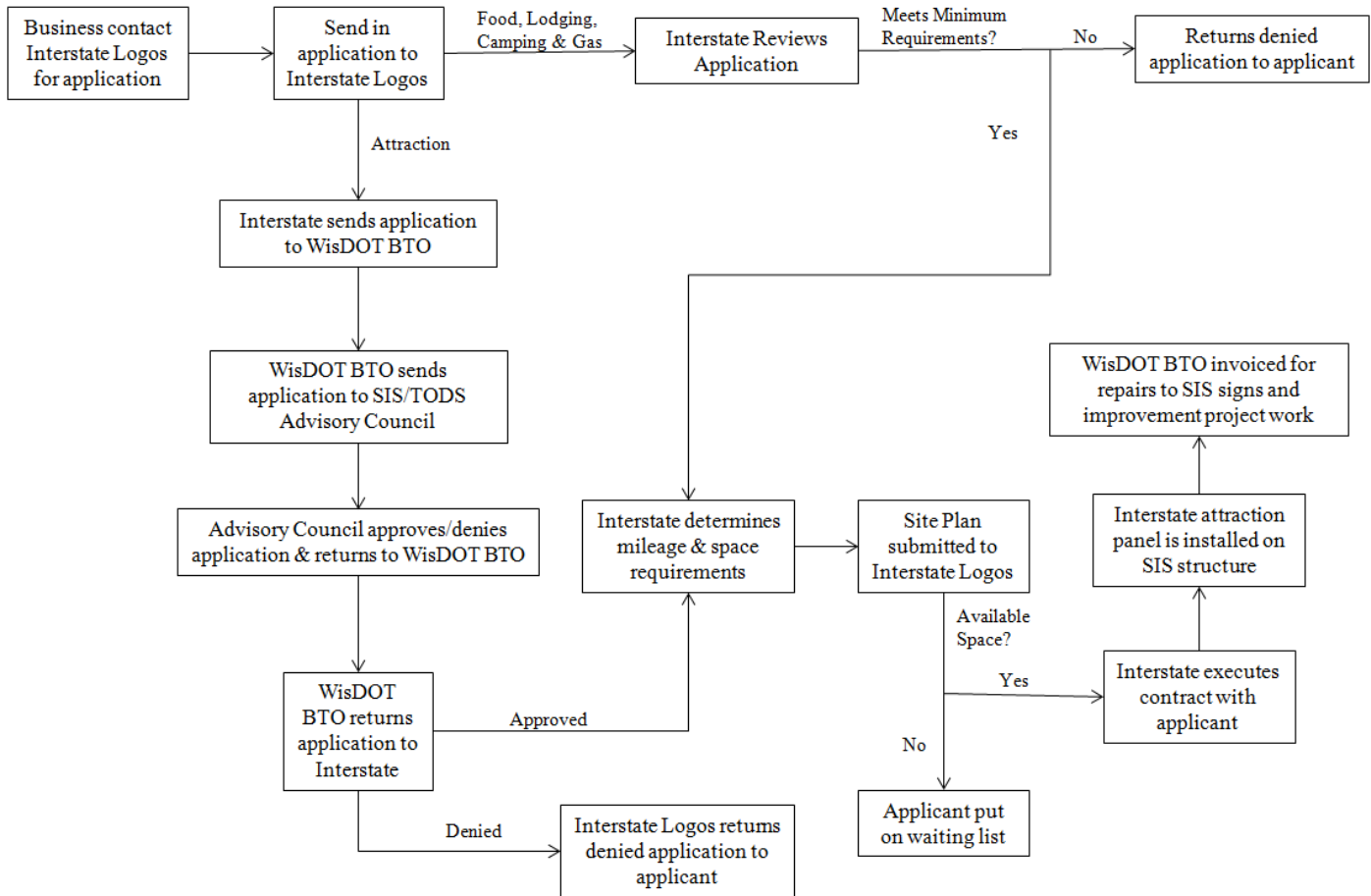
Improvement Projects

- Site Plans **shall** be requested from Wisconsin Logos (see attached example below).
- Project contractors **shall not** perform work on SIS signs.
- STSP 638-010 **shall** be included in projects with SIS signs.



The flow chart below describes the application process to obtain a SIS sign.

SIS Application Process



2-15-59 Tourist Oriented Directional Signs

April 2017

PURPOSE

The purpose of this policy is to provide consistent statewide direction for the permitted use of Tourist Oriented Directional Signs under Wisconsin Administrative Code Chapter Trans 200.08 and the [Wisconsin Statute 86.196](#).

The Tourist Oriented Directional Signs (TODS) are white on blue signs. These are not permitted on SIS highways or in urban areas.

The application/permit form DT1864 incorporates Trans 200.08 and Statute 86.196 and specifies complete guidance on the use of these signs.

DEFINITIONS

SIS Highway: Specific Information Sign highways can be found in [TEOpS 2-15-58](#).

Federal Urban Area: Federal urban areas are defined as “Urban Federal Aid Systems” with populations of 5,000-49,000.

Urban Areas: Urban areas are defined as urban boundaries with populations of 50,000 or greater.

GUIDANCE

The following businesses are qualified for a TODS sign under the gas, food, lodging, or camping categories.

| | |
|-------------------|-----------------|
| Bed and Breakfast | Campground |
| Hotel | Motel |
| RV Park | Resort |
| Restaurant | Service Station |
| Coffee Shops | |

The following table provides a list of facilities which, if open and available to the public, *may be* eligible for a TODS attraction sign.

| | |
|--|---|
| American Indian Craft | Amusement Park |
| Antique Shop | Art Gallery |
| Bait and Tackle Shop | Beach (privately owned) |
| Bicycle Rental | Boat Tour |
| Boat/Canoe Rental | Brewery (with tours) |
| Candy Store (Primary Business) | Cave (with tours) |
| Cheese Factory Shop (Primary Business) | Farm Tour |
| Ferry | Fish Farm |
| Game Farm (open to Public) | Golf Course |
| Hot Air Balloon Rides | Museum |
| Orchard | Park |
| Petting Zoo | Pick-Your-Own Fruits and Vegetables |
| Rafting/Tubing Business | Sausage Factory Shop (primary business) |
| Ski Resort/Hill | Stable |
| Tree Nursery | Wildlife Refuge |
| Winery (with tour) | Zoo |
| Botanical Gardens | Fairgrounds |
| Water Park | Casino/Bingo |

The following table proves a list of facilities which are *not* eligible for TODS attraction signs.

| | |
|--------------------------|------------------|
| Tennis Court | Fireworks |
| Book Store | Go-Kart Track |
| Taxidermy Shop | Grotto |
| Car Rental | Health Club |
| Swimming Pool/Natatorium | Hobby Shop |
| Civic Center | Ice Rink/Arena |
| Conservation Area | Movie Theater |
| Outlet Mall | Religious Shrine |
| Sports Arena/Stadium | |

POLICY

TODS signs are intended for use in rural or outlying urban areas. They **shall not** be installed in Federal Urban Areas or Urban Areas due to sidewalks, terraces, and right of way constraints. TODS Signs **shall not** be installed in urban areas.

In addition, the following DOT qualifying considerations **shall** be met.

1. Name changes **shall** require cancellation of the old sign and issuance of a new permit.
2. Only the name of the facility and mileage **shall** be allowed for guidance. Additional sign features, such as vacancy, hours of operation or products offered **shall not** be allowed on the sign or on an attached plaque or board.
3. If a conventional highway facility qualifies for signs in more than one category (TODS, SIS, Trans 200 Guidance or Supplemental Guide sign), only one category will be allowed in each direction.
4. If outdoor advertising signs for the facility are within 1,000 feet of the intersection or entrance, guidance signs **shall not** be permitted.
5. Businesses **shall** be within five miles and have direct access of the State or U.S. Highway.
6. Businesses **shall** have no illegal outdoor advertising signs.

Category specific information:

Gasoline

1. Businesses **shall** have fuel, oil, and water available.
2. Businesses **shall** be open a minimum of twelve hours per day, seven days a week.
3. Businesses **shall** provide a restroom, drinking water, and a public telephone.

Food

1. Businesses **shall** have licensing or approval, where required.

2. Businesses **shall** be open five days per week and open from at least 10 a.m. to 7 p.m.
3. Businesses **shall** have at least 50 percent of the gross receipts from food and non-alcoholic beverages.
4. Businesses **shall** provide a restroom, drinking water, and a public telephone

Lodging

1. Businesses **shall** have licensing or approval, where required.
2. Businesses **shall** have adequate sleeping accommodations.
3. Businesses **shall** have parking accommodations.
4. Businesses **shall** provide restrooms, drinking water, and a public telephone.

Camping

Businesses **shall** have licensing or approval, where required.

Businesses **shall** have parking accommodations.

Businesses **shall** provide restrooms, drinking water, and a public telephone.

Tourist Attractions

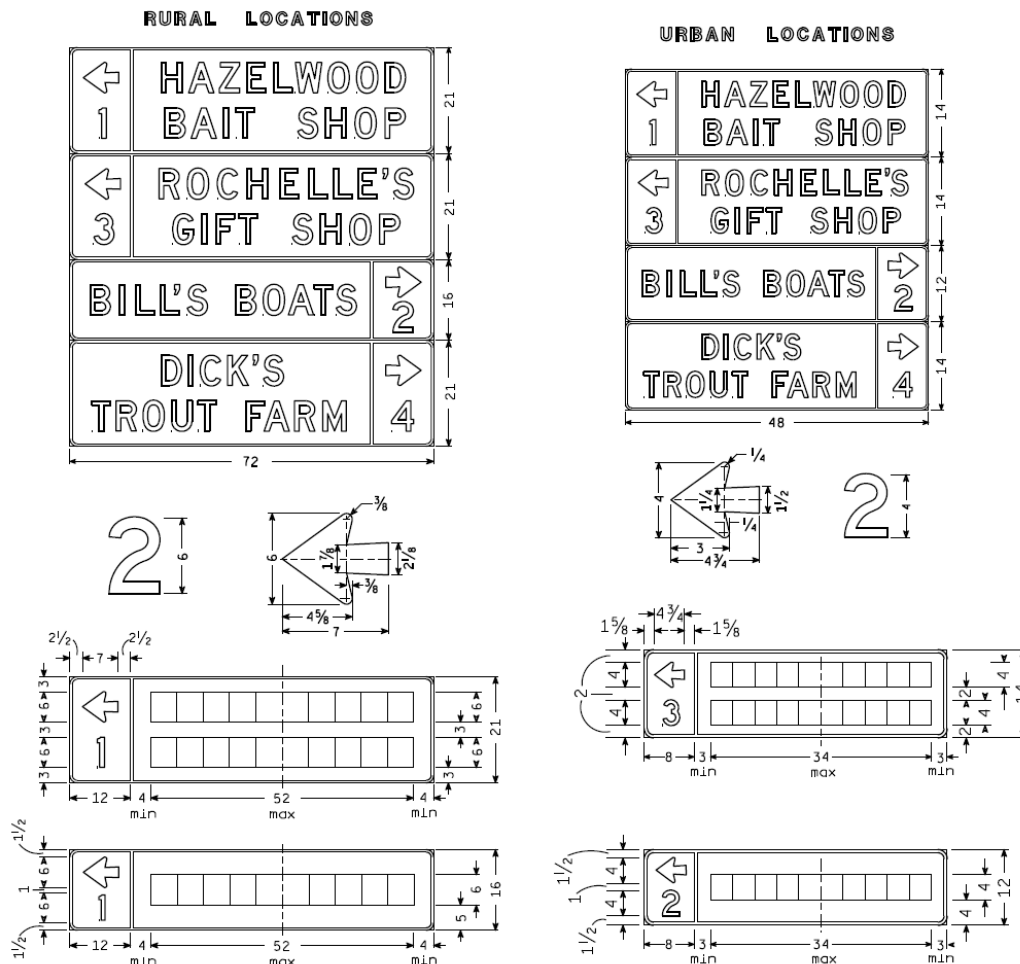
Businesses **shall** have licensing or approval, where required.

Businesses **shall** be open at least eight hours per day, five days a week for three consecutive months.

Businesses **shall** provide restrooms and drinking water

Businesses **shall** have significant interest to the traveling public, as approved by the Advisory Council.

Figure 1. Standard Plate for TODS signs



As shown on Figure 1 of the Standard Sign Plate E10-82, the sign message **shall** consist of 4 or 6 inch white

lettering on type H reflective blue background. Letter sizes and spacing **shall** conform to the standards in the FHWA Standard Highway Signs manual. Overall sign sizes used **shall** conform to the dimensions as shown on Figure 1 of the Standard Sign Plate E10-82. A half inch white border with a 1 ½" radius shall be placed around the sign.

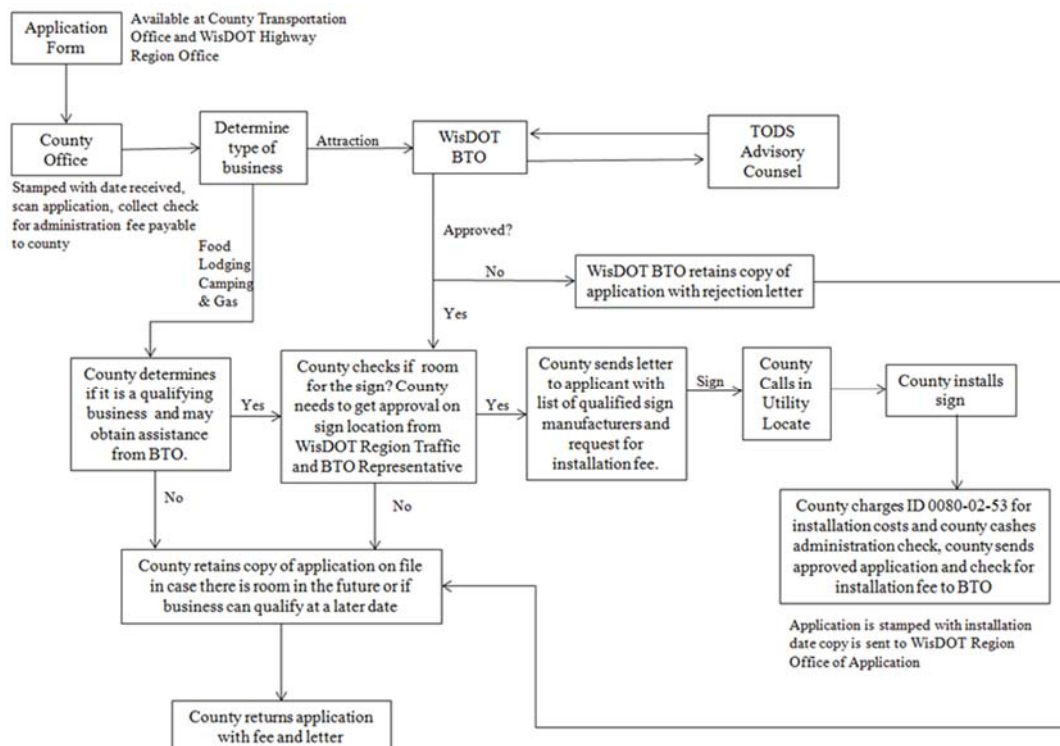
The WisDOT Region office reserves the right to remove non-conforming signs from the highway right-of-way. The owner *may* contact the WisDOT Region office to pick up any signs that have been removed. Upon pickup of the removed signs, the sign owner **shall** be responsible for sign removal costs.

Installation of Tourist Oriented Directional Signs by Counties

1. Businesses **shall** bring in the completed [DT1864](#) form with a check payable to the county for the \$100/sign for administration fee. Businesses need to pay fee every 5 years.
2. Once approved, the business *may* have the sign manufactured from one of the businesses on the Qualified Manufacturer list.
3. The business **shall** bring in the sign along with a check for \$250 per sign payable to the Wisconsin Department of Transportation. These checks *should* be sent to: Wisconsin Department of Transportation, attn: Jeannie Silver, 3609 Pierstorff St. Madison, WI 53703.
4. Signs **shall** be mounted on 4" x 6" treated posts.
5. For removal and/or installation of 1 sign on existing posts the cost is \$100 per sign for the installation fee. Checks *should* be sent to: Wisconsin Department of Transportation, attn: Jeannie Silver, 3609 Pierstorff St. Madison, WI 53703.
6. All applications **shall** be forwarded to Jeannie Silver to verify the location is outside urban area boundaries.
7. All county costs for TODS repairs and installations **shall** be charged to the 0080-02-53 project ID and appropriate invoicing **shall** be submitted to the requestor as outlined in item 3 above.
8. The county *should* only repair damaged TODS when directed to do so by the sign owner.
9. Any existing white arrow boards for the business **shall** be removed before a TODS sign is installed

The application process for a TODS sign is shown below in the Figure 2.

Figure 2. TODS Application Process



TOURIST ORIENTED DIRECTIONAL SIGN APPLICATION/PERMIT

Wisconsin Department of Transportation

DT1864 8/2014
 s. 86.196 Wis. Stats., Ch. Trans. 200.08 Wis. Admin. Code

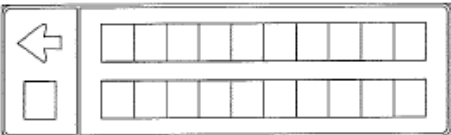
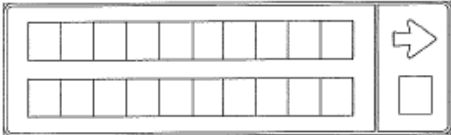

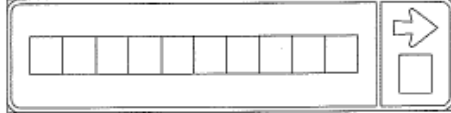
| |
|-----------------------|
| Make Check Payable To |
| Mail To |

INSTRUCTIONS:

1. Complete both sides of the form. PLEASE PRINT CLEARLY.
2. Submit a check for \$100 per sign.
 This is an administration fee. Make the check payable to the county in which the proposed sign(s) is (are) located.
3. Staple the check to the upper left corner of this application.
4. This check will be returned if the application is rejected.
5. Send this application and check to your County Highway Commissioner.

| | |
|--|---|
| Business/Service/Activity NAME for which TODS Sign is Requested | |
| Street Address, City, State, ZIP Code | |
| Business/Service/Activity Category for which TODS Sign is Requested. (Check ONE) | |
| <input type="checkbox"/> Gas | <input type="checkbox"/> Food |
| <input type="checkbox"/> Lodging | <input type="checkbox"/> Camping |
| <input type="checkbox"/> Tourist Attraction | |
| Services Available at the Facility | |
| <input type="checkbox"/> Restrooms | <input type="checkbox"/> Parking |
| <input type="checkbox"/> Drinking Water | <input type="checkbox"/> Public Telephone |
| Period of Business/Service/Activity Function | Open Each Year |
| <input type="checkbox"/> Open All Year | <input type="checkbox"/> Seasonal Operation |
| From (month/day): | |
| To (month/day): | |

| Hours of Operation | OPEN | CLOSE | Annual Attendance (Number is <i>Required</i> for "TOURIST ATTRACTIONS" only) |
|--------------------|--|--|---|
| Monday | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | Number of Visitors per Year: |
| Tuesday | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | Special Rule for FOOD Category If you are applying for a TODS sign under the FOOD category, please answer the following: |
| Wednesday | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | |
| Thursday | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> Yes <input type="checkbox"/> No 1. Do you serve 3 meals per day? |
| Friday | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> Yes <input type="checkbox"/> No 2. Are at least 50% of your gross annual receipts for food and nonalcoholic beverages? |
| Saturday | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | Sign Conflicts <input type="checkbox"/> Yes <input type="checkbox"/> No 1. Do you have a "White Arrow Board" sign (Ch. Trans 200.03, Wis. Admin. Code) at the intersection of the proposed TODS signage? |
| Sunday | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <input type="checkbox"/> a.m. <input type="checkbox"/> p.m. | |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No 2. Do you have an outdoor advertising sign, which is not in accordance with s.84.30 Wis. Stats. or Ch. Trans. 201 Wis. Admin. Code? |

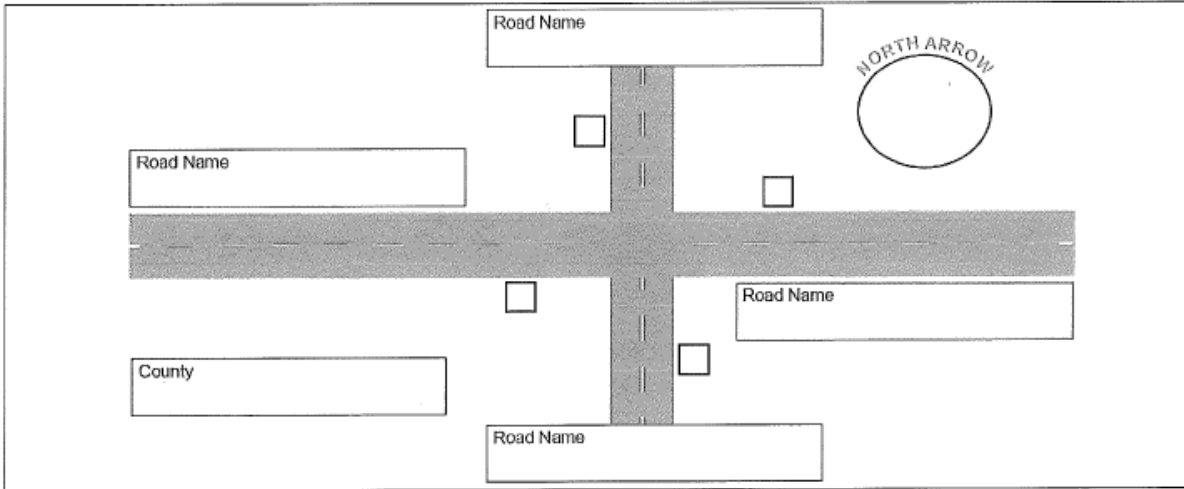
| | | |
|--|---|--|
| Number of Signs <input type="checkbox"/> One TODS sign (Administration fee is \$100 payable to the county) <input type="checkbox"/> Two TODS signs (Administration fee is \$200 payable to the county) | Proposed Sign Wording Fill in the name and the distance from the intersection to the business/service/activity for each TODS Sign requested. Limit the name to one character or space per box. | |
| |  |  |
| |  |  |

TOURIST ORIENTED DIRECTIONAL SIGN APPLICATION/PERMIT (continued)

Wisconsin Department of Transportation DT1864

PROPOSED SIGN LOCATION INSTRUCTIONS

1. Label the intersecting roads.
2. Place an arrow in the circle pointing to the North.
3. Check (X) one or two of the boxes corresponding to the proposed sign location(s). (TODS signs are only permitted on State Highways or U.S. Highways. They must direct motorists to businesses, which are located on County Highways or Town Roads.)
4. Place an O (circle) at the approximate location of your business.
5. Write in the name of the county in the lower left corner.
6. Write in any additional details or comments that would be helpful in determining the proposed sign location. (Optional)



CERTIFICATION

I, the applicant, certify that the statements contained on this application/permit are true and correct, and that the business identified is conducted in conformity to all laws applicable to nondiscrimination, and that discrimination is not exercised in regard to race, religion, color, sex, sexual orientation, or national origin. I understand that in addition to the attached administration fee, I am responsible for the manufacturing and installation costs for the proposed sign(s). I understand that this permit is revocable, and that it is subject to renewal every five years. I further understand that if my business is a seasonal business, that a "CLOSED" plaque will be placed on my sign when my business is closed for the season.

| |
|----------------------------------|
| Applicant Name (First, MI, Last) |
| (Area Code) Telephone Number |

_____ (Date – m/d/yyyy)
 (Applicant Signature)

APPROVAL – APPROVED FOR WISCONSIN DEPARTMENT OF TRANSPORTATION

Subject to present and continuing compliance by the applicant with all requirements of s.86.196 Wis. Stats. and Chapter Trans. 200.08, Wisconsin Administrative Code, a permit is granted for the TODS sign described. This permit expires on the five-year anniversary date of the installation of the TODS sign panel.

_____ (Date – m/d/yyyy)
 _____ (Date – m/d/yyyy)
 (WisDOT Region Traffic Engineer) (State Traffic Engineer or Authorized Agent)

| — For WisDOT Use ONLY — | | | | | | |
|--------------------------------------|--------------------------------------|---------------|--------|-------------------|-----|------|
| SIGN SIZE | | PERMIT NUMBER | | INSTALLATION DATE | | |
| <input type="checkbox"/> RURAL (72") | <input type="checkbox"/> URBAN (48") | County | Number | Month | Day | Year |

2-15-60 Trans 200 Guidance Signing**April 2017****PURPOSE**

The purpose of this policy is to provide consistent statewide direction for the permitted use of guidance signs under Wisconsin Administrative Code Chapter Trans 200.

These narrow horizontal signs are only permitted on conventional state highways or expressway approaches to at-grade intersections. As prescribed in subsection Trans 200.03, these signs *may* be permitted to direct to:

- resorts,
- hotels,
- places of public entertainment or instruction,
- any place of religious worship,
- any county institution,
- any scientific experiment location for the furtherance of agriculture or other science or art.

The term “entertainment” in this case does not include nightclubs, taverns, or similar establishments.

Trans 200.03, this policy, and the Application/Permit Form DT1903 specify complete guidance on the use of these signs.

DEFINITIONS

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate Highways are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional Highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

GUIDANCE

The following table provides a list of facilities which, if open and available to the public, *may* be eligible for a White Arrow Board permit.

MAY BE ELIGIBLE

| TYPE OF FACILITY | QUALIFYING CONSIDERATIONS |
|-------------------------------|--|
| Agricultural experiment | |
| Animal shelters | <i>May</i> be permitted for County Institutions only. |
| Athletic fields, facilities | <i>May</i> be permitted for facilities that do not qualify for supplemental signing, and community wayfinder signing is not available. |
| Aviation Flight School | |
| Cabins, Cottages | For rental periods less than 30 days |
| Camps, religious or youth | |
| Campgrounds, RV Parks | Privately owned with rental periods less than 30 days. |
| Churches | |
| Condominiums | Only if part of a resort, for rental periods less than 30 days |
| Convention Center | <i>May</i> be permitted for facilities that do not qualify for supplemental signing, and community wayfinder signing is not available. |
| Country Clubs | Only when open to the public |
| County Healthcare Facilities | |
| Cruises, Boat | |
| Environmental Center | |
| Exhibition, Exposition Center | <i>May</i> be permitted for facilities that do not qualify for supplemental signing, and community wayfinder signing is not available. |
| Golf Courses | Only when open to the public |
| Horseback Riding | Only when open to the public |
| Hotel, Motel, Bed & Breakfast | <i>May</i> be permitted as a substitute for “Lodging” category where SIS or TODS is not permitted. |
| Humane Society Shelter | <i>May</i> be permitted for County Institutions only. |
| Libraries | |
| Marinas | |
| Museums and historic sites | <i>May</i> be permitted for facilities that do not qualify for supplemental signing, and community wayfinder signing is not available. |
| Recreational facilities | Facilities open to the public for recreational activities including ATV parks; |

| | |
|---|---|
| | amusement parks; archery ranges; boat, kayak or canoe launches, tours or rental facilities; bowling alleys; casinos; caves; concert venues; curling venues; disc golf courses, fishing piers; go-cart tracks, hanggliding; horseshoe facilities; ice skating rinks; paintball facilities; playgrounds; riding stables; rock climbing; shooting ranges; skate parks; skydiving facilities; sledding hills; splash parks; swimming pools; tour providers (airplane helicopter, tram, boat, walking); volleyball courts; waterski or wake board shows; waterparks. |
| Religious Worship Facilities | |
| Research Facilities | |
| Resorts | For rental periods less than 30 days |
| Restaurants, Supper Clubs | May be permitted as a substitute for "Food" category where SIS or TODS is not permitted. |
| Schools | |
| Scientific Experiments | |
| Seminaries | Only if it contains a public place of worship. |
| Shooting Ranges, Gun Clubs | Gun clubs shall be open to the public as shooting ranges. See types of shooting ranges under Qualifying Considerations for Recreational Facilities. |
| Theaters | Live entertainment only |
| Trails - Recreation, Nature, Skiing, Biking, Hiking, Snowshoeing, Snowmobiling, ATV or other vehicle trails | Directing to trailhead access with parking. |
| Train rides | May be permitted as a substitute for "Attractions" category where SIS or TODS is not permitted. |
| Wildlife Refuges | To instructional centers only |
| Zoo | May be permitted for facilities that do not qualify for supplemental signing, and community wayfinder signing is not available. |

The following table provides a list of facilities which are **not eligible** for a White Arrow Board permit. As a general class, all retail or wholesale sales or service establishments **shall not** be approved for White Arrow Board.

NOT ELIGIBLE

| | | | |
|---|------------------------|---|--------------|
| Agricultural Farms | Berry Patches | Cranberry Marshes | Tree Farms |
| | Tree, Plant Nurseries | Produce Stands | Greenhouses |
| Air Traffic Control | | | |
| Animal Hospitals | | | |
| Animal Ranches | Game Farms | | |
| Apartments | Buildings | Complexes | |
| Artists | Art Dealers | Artist Studios | |
| Auto Repair | Auto Body Repair | | |
| Barber, Beauty Shops | | | |
| Builders, Contractors | Carpenters | Electricians | Landscapers |
| | Painters | Plumbers | Tree Service |
| Bus Terminals | | | |
| Cemeteries | | (see TEOpS 2-15-3 & 2-15-20 re: Veterans Cemeteries) | |
| Clinics | | | |
| Crafts supplies, outlets | | | |
| Dance Halls | | | |
| Factories | | | |
| Freight Terminals | | | |
| Government Offices | | | |
| Halfway Houses | | | |
| Health Clubs | | | |
| Highway Departments | Maintenance Facilities | | |
| Historic Neighborhoods | | | |
| Hospitals | | | |
| Jails | | | |
| Kennels | | | |
| Lakes | Landings | | |
| Malls, Shopping Centers | | | |
| Mental Health Facilities (except County) | | | |
| Mobile Home Parks | | | |

| | | | |
|--|---------------------|---------------------|-------------------|
| Movie Theaters | | | |
| Nursing Homes, Assisted Living, Private | | | |
| Office Buildings | | | |
| Pharmacies | | | |
| Post Offices | | | |
| Power Plants | Utilities | | |
| Private Clubs | | | |
| Realtors | | | |
| Recycling Station | | | |
| Rehabilitation Centers (except County) | | | |
| Residences | | | |
| Retirement Facilities (except County) | | | |
| Sales, Retail or Wholesale | | Antique Dealers | Auto Dealerships |
| | Bait & Tackle Shops | Grocery Stores | Hardware Stores |
| | Home Furnishings | Home Improvements | Liquor Stores |
| | Lumber Dealers | Materials Suppliers | Mobile Home Sales |
| Storage Units | | | |
| Subdivisions | | | |
| Taverns | Bars | Pubs | Taps |
| Taxidermists | | | |
| TV & Radio Stations | | | |
| UW Extension Offices | | | |
| Veterans Memorials | | | |

POLICY

White Arrow Boards are intended for use in rural or outlying urban areas. They *should not* be installed in dense urban areas due to sidewalks, terraces, and right of way constraints.

In addition, the following DOT qualifying considerations **shall** be met.

1. The facility **shall** be open to the public.
2. Lodging facilities **shall** have three or more units that **shall** be available for less than 30-day rental periods.
3. Signs *may* only be permitted on the state highway(s) nearest the facility.
 - a. Directing to its entrance from the state highway, or
 - b. Directing to its entrance on a local road.

Signs directing to facilities beyond other state, US, or Interstate highways **shall not** be permitted.

1. Guidance signing **shall not** be permitted on the right of way at the entrance to a facility if there is sufficient sight distance in which to identify the activity, facility or other type of signing at the entrance. This applies both to businesses that front the roadway and also to those not fronting the roadway, but are visible from the roadway. Minimum visibility distances, based on the posted speed, are found in the following table from MUTCD Section [2C.36](#).
2. Businesses **shall** have the appropriate operating licenses to receive, maintain, or renew a permit.
3. Name changes **shall** require cancellation of the old and issuance of a new permit.
4. Only the name of the facility **shall** be allowed for guidance. Additional sign features, such as vacancy, hours of operation or products offered **shall not** be allowed on the sign or on an attached plaque or board.

| Posted Speed | Minimum Visibility Distance |
|--------------|-----------------------------|
| 25 mph | 280 ft |
| 30 mph | 335 ft |
| 35 mph | 390 ft |
| 40 mph | 445 ft |
| 45 mph | 500 ft |
| 50 mph | 555 ft |
| 55 mph | 610 ft |
| 60 mph | 665 ft |
| 65 mph | 720 ft |

5. If a conventional highway facility qualifies for signs in more than one category (TODS, SIS, White Arrow

Boards or Supplemental Guide sign), only one category will be allowed. In this case, the White Arrow Boards *should* be discouraged because it is not retroreflective.

6. If outdoor advertising signs for the facility are within 1,000 feet of the intersection or entrance, guidance signs **shall not** be permitted.
7. No more than one arrow board for a facility **shall** be permitted on a state highway in each direction.
8. Guidance sign assemblies **shall** be limited to a maximum of six arrow boards.
9. There *may* be a maximum of two guidance sign assemblies per intersection approach in the same direction.

As shown on Figure 1 of the DT1903 form, the sign message **shall** consist of 4½-inch black block lettering on a non-reflective white background. Letter sizes and spacing **shall** conform to the standards in the FHWA Standard Highway Signs manual. Overall sign sizes used **shall** conform to the dimensions as shown on Figure 1 of the DT1903 form.

The WisDOT Region office reserves the right to remove non-conforming signs from the highway right-of-way. The owner *may* contact the WisDOT Region office to pick up any signs that have been removed. Upon pickup of the removed signs, the sign owner **shall** be responsible for sign removal costs.

Upon approval as a qualifying facility, the region *may* issue the permit Form DT1903, "AUTHORITY TO ERECT DIRECTIONAL SIGNS ON THE STATE HIGHWAY SYSTEM APPLICATION". There is no permit fee.

Installation **shall** be by the requestor's choice of a WisDOT approved signing contractor or county signing crew in accordance with Department signing standards as detailed on Figure 2 of the DT1903 form. All costs of sign manufacturing, installation, maintenance, and modification of assemblies **shall** be the responsibility of the requestor(s).

Installation of White Arrow Board Signing by Counties

1. If the sign is fabricated by the County, all charges **shall** be charged to the business. Installation costs **shall** be charged to project ID 0080-02-63.
2. New installation of the sign **shall** be \$250 per sign with 4 x 6 treated posts. For removal and/or installation of 1 sign on existing posts the cost will be \$100 per sign.
3. Requestor **shall** make checks payable to the Wisconsin Department of Transportation, attn: Jeannie Silver, 3609 Pierstorff St. Madison, WI 53703.
4. The county *should* only repair damaged white arrow boards when directed to do so by the sign owner.
5. All county costs for white arrow board sign repairs **shall** be charged to the 0080-02-63 project ID and appropriate invoicing **shall** be submitted to the requestor as outlined in items 2 and 3 above.

AUTHORITY TO ERECT DIRECTIONAL SIGNS ON THE STATE HIGHWAY SYSTEM APPLICATION

Wisconsin Department of Transportation (WisDOT)
 DT1903 9/2015 (Replaces ET602)

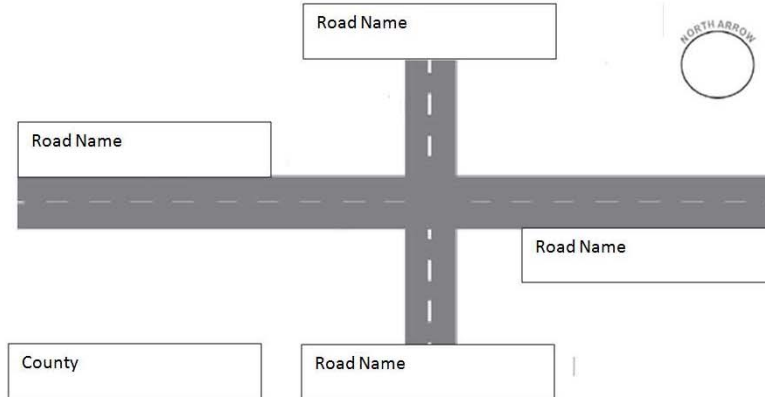
Submit completed applications to Wisconsin Department of Transportation Regional Office

Business/Service/Activity Name for which White Arrow Board sign is Requested

| | | | |
|---------------|------|--------------|----------|
| Street | City | State | ZIP Code |
| Email Address | | Phone Number | |

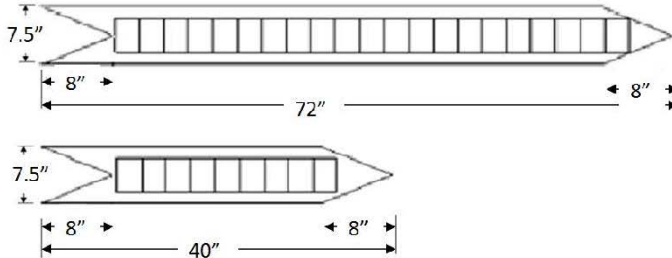
Proposed Sign Location Instructions

1. Label the intersecting roads.
2. Place an arrow in the circle pointing to the North.
3. Check (x) in the boxes corresponding to the proposed sign location.
4. Write the name of the county in the lower left corner.



Proposed Sign Wording

Fill in the name of the business. Limit the name to one character or space per box. Signs shall contain 4.5" black, block lettering on white background.



Number of Signs (select one):

- 1 Sign
- 2 Signs

Sign placed on (select one):

- New Posts
- Existing Posts

I apply for authority to erect and maintain guidance signs at the locations listed on this application. I certify and agree that these signs will conform to the approved design of the Wisconsin Department of Transportation and that I will comply with all the regulations under which authority these signs may be erected. I also certify that I will comply with the attached figures

X

 Applicant Signature Date

X

 WisDOT Region Signature Date

AUTHORITY TO ERECT DIRECTIONAL SIGNS ON THE STATE HIGHWAY SYSTEM APP *(continued)*

Wisconsin Department of Transportation DT1903

Sign Erection Regulations

Extracted from Chapter Trans 200, Wisconsin Administrative Code

Trans 200.02 Authority for the erection of signs.

1. The Department of Transportation or its authorized representatives in the case of the marked routes of state trunk highways, and local authorities with respect to highways under their exclusive jurisdiction, may place and maintain such traffic signs and signals as they deem necessary to warn, guide, inform, and regulate traffic, and also such signs and signals as are expressly permitted or required by the statutes or by these regulations, subject, however, to such limitations and restrictions as are contained in the statutes and these regulations.
2. The Department of Transportation with respect to the state trunk highway system, and local authorities with respect to highways under their jurisdiction, may erect or permit any department of the federal, state or local government to erect such standard signs as the Department of Transportation or local authorities deem necessary to inform and warn the public of federal or state laws, local ordinances and lawful regulations by any such department.

Trans 200.03 Guidance signs for resorts, hotels, county institutions, etc.

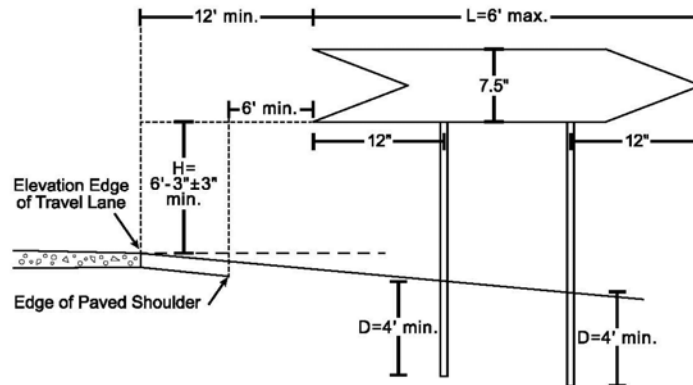
1. Any person or persons conducting a summer or winter resort, hotel, or any place of public entertainment or instruction, or any place of religious worship, or persons having charge of any county institution or of any scientific experiment for the furtherance of agriculture or other science or art may be permitted to erect guidance signs of a type approved by the Department subject to the conditions contained in this section.
2. No guidance sign may be permitted on freeways, including the national system of interstate highways.
3. Only where such institution or business location is removed from the state trunk highway system may such guidance signs be erected.
4. Such guidance signs may be erected at only two intersections of the state trunk highway system with county highways or town roads, and at such intersections of county or town highways as are deemed necessary by the local authorities having jurisdiction over those highways.
5. One sign of an approved size and shape may be erected at the entrance to any of the enumerated institutions or businesses.
6. No person may be permitted to erect or maintain a guidance sign on a highway if that person has any advertising in the vicinity of the intersection where the guidance sign is proposed to be erected or has a business sign under 200.06 on the same highway.
7. All guidance signs erected on any public highway shall be of a type and design approved by the Department. No flashing, illuminated, or reflecting signs or installation shall be permitted.
8. No guidance sign may be erected upon state trunk highway right of way at an intersection with the state trunk highway system until the location and manner of erection of the have the written approval of the Department. No guidance sign may be erected on the right of way of a county and town highway until the location and manner of erection of the sign have the written approval of the local authorities having jurisdiction over the said highway.
9. All guidance signs and their supports shall be maintained in good condition. **Signs or installations not satisfactorily maintained shall be removed by the officers in charge of the maintenance of the highway.**

Trans 200.04 Prohibited signs and signals.

1. No person may erect, cause to be erected, permit to be erected or maintain any advertising, warning, route, guide, information, or regulatory sign or signal within the limits of any highway except as authorized in sections 200.02, 200.03, 200.05 or 200.06.
2. No person may place or maintain nor may any public authority permit upon any highway any official traffic control device bearing thereon any commercial advertising except as authorized in 200.06.

AUTHORITY TO ERECT DIRECTIONAL SIGNS ON THE STATE HIGHWAY SYSTEM APP (continued)
 Wisconsin Department of Transportation DT1903

Figure 2. Typical Installation Detail for Arrow Board Signs
 (Supplement to form DT1903)

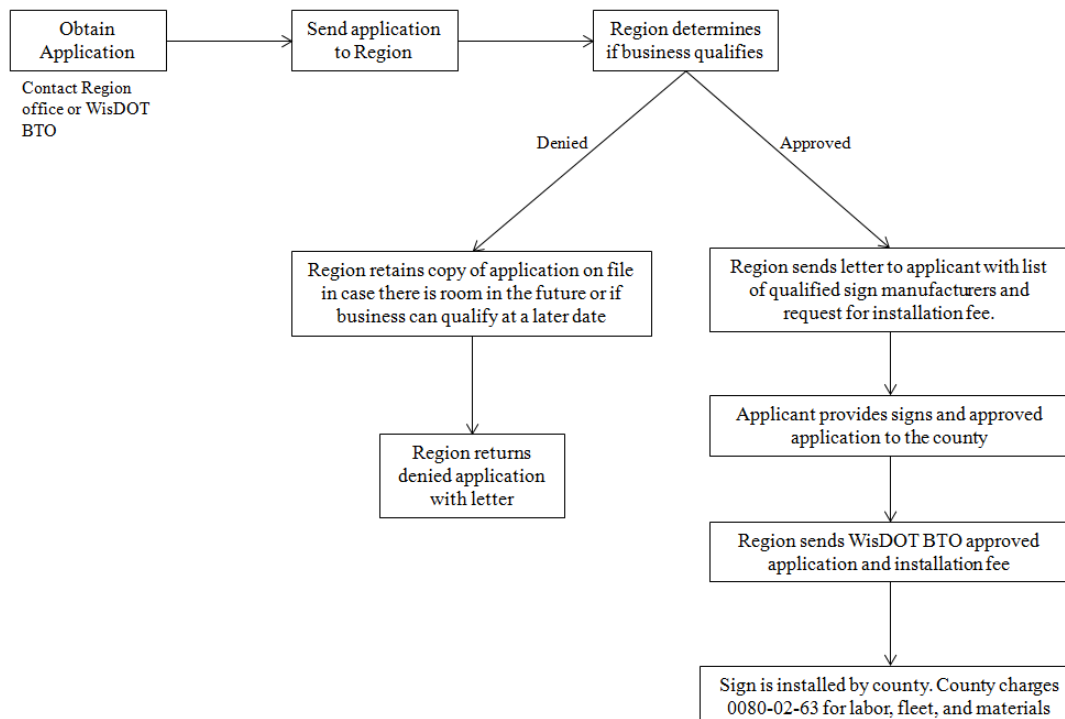


Sign Installation Requirements:

1. The Requestor shall contact the county highway department or WisDOT approved Signing Contractor for installation of the signs. Counties should charge all installation and repair costs to ID 0080-02-63. Counties will invoice charges to the requestor. Payment shall be made to: Wisconsin Department of Transportation, Attn: Jeannie Dammen, 3609 Pierstorff Street, Madison, WI 53704.
2. Signs are to be mounted per dimensions shown above.
3. Sign posts are to be treated wood 4 x 4's or 4 x 6's suitable for ground contact.
4. Signs less than 4 feet in length may be mounted on a single post; all other dimensions shown above apply.
5. Signs are to be mounted to project approximately 1 inch above the top of the post.
6. If multiple signs are "stacked" on the same posts, all signs are to be the same length. In this case, the minimum mounting height shall be 5' 3" for rural areas.
7. Sign assemblies shall be limited to a maximum of six signs per side.
8. There may be a maximum of two guidance sign assemblies per intersection approach in the same direction.
9. Contact Diggers Hotline prior to any excavation (800) 242-3500.
10. 7-Ply Highway Grade High Density Overlay Plywood (5/8") should be used for the sign base material.

The flow chart below describes the application process for a White Arrow Board.

White Arrow Board Process



PURPOSE

In addition to the roadways maintained by the Department, there are several types of ancillary facilities that are either constructed or maintained by the Department. This includes rest areas, SWEFs, waysides, park & ride lots, etc. These facilities *may* be maintained either by the Department, or by county or municipal forces via signed agreements. In the past, the maintenance of signs and pavement markings for these facilities has been inconsistent, due to lack of guidance as to how they *should* be maintained. This policy will clarify which signs and pavement markings are to be maintained by the Department, and how this maintenance **shall** be funded.

POLICYRest Areas

All rest area signing and pavement marking **shall** be maintained by the Department. All signs along the mainline highway **shall** be paid for either under the standard county RMA Project ID (00XX-01-65) or the appropriate improvement project. In addition, all signing along the exit ramp, up to and including the R8-74 (Cars, Trucks, Trailers, etc.) sign, and all signs along the entrance ramp beginning with the R1-2 (Yield) sign, **shall** also be paid for either under the standard county RMA Project ID or the appropriate improvement project. These signs **shall** be replaced as part of the normal sign replacement cycle.

All sign and pavement marking replacement within the rest area, between the R8-74 sign and the R1-2 sign, **shall** be paid for under the Rest Area maintenance Project ID, which will be provided by the Bureau of Highway Maintenance. These signs and pavement markings **shall** be maintained by the department, and *should* be replaced on the normal replacement cycle. The Region **shall** coordinate with BHM before replacing any signs or pavement markings within rest areas.

Waysides

All wayside signing and pavement marking **shall** be maintained by the Department. All signs along the mainline highway **shall** be paid for either under the standard county RMA Project ID or the appropriate improvement project. This includes any regulatory signs (R1-1, R5-1, R6-2, etc.) located at the wayside driveway. These signs **shall** be replaced as part of the normal sign replacement cycle.

All sign and pavement marking replacement within the wayside **shall** be paid for under the Wayside maintenance Project ID, which will be provided by the Bureau of Highway Maintenance. These signs and pavement markings **shall** be maintained by the department, and *should* be replaced on the normal replacement cycle. The Region **shall** coordinate with BHM before replacing any signs or pavement markings.

SWEFs (Safety and Weight Enforcement Facilities)

All SWEF signing **shall** be maintained by the Department. All signs and pavement markings along the mainline highway **shall** be paid for either under the standard county RMA Project ID or appropriate improvement project. The signs and pavement markings **shall** be replaced as part of the normal replacement cycle.

All sign and pavement marking replacement within the SWEF **shall** be paid for under the appropriate maintenance Project ID for that SWEF, which will be provided by the Bureau of Highway Maintenance. These signs **shall** be maintained by the department, and *should* be replaced on the normal replacement cycle. The Region **shall** coordinate with BHM before replacing any signs or pavement markings.

Park & Rides

The Department has several Park & Ride lots that were constructed under WisDOT LET projects, but that are maintained by either the county or municipality via signed agreement. The Region *should* read these agreements to verify which signs the Department is responsible for. This *may* include off-system directional (D4-series) signs. These signs **shall** be paid for either under the standard county RMA Project ID or the appropriate improvement project, and **shall** be replaced as part of the normal sign replacement cycle.

The Department also has several Park & Ride lots that do not have any such maintenance agreements. For these lots, all signs and pavement markings **shall** be maintained by the Department. These signs and pavement markings **shall** be paid for under the standard county RMA Project ID, and **shall** be replaced as part of the normal replacement cycle.



Traffic Engineering, Operations, & Safety Manual

Chapter 2 Signing

Section 20 Sign Manufacture

2-20-10 Sign Delivery Process

August 2016

PURPOSE

Most signs (with the exception of Type I Signs) are delivered from the Traffic Operations Central Sign Shop in Madison to a distribution county utilizing the Badger State Industries (BSI) delivery system. Shorter lead times for sign delivery are available, however the sign cost(s) will increase.

The Bureau of Traffic Operations maintains all of the sign costs in the WorkDirector database. These costs are for the normal delivery period of each type of sign.

The Sign Delivery Calendar will be produced and sent to the Regions annually. Copies of this calendar can be obtained from the Bureau of Traffic Operations Traffic Design Unit (DOTBTOSignOrders@dot.wi.gov).

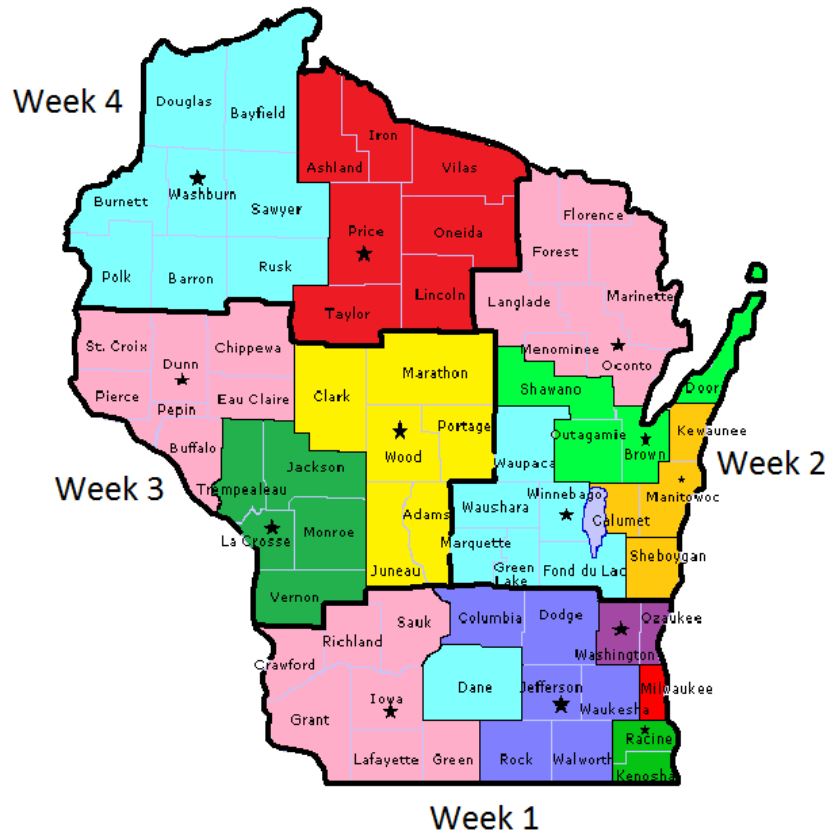
PROCESS

The BSI delivery process consists of a four-week cycle.

The requestor will need to allow the proper lead time for a sign delivery. The lead times differ on the vendor contracts for each sign type. Please keep these times in mind when ordering signs. These lead times are subject to change upon renewal of vendor sign contracts. The Regional Sign Shops will be notified of any changes in vendor lead times.

IMPORTANT: Remember to add 14 calendar days to these lead dates to allow the Bureau of Traffic Operations to process the sign order. That time is needed to check the requisition, prepare a sign detail (if necessary), get the requisition entered on a vendor order and send the purchase order to the vendor.

Sign Distribution Counties



Requirements of BSI Sign Delivery Contract

Below is a summary of the provisions contained in the BSI sign delivery contract.

1. Aluminum signs are normally banded together and secured on pallets.
2. Signs not on pallets are on red carts. Typical lengths of these signs are 8 to 10 feet but may be as long as 16 feet.
3. Each Sign Shop **shall** have an individual available to assist in the unloading procedure.
4. Deliveries will normally be made on Thursday of each week. Revisions to the delivery schedule by BSI must be approved by the Sign Distribution County BSI must notify the Distribution County of changes in the delivery schedule 48 hours prior to the delivery. In addition, the contacts at each Sign Shop **shall** be notified 48hours in advance by BSI as to the arrival time of each delivery.
5. For County contact information please contact DOTBTOSignOrders@dot.wi.gov
6. BSI will also return signs from the county to the Central Office Sign Shop in Madison.
7. BSI will pick up and haul scrap aluminum signs from the counties.
8. BSI is responsible for damages to signs that are shipped and returned.

2-20-15 Sign Evaluation Form for Regions

July 2012

PURPOSE

All roadway signs for the department are now manufactured by outside vendors. In an effort to consistently maintain the high quality of signs expected by the department, a procedure has been developed that will monitor the performance of vendors and track potential problem patterns. The intent of the procedure is for Bureau of Traffic Operations to have written documentation to discuss and resolve any problems with vendors.

This procedure has also been established to give the region sign shops guidance on the steps to take when faced with poor-quality signs from vendors.

POLICY

The attached form describes the procedure that the region sign shops *should* follow when poor quality signs have been delivered to them. This procedure on this attached form *should* be followed and the form filled out and attached to every sign returned for poor quality.

Not all "defects" noted on the form will necessitate the sign to be returned.

SIGN EVALUATION FORM

Date _____

Region # _____

WorkDirector Requisition No. _____

Requisition Line No. _____

Instructions: The Region Sign Shops should follow the procedure outlined on this form and fill out the following information when returning signs that have been manufactured poorly by a vendor. It is important to fill out this evaluation form for any defective signs received so that Central Office can monitor vendor performance and have written documentation to discuss problems with vendors.

Step 1: Once the Region Sign Shop receives a poorly manufactured sign, they should notify the Central Sign Shop (608) 246-3270 of the problems either verbally or by email. Central Sign Shop will then inform appropriate vendor of the problem(s).

Step 2: Demountable Copy Signs: Since demountable copy signs are shipped directly to the Region Sign Shops, any defective demountable copy signs will be picked up from the Region Sign Shop directly by the vendor. After the Region has contacted Central Sign Shop, in step 1, Central Sign Shop will contact the vendor and have them pick up the sign from the Region Sign Shop. The vendor, after receiving notice from Central Sign Shop, will have five (5) working days to pick up the sign from the Region Sign Shop, repair or replace the sign, and ship the sign back to the Region Sign Shop. The Region Sign Shop should attach a completed sign evaluation form with the returned sign and should also send a copy of the evaluation form to Central Sign Shop for record keeping.

All Other Signs: Since signs other than demountable copy signs are shipped to the Region Sign Shops via Badger State Industries (BSI), any defective signs will be sent back to Central Sign Shop at the Central Sign Shop via the BSI sign delivery truck. After the Region has contacted Central Sign Shop, in step 1, Central Sign Shop will contact the vendor and they will have five (5) working days to re-fabricate the sign and have it delivered to the

Central Sign Shop in Madison. This process can take place before the Region ships the sign back to Madison via the BSI delivery truck. After the re-fabricated sign is delivered by the vendor to Central Sign Shop, Central Sign Shop will place the sign on the next scheduled delivery to the Region. The Region Sign Shop should attach a completed sign evaluation form with the returned sign and should also send a copy of the evaluation form to Central Sign Shop for record keeping.

Problems with Sign(s)

(place an "x" next to each deficiency and make comments, if necessary)

Sign Base Material

- Incorrect Material Incorrect Thickness Mounting Holes Incorrectly Located
 Bent/Warped Corners Incorrect Wrong Size Sign
 Rough Edges Uneven Sawcuts

Other Deficiencies/Additional Comments _____

Sign Face Material

- Incorrect Material(s) Peeling From Sign Air Bubbles in Sheeting
 Sheeting Recovered Wrong Color Inconsistency in Colors
 Missing Manufacturing Date Sticker on Back Missing WisDOT ID Sticker on Front

Other Deficiencies/Additional Comments _____

Sign Message Material

- Incorrect Material Incorrect Letter Spacing Message Crooked on Sign
 Incorrect Letter Series Incorrect Location Inconsistency in Colors
 Message Cut Poorly Message Peeling or Not Applied According to WisDOT Standards

Other Deficiencies/Additional Comments _____



PURPOSE

This subject was developed to provide guidance to improvement project inspectors as well as Department and County field and maintenance crews for the installation, service and maintenance of all types of highway signs and pavement markings on the State Highway network. The goal for this manual is to install signs and pavement markings to provide a safe, understandable and efficient system of guidance to the motoring public.

These guidelines are intended to provide a framework of policies and practices for the systematic reporting and handling of signing and pavement marking installation and replacement or sign repair activities done by others under the direction of the Wisconsin Department of Transportation through its Regions. It is inherent these guidelines that the basic thrust be to promote safety of the motorist, safety for the improvement and maintenance crews and standardization of practices toward uniform application and appearance statewide.

Improvement project crews and maintenance crews will perform their operations in accordance with the Wisconsin Manual on Uniform Traffic Control Devices, Traffic Guidelines Manual and other Department policies as referenced within.

The Department recognizes these guidelines *may* require adjustments and revision as they are implemented.

SIGN TYPES

There are two types of signs that are installed and maintained for the DOT:

- Type I signs are on an extruded aluminum base material, typically mounted on steel I-beams.
- Type II signs consist of direct applied message on either plywood or sheet aluminum base material, typically mounted on wood or steel posts.

SIGN CLASSIFICATIONS

Regulatory signs give notice of traffic laws and convey the rules of the road. Regulatory signs typically have a red or white background. Examples are stop signs, speed limit signs, wrong way signs, etc.

Warning signs alert the attention of the driver to special conditions on or adjacent to a roadway that *may* require an important driving decision or action. Warning signs typically have a fluorescent yellow background. Examples include curve warning signs, no passing zone signs, stop ahead signs etc.

School signs are used to alert the motorist to school locations and the posted school speed limit. School Signs typically have a fluorescent yellow/green background.

Guide signs are directional and informational. They are used to direct the motorist to their destination and to inform them about various service facilities and other points of interest along the highway. Guide Signs typically have a green background, and directional assemblies are typically black on white background or white on blue background.

Recreational signs are informative for the traveling public not familiar to an area to get to their destination. Recreational Signs typically have a brown background. Examples are historical marker signs and boat landing signs.

Tourist information signs are informative signs used to guide motorists to service type areas. Tourist Informational Signs typically have a blue background. Examples of these signs are TODS.

STORAGE & HANDLING OF SIGNS

Signs **shall** be shipped with the sign face protected either by cardboard or slip-sheeting paper taped to the sign. Signs **shall** be stored vertically on edge.

Signs that *may* be stored at County shops:

- Mandatory (max of 6)
 - Stop Signs (30x30 and 36x36)
 - Yield (36x31)

Signs **shall not** be stored at the Region except those necessary for the electricians. Scrap aluminum signs **shall** be returned to the Distribution County. The Distribution County will return all scrap aluminum signs to BSI.





















SIGN VERIFICATION

Check all signs in against the sign shipper received at the time of delivery. Call and/or email you region rep or BTO Shop Coordinator with any questions.

a. Acceptable Abbreviations

| | | | | | |
|-----------|------|--------|-----|-------|----|
| Highway | Hwy | Circle | Cir | Lane | Ln |
| Parkway | Pkwy | Road | Rd | Trail | Tr |
| Boulevard | Blvd | Street | St | Court | Ct |
| Avenue | Ave | Place | Pl | Drive | Dr |
| Terrace | Ter | | | | |

b. Arrow Abbreviations

| | | | | | |
|-----------------------|---|---------|------------------------|---|---------|
| Left Arrow |  | [LA] | Right Arrow |  | [RA] |
| Tilt Left Arrow |  | [TL] | Tilt Right Arrow |  | [TR] |
| Up Arrow |  | [UA] | Double Arrow |  | [DBA] |
| Down Left Arrow |  | [DL] | Down Right Arrow |  | [DR] |
| Left Turn Arrow |  | [LT] | Right Turn Arrow |  | [RT] |
| Left Bent Arrow |  | [LB] | Right Bent Arrow |  | [RB] |
| Ahead & Left Arrow |  | [U/LA] | Ahead & Right Arrow |  | [U/RA] |
| Left and Tilt Right |  | [LA/TR] | Tilt Left and Right |  | [TL/RA] |
| Ahead and Tilt Left |  | [UA/TL] | Ahead and Tilt Right |  | [UA/TR] |
| Tilt Down Left and TR |  | [DL/TR] | TL and Tilt Down Right |  | [TL/DR] |

c. J-panels

How to organize J-panels (Refer to [A2-1s](#) for the correct codes):

1. Direction of arrow:



AND



2. IH, USH, STH, CTH, Business Routes, Alt Routes, To, Tours, Hospitals



3. Number (lowest number first)

INSTALLING SIGNS

County Maintenance Agreements

Counties will be given segments of the signs and/or posts needing replacement from the Region. For locations of new signs the work order will be provided by a Regional contact, the area then will be staked by the DOT. Crews **shall** contact Digger's Hotline prior to digging. Crews need to check to make sure sign is facing in the proper direction for traffic and at proper heights, offsets and use of proper mounting hardware.

The scheduling of the sign replacements will be left to the county. Counties will then be able to schedule their crew(s) to what best fits their needs, but work **shall** be completed in a timely matter. WisDOT, however, is requiring that all sign replacements of the CMA be done by November 15 of the year contracted unless another date is agreed upon.

A detailed breakdown of county costs including county labor, equipment, number of signs, and number of posts **shall** be shown on all invoices.

The following signing activities can be classified into the following county maintenance agreements (XX denotes county unless otherwise noted):

| | | | | | |
|----|-------------|----|-----------|----|-------------|
| 1 | Adams | 25 | Iowa | 49 | Portage |
| 2 | Ashland | 26 | Iron | 50 | Price |
| 3 | Barron | 27 | Jackson | 51 | Racine |
| 4 | Bayfield | 28 | Jefferson | 52 | Richland |
| 5 | Brown | 29 | Juneau | 53 | Rock |
| 6 | Buffalo | 30 | Kenosha | 54 | Rusk |
| 7 | Burnett | 31 | Kewaunee | 55 | Sawyer |
| 8 | Calumet | 32 | La Crosse | 56 | Sauk |
| 9 | Chippewa | 33 | Lafayette | 57 | St. Croix |
| 10 | Clark | 34 | Langlade | 58 | Shawano |
| 11 | Columbia | 35 | Lincoln | 59 | Sheboygan |
| 12 | Crawford | 36 | Manitowoc | 60 | Taylor |
| 13 | Dane | 37 | Marathon | 61 | Trempealeau |
| 14 | Dodge | 38 | Marinette | 62 | Vernon |
| 15 | Door | 39 | Marquette | 63 | Vilas |
| 16 | Douglas | 40 | Milwaukee | 64 | Walworth |
| 17 | Dunn | 41 | Monroe | 65 | Washburn |
| 18 | Eau Claire | 42 | Oconto | 66 | Washington |
| 19 | Florence | 43 | Oneida | 67 | Waukesha |
| 20 | Fond du Lac | 44 | Outagamie | 68 | Waupaca |
| 21 | Forest | 45 | Ozaukee | 69 | Waushara |
| 22 | Grant | 46 | Pepin | 70 | Winnebago |
| 23 | Green | 47 | Pierce | 71 | Wood |
| 24 | Green Lake | 48 | Polk | 73 | Menominee |

Activity Code 081 for Permanent Sign Repair and 085 Temporary/Emergency Sign Repair

- RMA 00XX-01-62 Damaged signs on Interstates **without** a break ticket and Adopt a Highway
- RMA 00XX-01-61 Damaged signs on non-interstate **without** a break ticket and Adopt a Highway
- Damage Claim 0077-0x-00 Damage Claim Damage Claim **with** break ticket (X designates the number for your region)
 1. Madison
 2. Waukesha
 3. Green Bay
 4. Wisconsin Rapids
 5. La Crosse
 6. Eau Claire
 7. Rhinelander
 8. Superior
- 0080-02-63 White Arrowboards*
- 0080-02-53 TODS Signing*
- 0080-02-61 Ski Area Signing

Activity Code 086 Permanent Sign Replacement

- RMA 00XX-01-65 Routine Maintenance
- DMA 00XX-58-22 Discretionary Maintenance Agreements

*For White Arrowboards and TODS signs the County *should* collect the checks made payable to the Wisconsin Department of Transportation. The applicant *should* send the checks to: Wisconsin Department of Transportation, Attn: Jeannie Silver, 3609 Pierstorff St, Madison, WI 53704. The County *should* only repair damaged White Arrowboards or TODS signs when directed to do so by the sign owner.

Improvement/Refurbishment Projects

A listing of signs will be provided by the Signing Coordinator to the designer to be included in the construction project plan. The listing *should* identify location on respective improvement project in both directions of travel. A special ID is set up for all improvement projects.

FIELD OPERATIONS

WisDOT **shall** provide all permanent signs. It **shall** be the responsibility of the County to provide all necessary posts and mounting hardware for installation of the signs, unless other arrangements have been made with the Region. All signs removed are the property of the DOT and arrangements **shall** be made for the delivery of signs back to the Central Office Sign Shop. Signs **shall** be returned banded on pallets or on red carts. Any signs put on a cart for transport back to Madison **shall** be placed so the back of the sign is against the metal protect the face of the sign from further damage.

Routine Maintenance Sign Installation Activities

1. Patrol

Crews generally have a daily work plan, which establishes the route to be traveled each day. Knockdown temporary repairs will be the responsibility of the Counties. **NO CREW SHALL LEAVE THE SITE OF A DOWNED STOP OR YIELD SIGN, A TEMPORARY OR PERMANENT REPAIR SHALL BE MADE IMMEDIATELY.**

Field and maintenance crews *should* be watchful for and report findings to Regional Signing Coordinator and/or CO Sign Shop:

- missing signs
- signs showing face material failures,
- obsolete signs or signs which are not needed
- vandalized signs or posts (defaced, gunshot or broken)
- maintenance or contractor damaged signs or posts
- bent or leaning posts
- correctness of installation (height, offset, location, visibility, plumbness)
- sign meets WMUTCD specifications

2. Installing Signs

Signs are attached to the posts using lag bolts or machine bolts. Signs are to be mounted so as to project 1" to 1-1/2" above the top of the post. All signs **shall** have a nylon washer used under the metal washer to reduce damage caused by the twisting of the sheeting under the pressure of tightening the bolts (See Sign Plate A4-8). Do not over tighten bolts.

Standard signs are fabricated using sheet aluminum or high-density plywood. Aluminum signs are usually pre-drilled with mounting holes. Plywood signs usually have to be drilled before mounting. When drilling plywood signs be sure to find the center of the sign prior to drilling. Drill mounting holes *should* be 7/16" in diameter and typically be 2" from the top and bottom edge of the sign. Aluminum signs 78" or more in width **shall** have channel steel stringers installed.

Ensure that post is set to the correct depth (see Sign Plate A4-2 through A4-4). Once the post is placed in the hole check to see that the sign is the proper height and the sign is square with the roadway, facing the proper direction for traffic the sign is intended. The posts **shall** be back filled with suitable materials, and tamped in place, using 6" layers while keeping the post plumb. It is recommended that a level be used in this process.

When attaching the sign to the post it is important to keep the sign square on the post. Attach the bolt to the top of the sign first. Then square the sign on to the post before attaching the lower bolt. Predrilling of the post while squaring the sign is recommended.

Breakaway holes **shall** be drilled on all 4"x 6" wood posts (see Sign Plate A4-11). The breakaway holes do not need to be drilled if the posts are located behind a concrete barrier or guardrail.

PRIORITY OF ACTION FOR KNOCKDOWNS

1. STOP and YIELD Signs.

These signs are the most important signs. If a STOP or YIELD sign is reported down it is to be considered life threatening and extreme steps **shall** be taken to get it back up, even if it means using temporary supports. This includes overtime, nighttime, weekends and holidays. Whatever is necessary to get the sign back up as quickly

as possible **shall** be done. A temporary repair **shall** be made immediately and a permanent repair **shall** be made within 10 working days, or as agreed upon with Regional Traffic Section.

2. Regulatory, Warning and School Signs.

Second priority goes to Regulatory, Warning and School Signs. These signs, when reported damaged or knocked down, require prompt scheduling of repairs. Signs that are recognized as being critical to motorist safety are those that require the motorist to be alert to a specific change in the road or a potential hazard. Temporary repair **shall** be made immediately, during normal business hours

3. Guide Signs.

Guide signs are directional and informational type signs. They are less critical with respect to scheduling damage repairs. Every effort **shall** be made to ensure temporary repairs last until permanent repairs are made.

4. Recreational & Tourist Signs.

Repairs to these signs **shall** be made as the crews schedule permit. Efforts *should* be made to protect sign from further damage.

All signs that have been damaged *should* be replaced, contact your Region Sign Coordinator for these signs. All temporary sign repairs **shall** meet National Cooperative Highway Research Program (NCHRP) 350 Crash Test Requirements. Temporary repairs **shall** be made to try and achieve same standards as for permanent repairs.

DETOUR AND CONSTRUCTION SIGNING

The majority of detours are planned and will be done by contract. Small and emergency type detours performed by the counties need to be in accordance with the WMUTCD. The Department will provide signs for these detours.

REPORTING SYSTEMS

Repair Records for Accidents/Broken Posts and Signs are to be filled out and sent to the Regional shops monthly or as agreed upon with your Region.

Annual Sign and Post Replacement List will be given to the Counties. As the County completes the work, they **shall** send an updated copy of the list to the Regional.

The Regions *may* periodically provide the Counties with a new sign and post work order. These forms need to be filled out and sent to the Region upon completion.

Any counties with repair charges for vehicle damage with accident claim tag numbers **shall** fill out the County Charges Worksheet form DT 1785 and send it to the Region as soon as practical. Forms can be obtained from your Regional Signing Coordinator.

Knockdown and Repair Report is a way to record incoming calls for knockdowns or repairs and Diggers Hotline ticket information on a single form. This form is provided for your convenience and does not need to be returned to the Regional Sign Shop.

REQUIRED NUMBER OF POSTS

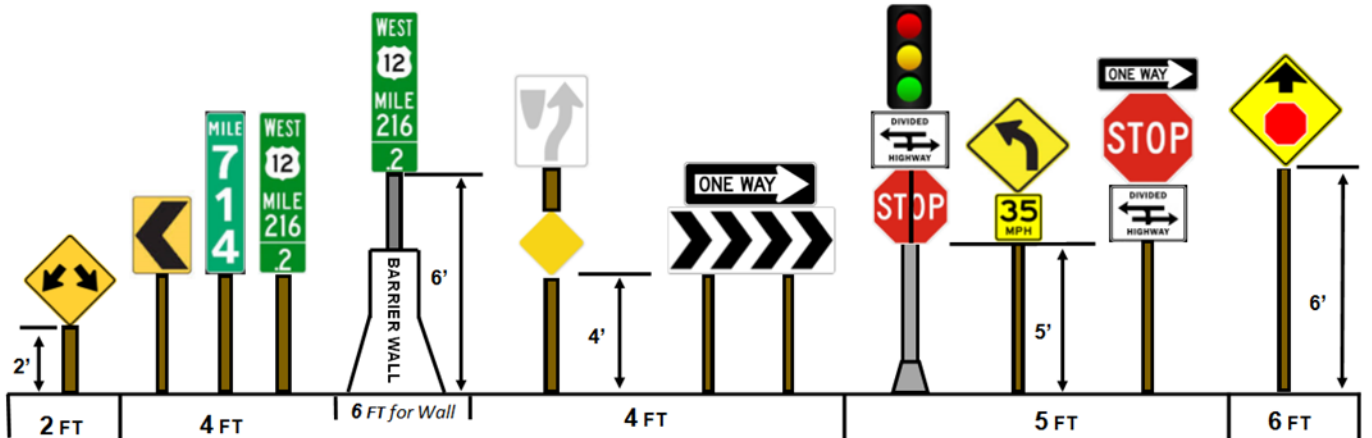
| 4x6 Wood Posts | | | |
|-----------------|---------------------------|-------------------------|--------------------------------------|
| Number of Posts | Length (Rectangle/Square) | Area (ft ²) | Comments |
| 1 | L ≤ 48" | A < 20 SF | *Must meet both criteria |
| 2 | 48" < L ≤ 120" | A ≥ 20 SF | |
| 3 | 120" < L ≤ 168" | - | Posts spacing shall be > 3.5' |
| 4 | L > 168" | - | |

| 4x6 Wood Posts | |
|-----------------|---------------|
| Number of Posts | Diamond |
| 1 | 24", 30", 36" |
| 2 | 48" |

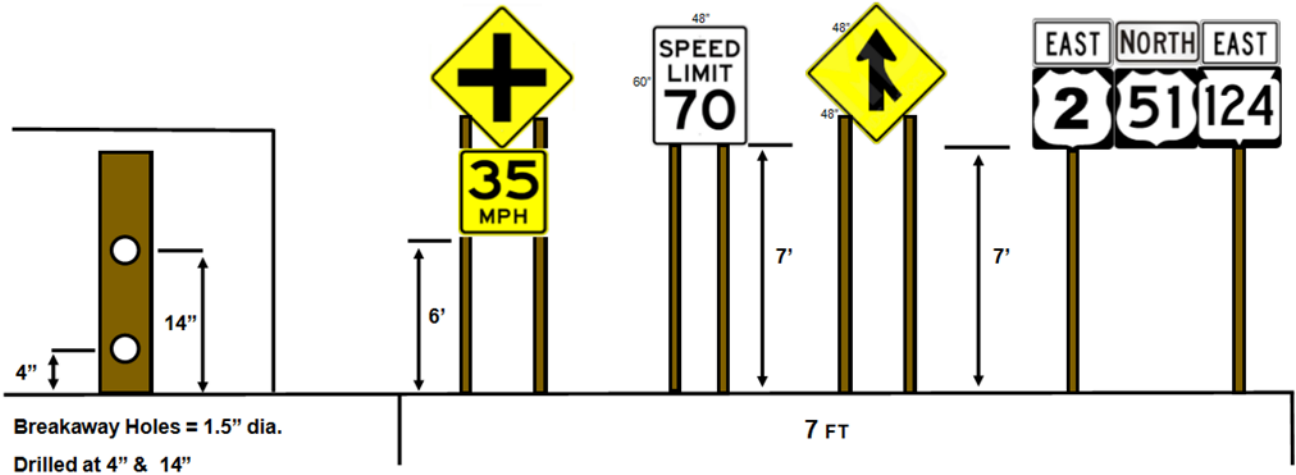
| 2x2 Square Steel Posts | |
|------------------------|-------------|
| Number of Posts | Area (SF) |
| 1 | ≤9 |
| 2 | 9 < x ≤ 18 |
| 3 | 18 < x ≤ 27 |

STANDARD INSTALLATION

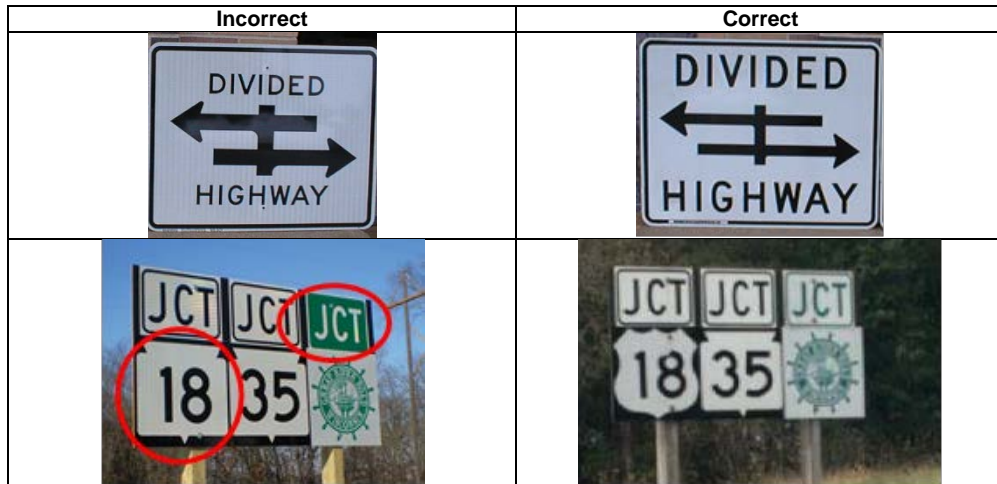
RURAL & URBAN: 2 lane highways with a posted speed of 55 mph or less. Urban installation is 7ft measured off the top of the curb.



FREEWAYS, EXPRESSWAYS & URBAN: 4+ lane highways standard installations.



EXAMPLES OF CORRECT VS. INCORRECT INSTALLATIONS







CONTACTS

| DOT Contacts | | | |
|---|--|--|---|
| Region | Contact Person | Number | Email |
| WisDOT CO Sign Shop 3609 Pierstorff St Madison, WI 53704 | Jon Eldridge Jay Hille Jeannie Silver | 608-246-3270 608-243-5981 608-246-5408 | jonathan.eldridge@dot.wi.gov jay.hille@dot.wi.gov jeannie.silver@dot.wi.gov |
| SW Region- La Crosse 3550 Mormon Coulee Rd. La Crosse, WI 54601 | Iver Peterson Eric Glindinning Kory Keppel | 608-785-9060 608-785-9909 608-792-6204 | iver.peterson@dot.wi.gov eric.glindinning@dot.wi.gov kory.keppel@dot.wi.gov |
| SW Region- Madison 3601 Pierstorff St Madison, WI 53704 | Jeff Holloway Tim Punzel | 608-246-3268 608-246-5352 | jeffrey.holloway@dot.wi.gov timm.punzel@dot.wi.gov |
| SE Region- West Allis 935 S. 60th St. West Allis, WI 53214 | Dennis Newton | 414-750-0257 | dennis.newton@dot.wi.gov |
| NE Region- Green Bay 944 Vander Perren Way Green Bay, WI 54304 | Tom Tilleman Mike Frewerd | 920-492-4135 920-492-5653 | thomas.tilleman@dot.wi.gov michael.frewerd@dot.wi.gov |
| NC Region- Wis Rapids 2841 Industrial St Wis Rapids, WI 54495 | Randy Dankemeyer George Nicolaus | 715-421-8370 715-421-8006 | randal.dankemeyer@dot.wi.gov george.nicolaus@dot.wi.gov |
| NC Region- Rhinelander Hanson Lake Rd Rhinelander, WI 54501 | Randy Dankemeyer George Nicolaus | 715-421-8370 715-421-8006 | randal.dankemeyer@dot.wi.gov George.Nicolaus@dot.wi.gov |
| NW Region- Spooner W7102 Green Valley Rd Spooner, WI 54801 | Steven Allard Gary Eisold | 715-855-7671 715-450-9093 | steven.allard@dot.wi.gov gary.eisold@dot.wi.gov |
| NW Region- Eau Claire 5009 USH 53 South Eau Claire, WI 54701 | Steven Allard Gary Eisold | 715-855-7671 715-450-9093 | steven.allard@dot.wi.gov gary.eisold@dot.wi.gov |

| Sign Distribution County Contacts | | | |
|---|----------------|------------------------------|------------------------------------|
| County | Contact Person | Number | Email |
| Iowa 1215 N. Bequette St. Dodgeville, WI 53533 | Randy Sudmeier | 608-574-2936 | randy.sudmeier@iowacounty.org |
| Jefferson 1425 S. Wisconsin Drive Jefferson, WI 53549 | Tyson Barns | 920-674-7390 | TysonB@jeffersoncountywi.gov |
| Washington 900 Lang St. West Bend, WI 53090 | Jeff Spaeth | 262-335-4435 262-483-3081 | Jeff.Spaeth@co.washington.wi.us |
| Milwaukee 10190 West Watertown Plank Rd Wauwatosa, WI 53226 | Jan Holytz | 414-257-6566 | janet.holytz@milwaukeecountywi.gov |
| Racine 14200 Washington Ave. Sturtevant, WI | David Prott | 262-534-6400 | david.prott@goRacine.org |
| Winnebago | Hank Mitchell | 920-232-1718 | HMitchell@co.winnebago.wi.us |

| | | | |
|--|---|--|---|
| 901 W. CTH Y Oshkosh, WI 54903 | | 920-420-9412 | |
| Manitowoc 3500 STH 310 Manitowoc, WI 54220 | Greg Grotegut Dan Neuser | 920-683-4345 | Gregorygrotegut@co.manitowoc.wi.us |
| Brown 2198 Glendale Ave Green Bay, WI 54303 | Dave Delvaux Andrew Sell | 920-662-2176 920-662-2174 | Delvaux_DJ@co.brown.wi.us sell_al@co.brown.wi.us |
| Oconto 202 Van Dyke St Oconto, WI 54153 | Vanessa Peters | 920-834-6885 | vanessa.peters@co.oconto.wi.us |
| La Crosse 301 Carlson Rd. West Salem, WI 54669 | Leo Leis Keith Pack Ron Chamberlain | 608-786-3843 608-421-8875 608-786-3810 | leis.leo@co.la-crosse.wi.us kback@lacrossecounty.org |
| Dunn 3303 USH 12 E Menomonie, WI 54751 | Jesse Rintala Dustin Binder | 715-232-2181 715-556-2293 | jrintala@co.dunn.wi.us |
| Wood 555 17th Ave Wisconsin Rapids, WI | Brandon Dammann Barry Hamm Doug Passineau | 715-421-9038 715-424-7408 715-421-9039 | bdammann@co.wood.wi.us bhamm@co.wood.wi.us dpassineau@co.wood.wi.us |
| Washburn 1600 CTH H Spooner, WI 54801 | Steve Flash Adam Gronning | 715-635-4459 715-635-4480 | sflash@co.washburn.wi.us |
| Price 704 N Lake Ave Phillips, WI 54555 | Chuck Fisher | 715-339-2355 | chuck.fischer@co.price.wi.us |

Sign Distribution Counties



PERSONAL SAFETY

All Department of Transportation (DOT) personnel **and** any personnel working for the state are required to follow the safety policies stated in the DOT Transportation Administrative Manual (TAM). DOT, county, and contractor personnel **shall** wear:

- Eye Protection: (TAM SD 36)
 - Safety glasses with attached shields
- Foot Protection: Steel-toe boot or shoe (TAM SD30)
- Protective Headgear: (TAM SD 51)
 - Hard hat
- High Visibility Safety Apparel: (TAM SD 57)
 - Reflectorized Safety Vest at all times on or along the roadway
 - Reflectorized Safety Pants during nighttime hours.

Hazard Warning Information - Treated Wood Management (See Exhibit 5)

(Material Safety Data Sheets *should* be requested from the wood post vendor)

EMPLOYEE RECOMMENDED TRAINING

All agencies doing work for the DOT *should* make sure their employees are properly trained in the following areas:

1. Field Operations Awareness
2. Shop Tools
3. Major Equipment Operations
4. Utilities Locate. Call Diggers Hotline 811
5. Retraining
6. Vehicle Safety and Inspection

WORK AREA TRAFFIC CONTROL

All traffic control **shall** be in compliance with the WMUTCD and Departmental policies. See Standard detail drawings.

Vehicles used in highway signing operations **shall** be equipped with at least two (2) yellow, high intensity rotating beacons, clearly visible from the front, rear and both sides of the vehicle. These beacons **shall** be placed as high as possible on each vehicle. Vehicles **shall** have all warning lights operating when stopped, or moving slowly along any highway. Warning lights **SHALL NOT** be displayed while the vehicle is traveling at highway speeds or when traveling between jobs.

When conditions are less than ideal, additional advance warning signs or devices *should* be added to the traffic control layouts. In some cases, the work *should* be deferred until the conditions are more favorable.

All lane closures on two lane roadways require flagging of traffic as well as advance signing and cone placement in the work area. Remember that all flaggers **shall** use stop/slow paddles.

An encroachment into a lane of traffic *may* require cones and/or flagging. The amount of encroachment, the volume and speed of passing vehicles will determine traffic control measures required. For example, a cone *may* be sufficient to mark the point where an outrigger makes contact with the pavement outside the overall width of the truck.

PUBLIC SAFETY

Workers **shall** park vehicles off the road as far as practical. Care *should* be taken to not block the vision of existing traffic control devices such as stop signs and signals. Work activities *should* be performed with an assumption the motorist does not know what the workers are going to do.

UTILITIES

Utility Locates. Diggers Hotline (811) **shall** be called and located before any work is performed. They *should* be given at least a 3 working day notice.

The following is a five-point plan for utility locates before digging in the highway right-of-way, which covers the routine steps required by Diggers Hotline:

1. Prepare a plan or work location sketch or drawing. Indicate a 25 foot radius around the stake or lath for "MARKING INSTRUCTIONS" for Diggers Hotline.

2. At each locate site, mark with a stake or by painting the pavement or shoulder of the highway. White or pink are the approved colors for ribbons, flags or paint when marking sign locations for utility locates.
3. Identify the exact location by measuring the distance from the nearest intersecting street or highway. Indicate which side of the highway the locate is on.
4. Contact Diggers Hotline to request the area to be located. Retain ticket number for a minimum of six years after work is completed.
5. Investigate the possibility of other utilities having services at the locate site.

Utility Damage Procedure. Damage prevention is the ultimate goal. As stated above it is essential to get clearance from utilities before doing any digging.

- BEFORE YOU DIG, CONFIRM UTILITIES HAVE BEEN LOCATED

IF UTILITY DAMAGE OCCURS:

- CALL THE UTILITY FROM A SAFE LOCATION AS SOON AS POSSIBLE.
- CLEAR AREA IF NECESSARY.
- EXTINGUISH ALL FIRE SOURCES; BE MINDFUL OF LOSS OF LIFE.
- NOTIFY EMERGENCY SERVICES (IF NECESSARY).
- NOTIFY SUPERVISOR.
- BE AVAILABLE ON OR NEAR THE SITE UNTIL REPAIR CREW ARRIVES.

MAJOR EQUIPMENT OPERATIONS

It is recommended that field operations that involve digger derricks or bucket trucks will NOT be performed with fewer than two crew persons on the job site.

HAVING A UTILITY LOCATE CLEARANCE DOESN'T NECESSARILY MEAN ALL DANGER HAS BEEN REMOVED.

Derrick operators must be aware of overhead lines to be certain the boom or its attachments remain the required distance away from the overhead lines.

ACRONYMS & DESCRIPTIONS

HMA - Hot Mix Asphalt

MSDS - Material Safety Data Sheets

PCC - Portland Cement Concrete

PMC - Pavement Marking Coordinator

TMA - Transportation Maintenance Agreement

Type H Sheeting - Prismatic High Intensity

Type F Sheeting - Prismatic High Intensity Fluorescent Sheeting



3-2-1 Longline Marking

November 2016

GENERAL

The purpose of this policy is to provide specific guidance for the uniform application of long line markings on State Highways under DOT jurisdiction. The MUTCD Section [3B](#) contains further guidance on longline markings.

Centerline Markings

Centerline markings **shall** be a 4" wide yellow line. Dashed lines **shall** be 12.5' long with a 37.5' gap.

Centerlines markings **shall** be marked on:

- All highways under DOT jurisdiction
- Through all intersections with local roads on two-lane state highways.
- On undivided multilane highway with a double yellow line

Centerline markings **shall not** be marked through:

- Intersections where the state highway is more than two lanes
- Intersections where Interstate, US, or State Highways intersect
- Signalized intersections
- All way stop
- Intersections with opposing left turn lanes.
- Stop lines or marked crosswalks.

Further information on centerline markings are located in Section [3B.01](#) of the MUTCD.

Edge line Markings

The MUTCD Section [3B.06](#), describes edge line markings in more detail. Edge line markings **shall** be a 4" white line on the edge of the roadway except the left most edge line on a divided highway **shall** be yellow.

Edge line markings **shall**:

- Continue through all driveways (commercial or private) except major commercial driveways (big box stores, etc.)
- Be used on freeways and expressways
- Be used on rural arterial roads with a traveling width of at least 20 feet and an ADT > 6,000 vehicles per day
- Urban areas with a travel lane of 16 ft. or greater.

Edge line markings **shall not** continue through:

- Intersections with more than two lane
- Intersections where Interstate, US, or State Highways intersect
- Intersections with opposing left turn lanes
- Signalized intersections
- Stop controlled intersections
- Commercial driveways meeting intersection design standards with full width paved turn lanes.

Edge lines *should* be used in urban areas or semi urban areas that do not have curb and gutter as required in MUTCD Section [3B.07](#).

Edge Lines Adjacent To Urban Curb & Gutter Sections

| POSTED SPEED | IS THERE CONTINUOUS LIGHTING? | |
|------------------|-------------------------------|-------------|
| | YES | NO |
| ≤ 30 mph | No | Optional |
| 35 mph or 40 mph | Optional | Recommended |
| ≥ 45 mph | Recommended | Required |

Lane Line Markings

Lane lines **shall** be marked to delineate traffic traveling in the same direction. Lane lines **shall** be a 4" wide white line that is 12.5 foot long with a 37.5 foot gap between lines. Lane lines **shall** be marked on all state highways

under DOT jurisdiction. Lane lines **shall** be marked through minor intersections and major T-intersections on the state highways, see [SDD 15C8 sheets b and c](#).

Dotted Lane Lines

According to the MUTCD Section [3B.04](#), adotted line (3' line, 9' gap) *maybe* used as a substitute lane line. This line **shall** be 4" wide and **shall** be used to separate a through lane that continues beyond an intersection or interchange from an adjacent lane under the following conditions:

- A deceleration or acceleration lane
- A through lane that becomes a mandatory turn or exit lane ([SDD 15C8-sheet e](#), [SDD 15C28](#))
- Auxiliary lane
- Tapered Exit Ramps ([SDD 15C31 sheets a, b, and d](#))
- Parallel Exit (Deceleration) Ramps ([SDD 15C 31 sheet c](#))

Dotted Extension Lines

Dotted extensions **shall** be added to provide guidance past exits or *may* be added through intersections on curves where the edge of the traveled lane is unclear. A dotted extension line *may* be continued through an uncontrolled movement of a state highway intersection with another highway. If these lines are used through an intersection they **shall** be 2' lines with a 6' gap and the same width as the line that is being extended see in [SDD 15C8-17 sheet e](#).

Channelizing Lines

Channelizing lines **shall** be white and 8" in width. Channelizing lines **shall** be used in the following locations:

- In advance of an exit ramps or intersections to distinguish a lane. (3 foot line with a 9 foot gap) [SDD 15C8-17 sheet e](#)
- In advance of freeway route splits with dedicated lanes.
- To separate a through lane that continues beyond an intersection from an adjacent auxiliary lane between two intersections [SDD 15C8-17b](#)
- Exit gore markings **shall** extend fifty feet past the unpaved neutral area and 300 feet to begin the gore line, as shown on [SDD 15C 8-13g](#) and [SDD 15C31 sheet b](#).
- Entrance gore marking **shall** follow [SDD 15C31-1a](#)

Channelizing markings **shall not** be marked through:

- Signalized intersections.
- Intersections at a 4 way stop.
- Stop lines or marked crosswalks.

Bike Lane

If bike lanes are marked it **shall** be at least 5 ft. wide. Refer to [SDD 15C29](#) in the FDM. The words "BIKE LANE" or the bike symbol *maybe* used to delineate the bike lane. Signing *may* also be used to supplement the marking. The DT2500 form **shall** be completed to permit locals to install/maintain bike lanes and the DT2137 form **shall** be completed to permit the locals to install/maintain Shared Lane Markings.

The usage of green pavement marking for bike lanes or bike boxes **shall not** be allowed on state maintained roadways.

3-2-2 No-Passing Zone Standards

February 2017

GENERAL

No-passing zones are marked and signed on state maintained highways to indicate where a driver cannot safely complete a passing maneuver under normal light and weather conditions. In addition to the zones required by inadequate sight distance, certain other conditions warrant short zones or no-passing zone extensions which are marked by no-passing barrier lines. Although sufficient sight distance *may* be present at these locations, the passing operation is not appropriate under state law or for safety reasons as documented in an engineering study.

Unmarked zones (where passing is allowed) allow the driver to make a decision based on rules of the road and circumstances, such as oncoming traffic, reduced visibility due to fog, low light, rain or smoke, turning traffic, or

vehicles entering from side roads or driveways. **No-passing zones *should not* be marked to eliminate all possible conflicts.**

[Wisconsin Statute 346.10](#) allows passing another vehicle in a rural (non-business regional, non-residential regional) intersection, unless the intersection is designated by signals, stop signs, yield signs, or warning signs. Routinely marking zones through minor intersections and/or driveways would significantly reduce legal passing areas available to the driver, increasing non-compliance and unsafe passing in less favorable locations where adequate sight distance *may not* be available.

NO-PASSING ZONE CRITERIA

No-passing zones **shall** be marked at all locations on the State Highway system that have insufficient sight distance for a vehicle to safely complete a passing maneuver under normal light and weather conditions. **The establishment of these zones shall be based exclusively on the sight distance required for the posted speed and the highway characteristics.**

The following criteria **shall** be used to mark no-passing zones:

SIGHT DISTANCE

Each Region has either a No-Passing Zone Sight Distance Map or spreadsheet listing the sight distance criteria on The State Trunk Highways. Either is available from your Regional Traffic Section. Typical sight distances are shown in the following table, but other criteria such as ADT or geometrics *may* change or alter those requirements.

| Posted Speed Limit (MPH) | No-Passing Zone Sight Distance | | Minimum Distance Between Zones | |
|-----------------------------|--------------------------------|--------|--------------------------------|--------|
| | (mile) | (feet) | (mile) | (feet) |
| 25-30 | 0.10 | 528 | 0.10 | 528 |
| 35-40 | 0.13 | 686 | 0.10 | 528 |
| 45-50 | 0.16 | 845 | 0.13 | 686 |
| 55 | 0.21* | 1,110* | 0.15 | 792 |

* When authorized by the designated Regional Signing/Marking Engineer, the 55 MPH No-Passing Zone, sight distance **may be increased from 0.21 to 0.26 miles** on certain higher volume highway segments, due to higher frequency of crashes and/or a demonstrated history of excessive speeding above the posted limit.

The specific characteristics and factors leading to the increase or decrease of the No-Passing Zone sight distance from the DOT 55 MPH standard of 0.21 mile, *should* be documented in the Region.

For 55 mph posted speed roadways, during the project design process, the designer **shall** contact the Region Signing/Marking Engineer to determine the correct No Passing Zone Sight Distance to be used. STSP 648-005 **shall** be inserted into the Special Provisions with the correct No Passing Zone Sight Distance for 55 mph posted speed roadways.

REQUIRED EQUIPMENT

1. Use two vehicles that provide a target on the lead vehicle 42 inches above the roadway. The observer's eye in the trailing vehicle **shall** be 42 inches above the roadway. Whatever type of target is used, it **shall** have a sharp cutoff when it disappears and appears.
2. A Distance Measuring Instrument (DMI) **shall** be used and **shall** have an accuracy of at least 10 feet per mile. The DMI **shall** decrease the measured distance when the vehicle backs up.
3. Two-Way communication equipment is required for the two vehicles.
4. At a minimum, a full-width flashing yellow light bar with 360 degree visibility **shall** be used. Additional signs and flashing lights on the vehicles are recommended.

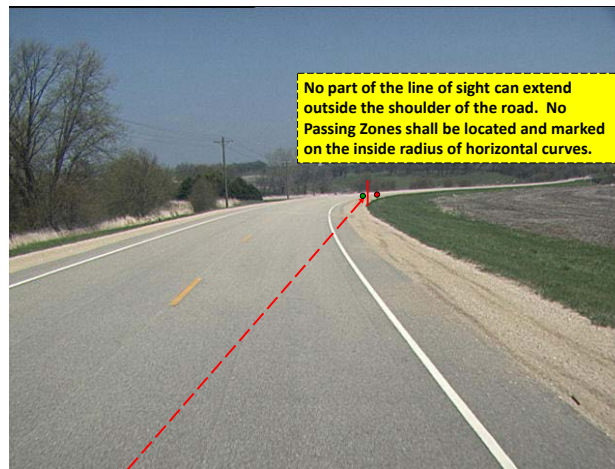
PROCEDURE FOR LOCATING AND MARKING NO PASSING ZONES

1. LOCATING NO PASSING ZONES

- Prior to beginning work on locating no passing zones, the project engineer or Region Signing/Marking Engineer **shall** be contacted to determine if there are any special no-passing zones to mark under the contract.
- The No Passing Zone sight distance shown in the table in part B **shall** be followed.
- The termini of no-passing zones **shall** be established to an accuracy of +/- 50 feet (0.01 mile).
- When the distance between two successive no-passing zones is less than the minimum distance shown in the table in part B, the two zones **shall** be connected.

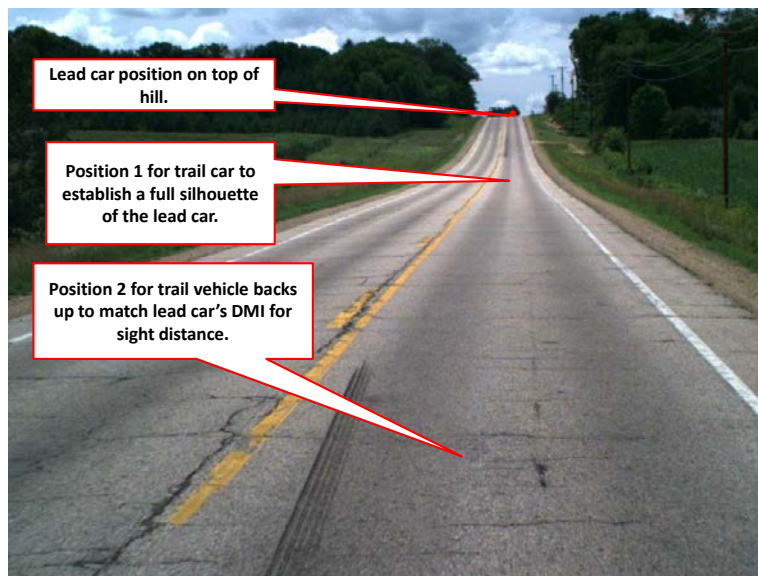
- For roadways with speed limit changes, the proper no-passing zone sight distance in the table in part B **shall** be maintained. For locations where the posted speed limit is increasing, when the lead vehicle reaches the increased speed sign, the trail vehicle would back up until the appropriate no-passing zone sight distance is achieved. For locations where the posted speed limit is decreasing, once the trail vehicle reaches the first decreased speed regulatory sign, the lead vehicle would back up until the appropriate no-passing zone sight distance is achieved.
- On horizontal curves, no part of the line of sight **shall** extend outside the shoulder (see Figure 1). No passing zones **shall** be located and marked on the inside radius of horizontal curves. If the horizontal curve requires a No Passing Zone, the starts and ends of the zones **shall** be recorded in the cardinal direction.

Figure 1. Horizontal Curve



- On vertical curves, whenever the target light disappears from sight, the crew **shall** check for blind spots. For a crest vertical curve, if the target light on the lead vehicle goes out of sight, the trail vehicle parks at the base of the hill. The lead vehicle **shall** back up to reveal a full silhouette of the rear of the car (from the bottom of the bumper up). Once the trail vehicle sees the full silhouette of the lead vehicle, the trail vehicle **shall** back up to establish the sight distance between the 2 vehicles before marking the roadway (see Figure 2).

Figure 2. Crest Vertical Curve



- For sag vertical curves, if the target on the lead vehicle goes out, the lead vehicle **shall** stop at the base of the hill or in the sag. The trail vehicle **shall** pull forward until they see a full silhouette of the lead vehicle. Once the trail vehicle sees the full silhouette of the lead vehicle, the lead vehicle **shall** pull forward to establish the sight distance between the 2 vehicles before marking the roadway (see Figure 3).

Figure 3. Sag Vertical Curve



- If the no passing zone is less than 500 feet in length, the zone **shall** be extended to 500 feet by lengthening the zone at its beginning in each traffic direction.
- The correctness of no-passing zones leading into and out of the project limits **shall** be checked. Ensure that the minimum distance between zones and the sight distance are checked.

MARKING MATERIAL

- The beginning and end of all no-passing zones **shall** be marked on the roadway by the marking of T's and dots with white spray paint (for asphalt) and black spray paint (for concrete).
- T's **shall** be 12" X 12" and 2" stroke. Dots **shall** be 3" - 4" in diameter.
- The paint material used to mark the road **shall** be durable enough to be readily visible for one year after application.

RECORDING OF NO PASSING ZONES

The WisDOT Standard No Passing Zone Log (form [DT2124](#)) **shall** be used to record the No Passing Zones (see Figure 4). Include the following data on the No Passing Zone Log Sheets:

- Date of survey on each sheet.
- County and Route on each sheet.
- The cardinal direction of travel (for east west roads, record in the easterly direction, for north south roads, record in the northerly direction).
- All starts and ends are logged in miles to the nearest 1/100th of a mile.
- The beginning and ending of each no-passing zone line in both directions.
- The sight distance and speed criteria for each zone.
- The location of landmarks (intersecting U.S., State and County trunk highways, bypass lanes, truck climbing lanes, passing lanes, county boundary lines, railroad crossings, starts and ends of bridges and regional boundaries).

NO-PASSING BARRIER LINE CRITERIA

1. No-passing barrier lines, 500 feet in length, **shall** be marked on an undivided STH approach in the following intersection situations:
 - The STH traffic is controlled by a stop sign.
 - The intersection with the STH is controlled by a signal.
 - The intersection with the STH is controlled by a roundabout.
 - At a T-intersection with a standard bypass lane that allows vehicles proceeding straight to pass to the right of a left turning vehicle without leaving the paved portion of the highway as per [SDD 15C8-b](#), a 500-foot barrier line **shall** be installed prior to the start of the bypass taper.
2. A no-passing barrier line **shall** be marked in the following non-intersection situations:
 - In advance of a divided highway. The marking configuration **shall** extend a barrier line 500 feet in advance of the island or median nose so passing is prohibited entering into the divided highway. This is

illustrated on the Standard Detail Drawing titled "Signing and Marking For Two Lane to Four Lane Divided Transitions", located in the Facilities Development Manual. ([SDD 15C21](#))

- In advance of a painted median island. The marking configuration **shall** extend a barrier line 500 feet in advance of the separation of the double yellow center line. This is illustrated on the Standard Detail Drawing titled "Median Island Marking", located in the Facilities Development Manual. ([SDD 15C18](#))
- Bridges having a width less than 24 feet. The marking **shall** include a 500 foot barrier in advance of the actual structure as shown on the Standard Detail Drawing titled "Traffic Control Devices for Two-Lane Bridges", located in the Facilities Development Manual. ([SDD 15C6](#))
- Railroad grade crossings. The barrier line **shall** be placed 500 feet prior to each approach (unless markings are not required, as provided in the MUTCD). The configuration of the marking is shown on the Standard Detail Drawing titled "Pavement Marking Details for Railroad-Highway Grade Crossings" and located in the Facilities Development Manual. ([SDD 15C9](#))
- Passing Lanes. The pavement marking configuration **shall** extend a barrier line 500 feet in advance of the beginning of the taper. This is illustrated on the [SDD 15C8-c](#) and [SDD 15C8-d](#), "Pavement Marking (Climbing Lane & Passing Lane)", located in the Facilities Development Manual. A bypass lane for an intersection is **not** considered a passing lane under this guideline.
- Truck Climbing Lanes. The pavement marking configuration **shall** extend a barrier line 500 feet in advance of the beginning of the taper. This is illustrated on the [SDD 15C8-c](#) and [SDD 15C8-d](#), "Pavement Marking (Climbing Lane & Passing Lane)", located in the Facilities Development Manual.
- Undivided 4 lane roadways. Any stretch of roadway with this configuration **shall** have the opposing lanes designated by a barrier line for its entire length and **shall** have barrier lines of 500 feet in length on the approaches to this section.

SPECIAL NO PASSING BARRIER LINES

No-passing barrier lines **shall** be marked with the approval of the designated Regional Signing/Marking Engineer in the following situations. When marked, they *should* be documented in the Region.

- At any intersection when justified by an engineering study. Appropriate reasons include a crash history related to passing maneuvers or demonstrated operational problems. The 500-foot barrier line would end at the near edge line of intersecting road and *may* be placed in only one direction based on operational need. This is illustrated on the [SDD 15C8-13b](#), "Pavement Marking (Intersections)", located in the Facilities Development Manual.
- In low speed urban areas, double yellow barrier lines *may* be placed when justified by an engineering study. Criteria for the engineering study include curb and gutter, reduced speed, parking allowed, poor stopping sight distance, closely spaced driveways or intersections, and high pedestrian volumes. The double yellow lines *should* be installed from the start of the curb and gutter to the end of curb and gutter through the urban area. When urban double yellow lines are used, 500-foot barrier lines **shall** be placed on the approaches to this special layout, unless a longer no-passing zone takes precedence.
- At a T-intersection with roadway pavement that allows vehicles proceeding ahead to legally pass to the right of a left turning vehicle without leaving the paved portion of the roadway, a 500-foot barrier line prior to the start of the bypass taper will be optional based on engineering judgment.

MARKING NO-PASSING BARRIER LINES

Barrier lines, as designated above, **shall** have a minimum length of 500 feet.

On State Trunk Highway approaches with stop or signal control, the barrier line would end at the stop line, theoretical stopping point or marked crosswalk. Each approach on the State Trunk Highway *should* be considered separately.

Barrier lines **shall** be connected into adjacent no-passing zones when there is less than minimum distance between zones, as described in the NO-PASSING ZONE CRITERIA section of this policy.

Where allowable barrier lines are justified, the traffic engineer **shall** give the crew locating no-passing zones specific directions as to where barrier lines are to be placed.

SIGNING

A No-Passing Zone pennant sign (W14-3) **shall** be installed as required in [TEOpS 2-3-38](#), supplementing zones established under this guideline. This sign **shall** be placed no more than 50 feet from the start of the no-passing barrier line unless it's impossible due to location on a bridge deck or other exception.

Sign quantities for moving the existing W14-3 sign **shall** be paid for separately and listed in the Permanent Signing Miscellaneous Quantities Sheet in the plan. If moved, the sign location **shall** be based on placement of the beginning of the revised no passing zone.

3-2-3 Special Marking

April 2017

GENERAL

Special pavement markings consist of arrows, symbols, words, stop lines, crosswalks, diagonals, and aerial/vascar enforcement markings. These markings *may* be used to supplement signing. When used, they **shall** conform to the requirements in Section [3B](#) of the MUTCD, and the following guidelines.

POLICY

All special markings **shall** be white and reflective.

Arrows

In general, arrows are used to supplement signing. There are 3 main types of arrows that WisDOT uses:

1. *Lane Control Arrows*
 - To supplement signing for complicated lane assignments and turn lanes. For mandatory turn lanes, the installation of arrows are required, per [SDD 15C8-17b](#)
2. *Wrong Way Arrows (Type 4)*
 - On any freeway off-ramp with high crash rates or unusual or poor geometrics.
 - Intersections or ramps with demonstrated problems of wrong way driving.
3. *Lane Drop Arrows (Type 5)*
 - On any lane drop with high crash rates.

Use [SDD 15C7 sheet c and d](#) for the size and shapes of these markings.

Words

Words currently allowed by WisDOT can be found in [SDD 15C7.12b](#) and [SDD 15C29 sheet e and f](#) for the size and shape of these words. All words *should* be used at a site with a documented safety problem and discussed with the regional traffic engineer.

- The word, "ONLY", *may* only be used with singular Type 1 or Type 2 lane use arrows. The word, "ONLY", **shall not** be used in a two-way left turn lane.
- The word, "SCHOOL", either single or dual lane marking, **shall** only be used when one of the following criteria applies:
 - In advance of a marked crosswalk, which is typically monitored by a school crossing guard.
 - At a mid-block or uncontrolled intersection. The requestor **shall** be responsible for maintenance of the "SCHOOL" marking in combination with the crosswalk marking. This **shall** be documented on the application/permit form, DT2136 and the crosswalks policy under the "Type of Crosswalk Marking, Other". The required detail **shall** comply with [SDD 15C7](#).
- "BIKE LANE" **shall** only be used with a signed bike lane.
- "YIELD" **shall** only be used at roundabouts.
- The word, "OK", **shall not** be used on any state maintained highways.

Symbols

Symbols **shall** conform to the [SDD15C7 sheet a](#) and **shall** only be used when the following criteria applies:

- At a site with a documented safety problem.

- Supplement to regulatory signage.
- At the discretion of the regional traffic engineer.

Chevron/Diagonal Markings

Chevron/Diagonal markings provide added emphasis to the neutral area of the gore. Chevron markings *may* be applied at gores. Refer to the FDM [SDD 15C8-13g, h, and i](#).

Stop Lines

Stop lines indicate where vehicles are required to stop at intersections. Stop lines are not required at all intersections, but *may* be desired if:

- An approach to a signalized intersection where detection is installed and stopping at a certain point *may* enhance the operation.
- Intersection approaches with unusual geometrics such as large skew angles or non-symmetric approaches.
- Complex multilane approaches.
- An approach to an intersection with the STOP sign installed well in advance of the desired stopping point because of curb radii.
- In advance of a marked or unmarked crosswalk with significant pedestrian volumes.

For placement of stop lines refer to [SDD 15C33](#). If the stop lines are required by the department, the Department will maintain the markings. All other stop lines and crosswalks *may* be marked by contract at the request of the municipality with the understanding that the local agency assumes responsibility for the maintenance.

Crosswalks

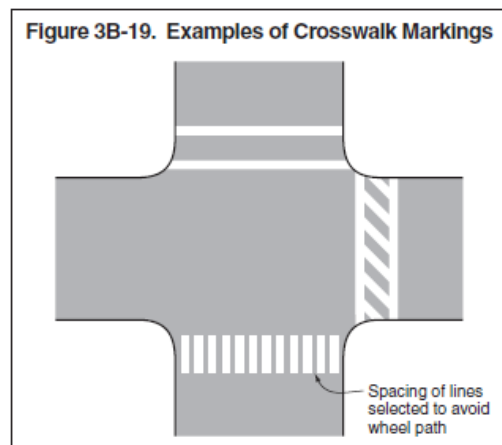
Crosswalks mark the path at which pedestrians *should* cross the roadway by delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops. As a secondary purpose, crosswalk markings *may* also serve to alert drivers of a pedestrian crossing point without signal or stop control. At non-intersection locations, crosswalk markings legally establish the crosswalk.

The Department policy for installation of crosswalks is as follows:

- Crosswalk markings *should* be installed at signalized intersections where pedestrian signal indications are present and at locations where there is a signed school crossing.
- Crosswalk markings *should not* be installed at non-intersection, mid-block locations or urban locations where posted speed limits are 45 MPH or more, unless traffic controls (all-way stop, signal, roundabout) or crossing enhancements (curb bump outs, median divider island, etc.) are present.
- Non intersection crosswalk markings **shall not** be permitted at rural locations with a posted speed limit of 45 MPH or more. Exceptions *may* include trail crossings where advance warning signs are present.
- A permit for crosswalk markings *should not* be approved if a sidewalk or trail approach and/or ADA-compliant curb ramps (where there is curb) do not currently exist or are planned outside the roadway limits on both sides of the crosswalk approach. Per approval of the Region Traffic Engineer, the local government *may* be permitted to maintain existing crosswalk markings without sidewalk and/or ADA-compliant curb ramps as long as the local unit of government agrees to become compliant with the next highway project (regardless of sidewalk or curb work) or local sidewalk project.
- A permit for crosswalk markings **shall not** be approved unless parking is prohibited within 15 feet of the near limits of the crosswalk, as referenced in Wisconsin State Statute 346.53(5).

There are 2 types of crosswalks that WisDOT allows as shown in Figure 3B-19 of the MUTCD

- 2 - 6" Transverse Lines (all intersections and roundabouts)
- 24" Ladder Pattern (Only for midblock crossings)



Crosswalk markings *should* be placed as nearly perpendicular as possible to the direction of travel on the roadway. The following form needs to be completed to permit a municipality to install and maintain a crosswalk DT2136. A signed copy of the permit **shall** be sent to the local unit of government and a copy **shall** be filed in the Region office.

Special Marking Treatments for Crosswalks

FHWA has published an official MUTCD Ruling, dated August 15, 2013 that allows subdued-colored aesthetic pavement treatments between legally marked transverse crosswalk lines. However, the following criteria **shall** apply:

- The colored pavement treatment **shall not** be made of retroreflective material.
- Transverse crosswalk lines **shall** delineate the edges of the crosswalk and **shall** be 2-6" white transverse lines.
- Examples of acceptable aesthetic pavement treatments include brick lattice patterns, paving bricks, paving stones, cobbles or other types of paving. All treatments cannot impede wheelchair pedestrians.
- Examples of acceptable colors for aesthetic pavement treatments are red, rust, brown, burgundy, clay, tan or similar earth tone equivalents.

Aerial Enforcement and Vascar Enforcement Bars

Aerial and Vascar Enforcement Bars are transverse markings placed on the roadway to assist law enforcement agencies in the enforcement of speed regulations. These markings are a series of two to five bars with a center-to-center spacing of 660 ft. and **shall** conform to the [SDD15C14](#).

- Aerial –These lines are utilized by airplane to determine vehicle speeds from the air.
- VASCAR (Visual Average Speed Computer and Recorder) – These lines are utilized at ground locations for speed monitoring and verification of distance traveled.

Wisconsin State Patrol is the authority on these markings in cooperation with the Division of Transportation System Development to determine the quantity and locations of these markings for the use on state trunk system. Wisconsin State Patrol will notify the Regional traffic office for new locations that are needed or those that need to be remarked. Actual marking of the lines will be done by the Special Marking Contractor as the work schedule permits. A representative of State Patrol **shall** mark the locations of the lines with a small paint stripe prior to placing markings. A car can be provided by State Patrol for Traffic Control during the marking process, if the project engineer deems it necessary.

3-2-4 Island Marking

November 2016

PURPOSE

This policy explains the concept of how islands **shall** be marked consistent with MUTCD Section [3B.23](#)

POLICY

Channelizing lines **shall** be placed upstream and adjacent to islands. The color of the pavement marking adjacent to the island **shall** be indicative of the function of the island.

- If an island separates traffic flowing in the same direction, such as a right or left turn island, the pavement markings along the island **shall** be white.
- If an island separates opposing traffic, such as a median island, the pavement markings **shall** be yellow.

Channelizing lines *may* be extended to address a demonstrated problem.

Refer to [SDD 15C8 \(c\)](#) for details on how to mark a Turn Lane Island, Median, and Corrugated Median

3-2-11 Raised Pavement Markers

March 2017

PURPOSE

Raised pavement markers are used to either supplement or substitute longitudinal pavement markings. These retroreflective units are either placed on top of or embedded into the pavement. Section [3B.11 to 3B.14](#) of the MUTCD covers the installation of raised pavement markers, and Section [6F.79](#) covers temporary raised pavement markers. This policy will clarify application of raised pavement markers on WisDOT maintained roadways.

POLICY

The color of the raised pavement markers **shall** match the color of the line that they supplement or substitute.

Plowable raised pavement markers **shall not** be used on state-maintained roadways. Existing plowable raised pavement markers **shall not** be covered over during a resurface project and **shall** be removed, prior to resurfacing the roadway.

Temporary Raised Pavement Markers, Type I

Temporary Raised Pavement Markers Type I *may* be used in construction zones to supplement pavement marking through shifting tapers. If used in shifting tapers within construction zones, temporary raised pavement markers **shall** remain in place until the traffic staging changes. They **shall** be placed every 50 feet.

Temporary Raised Pavement Markers, Type II

Temporary Raised Pavement Markers Type II **shall** be used to substitute pavement markings which are completely covered. Permanent markings **shall** be installed within 14 days of the marking being obliterated.

On undivided roadways, W8-12 "NO CENTER LINE" signs **shall** be used to warn motorists of a roadway without any centerline until temporary or permanent markings are installed. These signs **shall** be placed at the beginning of the project, at two-mile intervals throughout the project, and at locations where traffic enters the project area from intersections with state trunk and county trunk highways.

On undivided roadways, prior to the existing marking being obliterated, the locations of the existing pavement markings, including no passing zones, **shall** be documented. In addition, prior to the existing marking being obliterated, the R4-1 DO NOT PASS sign **shall** be installed at the beginning of the no passing zones. Additional R4-1 DO NOT PASS signs **shall** be installed within any no-passing zone that continues beyond an intersection with a state or county trunk highway or that exceeds one mile in length. The R4-2 PASS WITH CARE sign **shall** be installed at the downstream end of the no passing zones. Once the permanent pavement marking has been re-established, the R4-1 and R4-2 signs **shall** be removed.

If the above signs are in place for less than seven continuous days and nights, rollup signs and stands *may* be used in lieu of post mounted signs.

Same-day pavement marking *may* be used in lieu of using Temporary Raised Pavement Markers, Type II.

The standard application of Temporary Raised Pavement Markers, Type II **shall** be installed as shown on Standard Detail Drawing [15C34-3](#).

Same Day Pavement Marking or if Roadway is Detoured During Construction

If temporary same-day pavement marking is being installed or if the roadway is detoured during construction, a reduced amount of temporary raised pavement markers *may* be used to locate the centerline and channelizing lines. At a minimum, the following spacing requirements **shall** be used for Temporary Raised Pavement Markers, Type II for same-day pavement marking operations:

- Centerline, Lane Line, and Edge Line Marking: Place temporary pavement markers at 100' spacing.
- Place temporary pavement markers at beginning and ends of barrier lines.
- Beginning of 8" channel line: Place two temporary pavement markers side by side.
- Dotted 8" Line: Place 1 temporary raised pavement marker at the beginning of the segment of dotted

- line.
- If the roadway is detoured during construction, the R4-1 DO NOT PASS, R4-2 PASS WITH CARE and W8-12 NO CENTER LINE signs *may* be omitted, provided a liquid marking is installed before the roadway is reopened to traffic.



Traffic Engineering, Operations & Safety Manual

Chapter 3 *Markings*

Section 4 *Maintenance*

3-4-1 Maintenance of Markings

XXXXX



3-6-1 Delineators

October 2017

GENERAL

Delineators are reflective devices, mounted in a series along the side of a highway providing guidance by indicating the alignment at night and/or under adverse weather conditions.

The 2009 Manual on Uniform Traffic Control Devices (MUTCD) [Part 3F](#) addresses the use of delineators. Additional guidance is given in Part [5E](#) and [6F](#) and [Facilities Development Manual](#).

POLICY—FREEWAYS AND EXPRESSWAYS

Locations

Delineators **shall** be used on unlighted freeways and expressways and *may* be used if they are continuously lit. Delineators *should not* be installed on the left side unless there are operational problems or high crash experience. Delineators also *should not* be used behind barrier wall or guardrail. They are to be installed as part of the barrier wall or guardrail.

Delineators **shall** only be used on conventional highways if there are crash or operational issues, as documented by an engineering study and approved by the Regional Traffic Engineer. Delineators **shall not** be installed along the left side of any roadway having bi-directional traffic. Chevrons are the recommended choice of treatment for the left side of roadway and guidance on the usage of chevrons can be found in [TEOpS 2-3-10](#).

Size and Color

The color of delineator **shall** match the color of the pavement marking line being supplemented. Delineator dimensions are shown in SDD 15A2 through 15A7.

Longitudinal Spacing

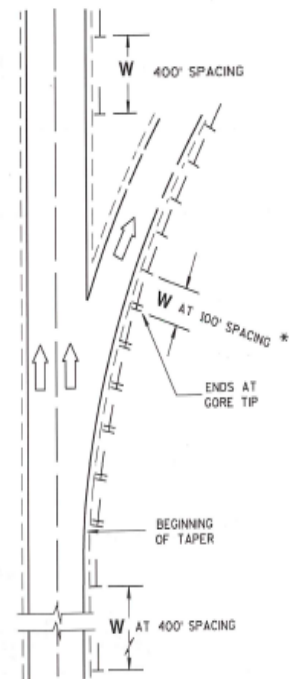
Delineators are to be placed at 100' center-to-center spacing on ramps and 400' center-to-center spacing on mainline. If they are interrupted, then they *may* be moved in either direction up to 25' for ramps and 100' for mainline. A minimum of 3 delineators is required.

Offset Distance

Delineators **shall** be placed at a constant distance from the edge of shoulder for the length of the installation, typically 4 feet. If a barrier wall or parapet is present place the delineators on the wall.

Transition Areas

Engineering judgment **shall** be used to adjust the longitudinal and offset spacing in any transition area. Consideration must be given to the function of providing guidance of the roadway alignment and as an aide for night driving.





3-10-1 Pavement Marking Material Selection Policy

May 2017

PURPOSE

Uniformity in the application of pavement markings materials on state highways is very important because it will provide for consistency of motorist expectations, which can enhance traffic safety. Consistency of application will result in the most efficient usage of dollars (both for projects and maintenance) for pavement markings. In turn, this will lead to a sustainable pavement marking program that will provide effective pavement markings to address the needs of motorists at the most economical cost.

This policy provides direction on what types of pavement marking materials are used on the different types of roadways.

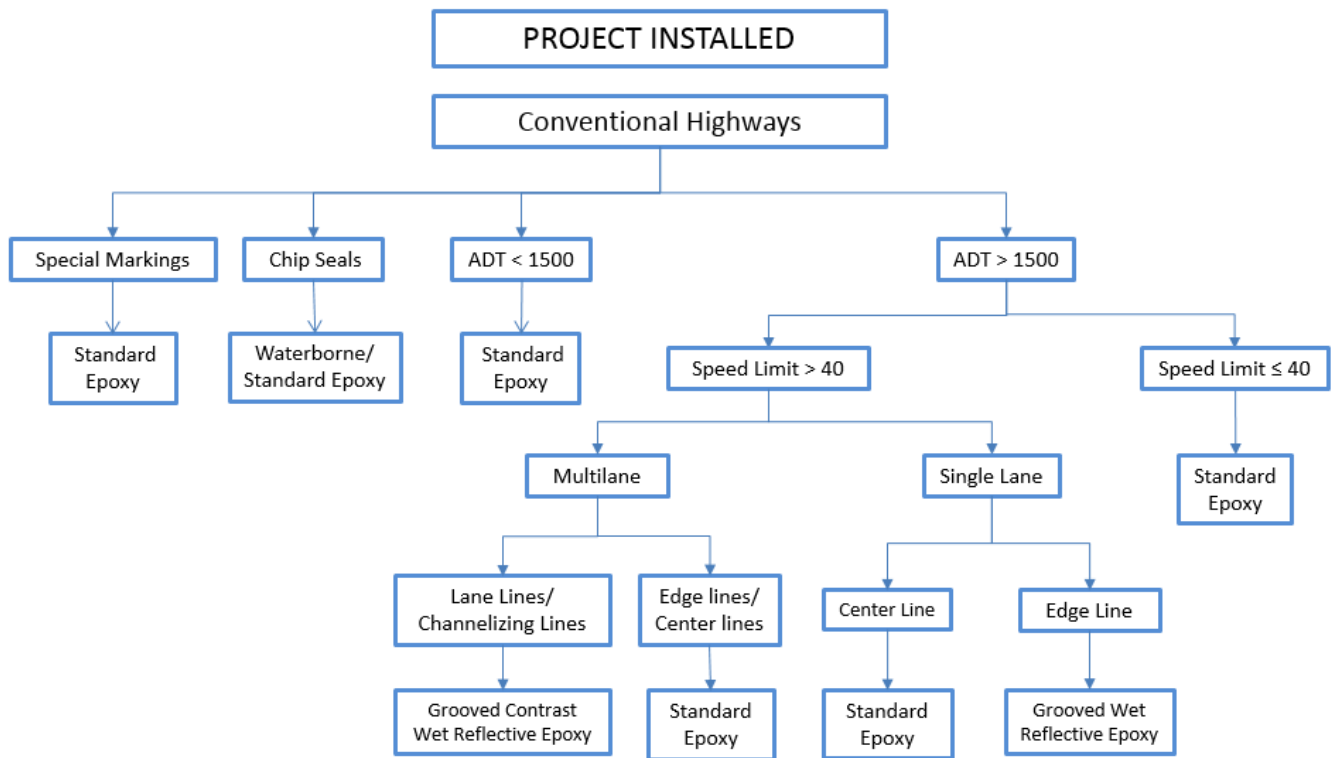
It is recognized that there may be times where unique situations could necessitate a deviation from this policy. Unique locations or non-standard markings **shall** be discussed with the Regional Traffic Signing and Marking Engineer prior to including such markings in contract plans.

Any pavement marking material usage requests that are not on the Department's Approved Products List **shall** be reviewed and approved by the Bureau of Traffic Operations prior to usage. Any shortages of pavement marking materials or vendors requesting usage of new products **shall** be referred to the Bureau of Traffic Operations.

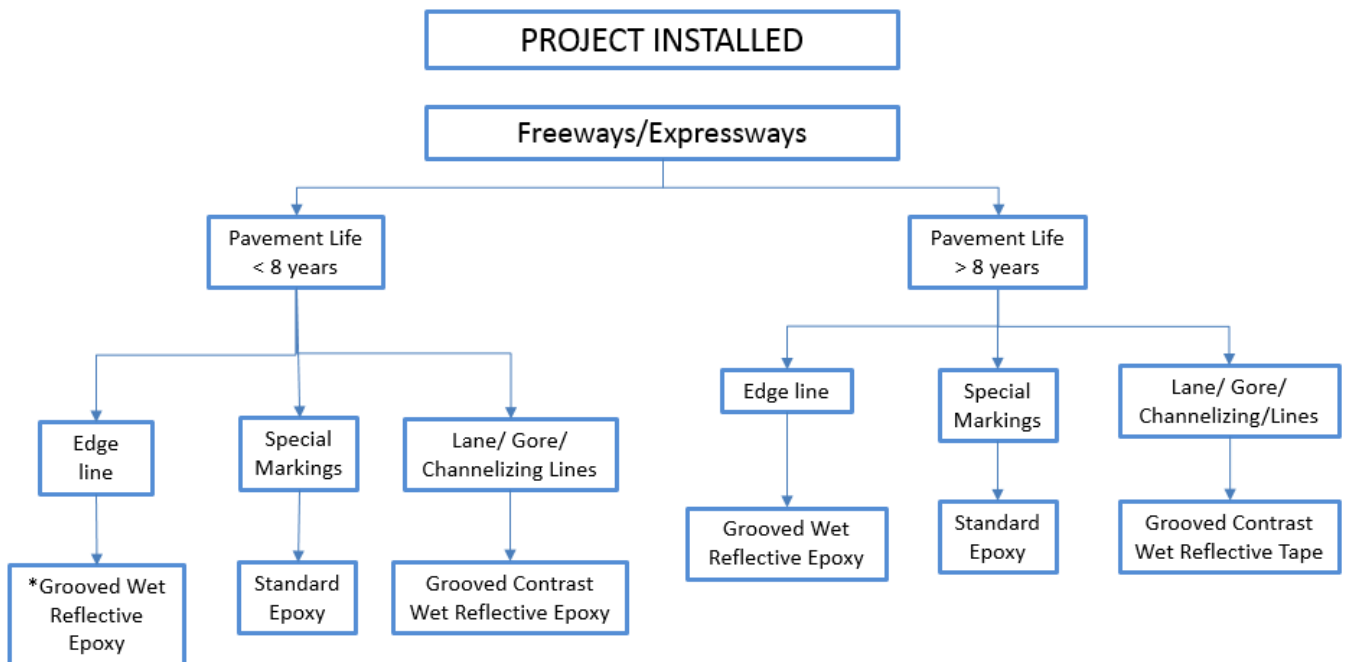
POLICY

The type of pavement marking material used on state highways is provided below in the flow charts. The flow charts are for project installed pavement markings and maintenance installed pavement markings. These charts **shall** be utilized when making the decision to select the proper pavement marking material for the roadway.

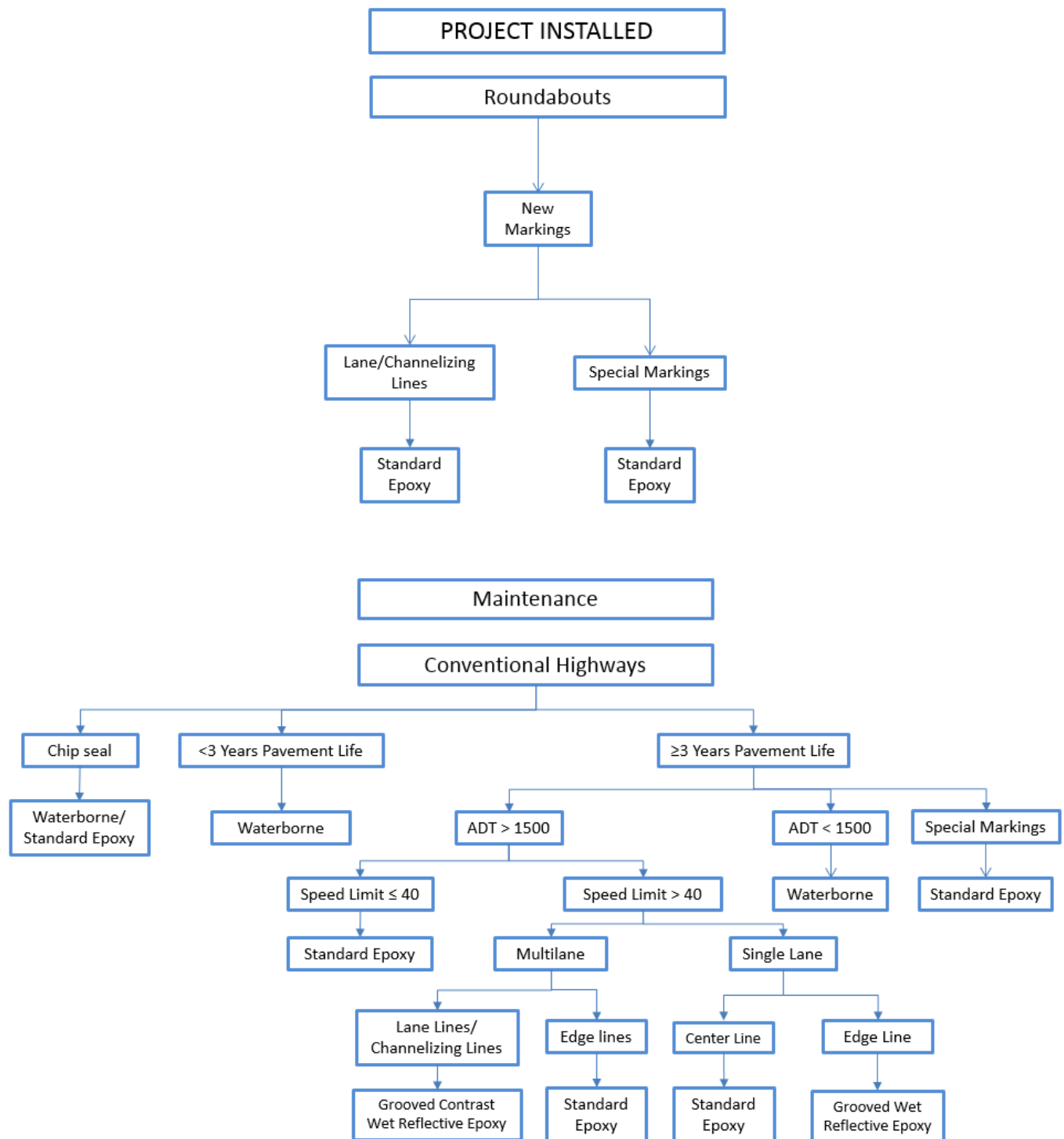
- When utilizing the flow charts, the following criteria shall be kept in mind: If a contrast epoxy product already exists, retrace only the white portion of the epoxy unless the black aggregate is visually missing.
- Grooved Wet Reflective Epoxy **shall** only be remarked in kind, if an existing groove has maintained adequate depth.
- If preformed thermoplastic is present, remove preformed thermoplastic markings and replace with a product listed on the associated flow chart. Retracing preformed thermoplastic is **NOT** permitted.
- If tape is present and still bonding, retrace marking with a product listed on the flow chart product. However, if the tape product is failing, remove tape and replace with epoxy.



Use the appropriate ADT section for overlay projects.

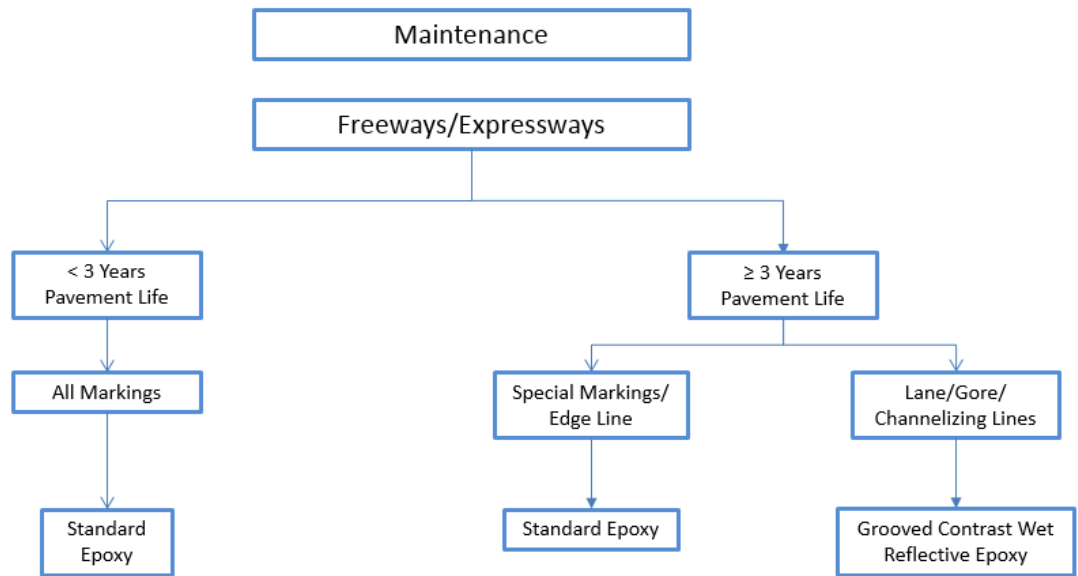


*Use Standard Epoxy if a groove is not present.
 Contact your region traffic engineer on what product to use on ramps.



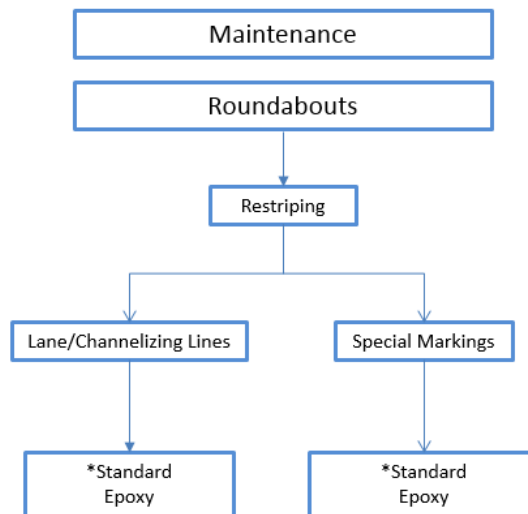
NOTE:

- In areas where there is no groove, marking would be standard epoxy or waterborne.
- Where contrast epoxy already exists, retrace only the epoxy, not the contrast marking unless visually missing.
- Grooved Epoxy: Remarkings within the existing groove, unless material is failing, then consider re-grooving.
- If thermoplastic is present, remove thermoplastic markings and replace with the correct product listed above. Retracing thermoplastic is NOT permitted.
- If tape is present and still bonding, retrace marking with the correct product listed above. If tape product is failing, remove tape and replace with epoxy.



NOTE:

- In areas where there is no groove, marking would be surface applied and not wet reflective.
- Where contrast epoxy already exists, retrace only the epoxy, not the contrast marking unless visually missing.
- Grooved Epoxy: Remarkings within the existing groove, unless material is failing, then consider re-grooving.
- If thermoplastic is present, remove thermoplastic markings and replace with the correct product listed above. Retracing thermoplastic is NOT permitted.
- If tape is present and still bonding, retrace marking with the correct product listed above. If tape product is failing, remove tape and replace with epoxy.



NOTE:

- Where contrast epoxy already exists, retrace only the epoxy, not the contrast marking unless visually missing.
- Grooved Epoxy: Remarkings within the existing groove, unless material is failing, then consider re-grooving.
- If thermoplastic is present, remove thermoplastic markings and replace with the correct product listed above. Retracing thermoplastic is NOT permitted.
- If tape is present and still bonding, retrace marking with the correct product listed above. If tape product is failing, remove tape and replace with epoxy.



3-15-5 Temporary Pavement Marking

January 2018

GENERAL

Temporary Pavement Markings help delineate the roadway during a construction project.

POLICY

Temporary Pavement Markings **shall** resemble the width and color of the permanent pavement markings. Temporary Pavement Markings can be one of the markings listed below:

1. Paint
 - a. Preferred product over the summer months.
2. Epoxy
 - a. Preferred product if the project will extend over the winter.
3. Removable Tape
 - a. **May** be used when it is applied to the permanent pavement, but not where the permanent marking will be placed.
 - b. **Shall not** be used over the winter.
4. Mask-out Tape
 - a. This is used to cover existing marking for the duration of the project, only if the marking will be there after the project.
 - b. This product *should* only be used for short term work, as long-term usage this *may* leave a residue on the underlying markings.
 - c. **Shall not** be used over the winter
5. Temporary Raised Pavement Markers- See [TEOpS 3-2-11](#) for further guidance. SDD [15C34-1](#).provides guidance on the placement of Temporary Raised Pavement Markers, Type II.

Transition Areas, Lane Shifts, and Crossovers *may* use the following marking for emphasis:

- Contrast lane lines (removable tape)
- Type I temporary raised pavement markers
- Solid lines (any product)

When same day marking is used for less than 14 days, 4 foot temporary skips *may* be used with a 46-foot gap.

3-15-15 Dynamic Envelope Marking

November 2015

PURPOSE

The MUTCD Section [8B.29](#) defines dynamic envelope pavement markings as a 4-inch solid white line, placed parallel to and 6 feet away from the nearest rail of an at-grade crossing. The MUTCD further defines a supplemental marking consisting of 12-inch solid white lines, placed at a 45-degree angle and 5 foot spacing between the 4-inch solid lines. This policy will clarify dynamic envelope pavement marking installation on state maintained roadways.

POLICY AND GUIDELINES

Between the 4-inch parallel lines, dynamic envelope markings fully cover 20 percent of the driving surface. This broad coverage area presents a potential safety hazard to bicycles and motorcyclists, as pavement marking material offers significantly less surface friction than unmarked pavement. In addition, this large amount of

marking creates a maintenance issue for the department. For these reasons, dynamic envelope markings **shall not** be utilized on state maintained roadways.

Certain grade-crossing locations on state maintained roadways *may* present operational issues. In lieu of dynamic envelope markings, the following signing countermeasures *may* be implemented:

1. The R8-8 "DO NOT STOP ON TRACKS" sign *may* be used at grade crossings where drivers tend to stop on the tracks.
2. The R10-6 "STOP HERE ON RED" sign *may* be used at grade crossings with signals downstream of the crossing.
3. The W10-11-A "XX FEET BETWEEN TRACKS & HIGHWAY" sign *may* be mounted in advance of a grade crossing where limited storage space exists between the tracks and a downstream intersection.
4. The W10-11-B "XX FEET BETWEEN HIGHWAY & TRACKS BEHIND YOU" sign *may* be used downstream of a grade crossing where limited storage space exists between the tracks and a downstream controlled intersection. If used, this sign *should* be mounted either below the STOP or YIELD sign, or just prior to the signalized intersection.



PURPOSE

This subject was developed to provide guidance to improvement project inspectors as well as Department and County field and maintenance crews for the installation, service and maintenance of all types of highway signs and pavement markings on the State Highway network. The goal for this manual is to install signs and pavement markings to provide a safe, understandable and efficient system of guidance to the motoring public.

These guidelines are intended to provide a framework of policies and practices for the systematic reporting and handling of pavement marking installation and replacement or sign repair activities done by others under the direction of the Wisconsin Department of Transportation through its Regions. It is inherent these guidelines that the basic thrust be to promote safety of the motorist, safety for the improvement and maintenance crews and standardization of practices toward uniform application and appearance statewide.

Improvement project crews and maintenance crews will perform their operations in accordance with the Wisconsin Manual on Uniform Traffic Control Devices, Traffic Guidelines Manual and other Department policies as referenced within.

The Department recognizes these guidelines *may* require adjustments and revision as they are implemented.

INSTALLING MARKINGS

Pavement marking **shall** be in accordance with the WMUTCD, Facilities Development Manual and the Wisconsin Standard Specification Manual.

Types of Roadway Markings

Skip line is a broken or dashed line. The standard is a 12.5' line with a 37.5' gap.

Dash is a painted portion of a skip line. Typically a 3' line with 9' gap.

Cat track is a painted line for guidance. Typically a 2' line with a 6' gap.

Channelizing line is double the thickness of a standard line. Typically 8".

County Maintenance

Counties will be given segments of roadways that need to be painted. The scheduling of pavement marking operations will be left to the county. Counties will then be able to schedule their crews to what fits their needs, but the work **shall** be completed in a timely manner. WisDOT is requiring all marking to be placed at or above manufacture specifications. Each stripping crew is responsible for completing the Pavement Marking Daily Report. These reports **shall** be sent to the Regional Pavement Marking Coordinator or representative at the end of every week. State actual time spent not painting at the bottom of the report (drive time, weather delay, maintenance, etc)

Improvement/Refurbishment Projects

Install per Spec 646, 647, and 649.

FIELD OPERATIONS

Paint and Beads **shall** be purchased off of the Statewide Bid for all State work. It **shall** be the responsibility of the County to order all paint and beads, unless other arrangements have been made with the Region. Return all empty paint totes to the provider. For application standards see the appropriate section below.

No Passing Zones

- No Passing Zone "T" is a mark on the roadway, which indicates the beginning and ending points of a barrier line.
- No Passing Zone "X" on the end of a line indicates that it needs to be extended or removed.
- No Passing Zone Dot indications the center of the roadway.

Figure 1. New Marking

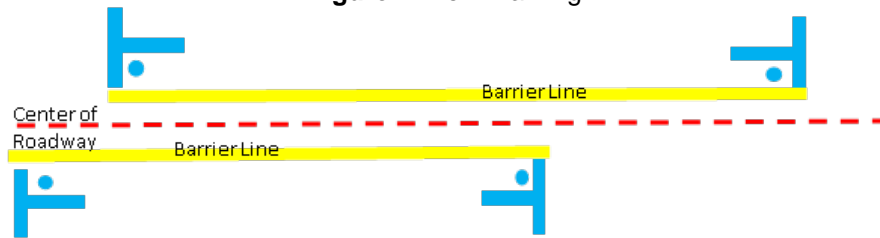


Figure 2. Existing Marking Extension



Figure 3. Existing Marking Removal



Waterborne Paint

General

Store waterborne paint in a dry area that will not freeze. Do not store paint for more than 12 months. Keep in mind the weather will drastically change the dry time of this product. Humidity and cooler weather are the biggest factors. Please let the Marking Coordinators know of any and all issues with the paint.

Types of Spraying

There are 2 ways to spray paint:

- Conventional: Air jets with a pressure (60 psi to 140 psi) at the tip of the paint gun that breaks up the paint. The tip defines the size of the line.
- Airless: The pressure created by the pump forces paint out through an orifice in the tip of the gun. The angle and size of tip affect the size of the line.

Temperature

Refer to manufacture specifications for the temperature the paint *should* be applied at. Typically the ambient temperature *should* be above 50°F.

Beads

Wisconsin is currently using the AASTHO Type I bead gradation with 80% rounds. These can also be purchased off of the State Contract.

Application

| Product | Mil thickness | Gallons per Mile | Feet per Gallon | Beads per Gallon |
|---------|---------------|------------------|-----------------|------------------|
| Paint | 16 | 17.6 | 300 | 8-10 |

Epoxy

General

Epoxy is a two part system. Epoxy has a longer life expectancy and can be applied at lower temperatures; however, it takes longer to dry than waterborne paint. Epoxy has a life expectancy of 3-5 years. Humidity and cooler weather are the biggest factors. Please let the Marking Coordinators know of any issues.

Mixing

Since epoxy is a two part system the resin has to be mixed with a hardener. Typically it is 2 parts resin to 1 part hardener.

Temperature

Refer to manufacture specification for the temperature the epoxy *should* be applied at. Typically the ambient

temperature *should* be above 35°F

Beads

Wisconsin is currently using the AASTHO Type I bead gradation with 80% rounds. See table above for how many pounds of beads per gallon are required.

Application

| Product | Pavement Type | Mil Thickness | Gallons per Mile | Feet per Gallon | Beads per Gallon |
|---------|--------------------------------|---------------|------------------|-----------------|------------------|
| Epoxy | SMA/ Seal Coat/ Epoxy Overlays | 25 | 27.4 | 193 | 25 |
| Epoxy | All Others not stated above | 20 | 21.9 | 241 | 22.5 |

Reflective Glass Beads

General

Beads are added to lines to increase the visibility of the lines at night. The beads help reflect light from a vehicle back to the driver as shown in the picture to the right.

Figure 1: No Beads

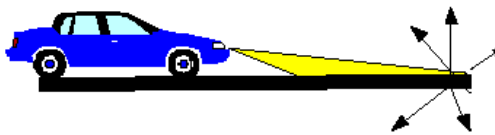


Figure 2: Beads added



Optimum embedment of beads is 50-60%. Anything less than that *may* cause the beads to pop out and any more than that affects how much light the bead can reflect back to the driver.

Bead Calibration

Bead calibration is very important since to many beads is expensive and doesn't adhere to the paint, and not enough beads can result in low retros. Hold a container under the bead gun for 10 seconds. Measure beads in milliliters. Use the table below to measure the volume of beads in milliliters per 10 seconds for a 4" wide line drop rate.

| Bead Calibration Chart (AASHTO Type I to Type 4) | | | | | |
|--|----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Lbs/100ft Bead Calibration Chart | | | | | |
| Speed | 8 lbs/1000 ft ² | 10 lbs/1000 ft ² | 12 lbs/1000 ft ² | 22 lbs/1000 ft ² | 24 lbs/1000 ft ² |
| 10 mph | 1080 | 1340 | 1600 | 2930 | 3200 |
| 9 mph | 960 | 1200 | 1440 | 2560 | 2880 |
| 8 mph | 850 | 1070 | 1280 | 2350 | 2880 |
| 7 mph | 750 | 940 | 1120 | 2040 | 2220 |
| 6 mph | 640 | 800 | 960 | 1760 | 1920 |
| 5 mph | 530 | 660 | 800 | 1460 | 1600 |
| 4mph | 430 | 530 | 640 | 1160 | 1280 |
| 3 mph | 320 | 400 | 480 | 880 | 960 |

Source: Ennis Flint Traffic Paint Guide Book

General Application Calculations

Formula for Determining Mil Thickness (only for a 4" wide line)

$$\text{Mil Thickness} = \frac{(0.9115 \text{ miles/ft}) * (\text{Number of Gallons})}{(\text{Miles Striped})}$$

Example: 55 gallons of paint was used in a 2 mile segment. What was the mil thickness?

$$\text{Mil Thickness} = \frac{(0.9115 \text{ miles/ft}) * (55 \text{ Gallons})}{(2 \text{ miles})} = 25.07 \text{ Mil}$$

Formula for Determining Gallons Per Mile at a Designated Width and Mil Thickness

$$\frac{(19,200 \text{ ft}^2 \text{ per gallon of linear line})}{(\text{Mil Thickness}) * (\text{Desired width of line in inches})} = \frac{\text{Linear Feet}}{\text{Gallon}}$$

$$\frac{5280 \text{ ft}}{\text{Linear Feet Per Gallon}} = \frac{\text{Gallons}}{\text{Mile}}$$

Example: Assume the Line is 8" wide with a mil thickness of 15. How many gallons per mile do you need?

$$\frac{(19,200 \text{ ft}^2 \text{ per gallon of linear line})}{(15 \text{ mils}) * (8 \text{ inches})} = 160 \text{ linear ft per gallon}$$

$$\frac{5280 \text{ ft}}{160 \text{ linear ft per gallon}} = 33 \text{ gallons per mile}$$

Troubleshooting Tips

Below are the common problems that occur during painting.

Table 1: Conventional Paint Application Troubleshooting

Source "MnDOT Pavement Marking Field Guide"

| PAINT APPLICATION TROUBLESHOOTING | | |
|--------------------------------------|---|--|
| PROBLEM | CAUSE | REMEDY |
| Excessive Thickness (overall) | <ul style="list-style-type: none"> Paint tank or pump pressure too high Paint gun volume control open too wide (if present) Applicator speed too low | <ul style="list-style-type: none"> Reduce tank or pump pressure Adjust paint gun volume control Increase speed |
| Excessive Thickness (middle of line) | <ul style="list-style-type: none"> Paint tank or pump pressure too high Paint gun volume control open too wide (if present) Atomizing air pressure off or too low Material buildup in paint gun tip and/or shroud | <ul style="list-style-type: none"> Reduce tank or pump pressure Adjust paint gun volume control Increase atomizing air pressure Clean tip and/or shroud |
| Excessive Thickness (along one side) | <ul style="list-style-type: none"> Material buildup in paint gun tip and/or shroud Clogged hole(s) in paint gun atomizing tip | <ul style="list-style-type: none"> Clean paint tip and/or shroud Clear clogged hole(s) in paint gun atomizing tip |
| Insufficient Thickness | <ul style="list-style-type: none"> Paint tank or pump pressure too low Paint gun volume control not open enough (if present) Vehicle speed too high Atomizing pressure too low. Material buildup in paint gun tip and/or shroud Material buildup in paint filter(s) and/or plumbing | <ul style="list-style-type: none"> Increase tank or pump pressure Adjust paint gun volume control Increase applicator speed. Increase atomizing air pressure Clean paint gun tip and/or shroud Clean paint filter(s) and/or plumbing |
| Wide Paint Line | <ul style="list-style-type: none"> Paint gun set too high Worn or damaged paint gun tip and/or shroud | <ul style="list-style-type: none"> Lower gun Repair or replace tip and/or shroud |
| Narrow Paint Line | <ul style="list-style-type: none"> Paint gun too low Paint gun tip slot not at 90° angle to paint line Clogged paint gun tip and/or shroud Low air pressure in paint machine tire. | <ul style="list-style-type: none"> Raise paint gun Reposition paint gun tip Clean paint gun tip and/or shroud Inflate tire |
| Uneven Paint Line (spotty) | <ul style="list-style-type: none"> Atomizing air pressure too low Paint tank pressure too low Old paint (viscosity too high) Loose paint gun tip and/or shroud Not enough heat for paint to flow evenly No shroud | <ul style="list-style-type: none"> Increase atomizing air pressure Increase material tank pressure Rotate material stock Secure paint gun tip and/or shroud Increase heat Install shroud |

Table 2: Epoxy Spray Application Troubleshooting

Source "MnDOT Pavement Marking Field Guide"

| EPOXY SPRAY APPLICATION TROUBLESHOOTING | | |
|---|--|--|
| PROBLEM | CAUSE | REMEDY |
| Heavy or Light centers | <ul style="list-style-type: none"> Inadequate fluid delivery | <ul style="list-style-type: none"> Increase fluid pressure Decrease tip size |
| Surging pattern | <ul style="list-style-type: none"> Pulsating fluid delivery | <ul style="list-style-type: none"> Reduce demand Remove restrictions in supply system Check individual pump pressures for unequal pressure Check supply hose for leaks |
| "Lop-sided" millage | <ul style="list-style-type: none"> Worn tip sides Clogged tip | <ul style="list-style-type: none"> Replace tips Clean tips |
| Line too wide | <ul style="list-style-type: none"> Gun too high Too wide a fan angle on tip | <ul style="list-style-type: none"> Lower gun Adjust tip size if necessary |
| Line too narrow | <ul style="list-style-type: none"> Gun too low Too narrow a fan angle on tip | <ul style="list-style-type: none"> Change tip size Decrease speed of application Verify pressure settings |
| Too much or too little hardener | <ul style="list-style-type: none"> Displacement pumps not properly synchronized | <ul style="list-style-type: none"> Adjust pumps |

Table 3: Reflective Bead Application Troubleshooting

Source "MnDOT Pavement Marking Field Guide"

| REFLECTIVE BEAD APPLICATION TROUBLESHOOTING | | |
|---|--|---|
| PROBLEM | CAUSE | REMEDY |
| Beads on one side | <ul style="list-style-type: none"> Bead gun out of alignment Clogged bead gun | <ul style="list-style-type: none"> Adjust alignment of gun cap |
| Excessive bead use | <ul style="list-style-type: none"> Worn gun needle, seat and orifice Excessive glass bead pressure | <ul style="list-style-type: none"> Rebuild gun Decrease pressure |
| Beads in middle of line | <ul style="list-style-type: none"> Bead tank pressure too low Bead gun "off" and "on" control screw not adjusted Bead gun cap out of alignment Too big of a bead gun tip | <ul style="list-style-type: none"> Increase pressure Adjust control screw Align cap deflector Change to a smaller tip |
| All beads buried | <ul style="list-style-type: none"> Bead gun too close to paint Bead gun angle too shallow Excessive paint millage | <ul style="list-style-type: none"> Re-align bead gun Adjust angle of bead gun Check wet millage thickness |
| All beads on top of line | <ul style="list-style-type: none"> Bead gun too far from paint gun | <ul style="list-style-type: none"> Re-align bead gun |
| Pulsed bead application | <ul style="list-style-type: none"> Bead tank pressure inadequate | <ul style="list-style-type: none"> Raise tank pressure Rebuild applicator to increase pressure |
| Excessive amount of beads beside line | <ul style="list-style-type: none"> Too much overlap of bead pattern on line pattern | <ul style="list-style-type: none"> Move bead gun closer to roadway |

CONTACTS

| DOT Contacts | | | |
|---|--------------------------------|------------------------------|--|
| Region | Contact Person | Number | Email |
| Pavement Marking Staff 3609 Pierstorff St Madison, WI 53704 | Jeannie Silver | 608-246-5408 | jeannie.silver@dot.wi.gov |
| | Linette Rizos | 414-333-6234 | linette.rizos@dot.wi.gov |
| | Matt Rauch | 608-246-5305 | matt.rauch@dot.wi.gov |
| SW Region- La Crosse 3550 Mormon Coulee Rd. La Crosse, WI 54601 | Kory Keppel | 608-785-9953 | kory.keppel@dot.wi.gov |
| SW Region- Madison 3601 Pierstorff St Madison, WI 53704 | Jeff Holloway | 608-246-3268 | jeffrey.holloway@dot.wi.gov |
| SE Region- West Allis 935 S. 60th St. West Allis, WI 53214 | Donald Steel Chuck Saldivar | 262-548-6765 414-266-1164 | donald.steel@dot.wi.gov chuck.saldivar@dot.wi.gov |
| NE Region- Green Bay 944 Vander Perren Way Green Bay, WI 54304 | Steven Herlache | 920-492-3512 | steven.herlache@dot.wi.gov |
| NC Region- Wis Rapids 2841 Industrial St Wis Rapids, WI 54495 | Mike Worzella | 715-421-8003 | michael.worzella@dot.wi.gov |
| NC Region- Rhinelander Hanson Lake Rd Rhinelander, WI 54501 | Mike Worzella | 715-421-8003 | michael.worzella@dot.wi.gov |
| NW Region- Spooner W7102 Green Valley Rd Spooner, WI 54801 | Chloe Anderson Mark Foster | 715-855-7672 | chloe.anderson@dot.wi.gov mark.foster@dot.wi.gov |
| NW Region- Eau Claire 5009 USH 53 South Eau Claire, WI 54701 | Chloe Anderson Mark Foster | 715-855-7672 | chloe.anderson@dot.wi.gov mark.foster@dot.wi.gov |

Pavement Marking County Contractor Contacts**Southwest**

| | | |
|--------|-----------------|----------------|
| Adams | Dave Johnson | (608) 547-0644 |
| Dane | Robert Peterson | (608) 575-5209 |
| Dodge | Wally Fett | (920) 296-2376 |
| Iowa | Jeff Anderson | (608) 574 2934 |
| Vernon | Phil Hewitt | (608) 606-3777 |

Southeast

| | | |
|------------|------------------|----------------|
| Milwaukee | Scott Schweitzer | (414) 588-5752 |
| Racine | Mike Kirshling | (262) 770-9690 |
| Walworth | Dave Gross | (262) 949-4660 |
| Washington | Jeff Spaeth | (262) 483-3081 |
| Waukesha | Dan Moudry | (262) 424-9598 |

Northeast

| | | |
|-------------|--------------|----------------|
| Brown | Andy Sell | (920) 609-4020 |
| Calumet | Andy Fuhrman | (920)418-2320 |
| Fond du Lac | John Hoffman | (920) 929-3491 |

| | | |
|-----------|---------------|----------------|
| Kewaunee | Keith Paplahm | (920) 255-3876 |
| Marinette | Joe Baranek | (715) 923-6874 |
| Sheboygan | Brian Olson | (920) 459-3822 |

North Central

| | | |
|----------|------------------|----------------|
| Adams | Tom Lachapelle | (608) 339-3355 |
| Langlade | Crystal Wells | (715) 627-6351 |
| Portage | Steve Schlice | (715) 345-5235 |
| Shawano | Casey Beyersdorf | (715) 853-1699 |
| Waushara | Tom Dahlke | (920) 787-3327 |

Northwest

| | | |
|-------------|---------------|-----------------------|
| Taylor | Kevin Kalepp | (715) 748-2456 |
| Trempealeau | Jim Johnson | (715) 538-4799 ext 27 |
| Washburn | Adam Gronning | (715) 641-0570 |

3-25-2 Field Crew Safety and Training**May 2017****PERSONAL SAFETY**

All Department of Transportation (DOT) personnel **and** any personnel working for the state are required to follow the safety policies stated in the DOT Transportation Administrative Manual (TAM). DOT, county, and contractor personnel **shall** wear:

- Eye Protection: (TAM SD 36)
 - Safety glasses with attached shields
- Foot Protection: Steel-toe boot or shoe (TAM SD30)
- Protective Headgear: (TAM SD 51)
 - Hard hat
- High Visibility Safety Apparel: (TAM SD 57)
 - Reflectorized Safety Vest at all times on or along the roadway
 - Reflectorized Safety Pants during nighttime hours.

Hazard Warning Information - Treated Wood Management (See Exhibit 5)

(Material Safety Data Sheets *should* be requested from the wood post vendor)

EMPLOYEE RECOMMENDED TRAINING

All agencies doing work for the DOT *should* make sure their employees are properly trained in the following areas:

1. Field Operations Awareness
2. Shop Tools
3. Major Equipment Operations
4. Utilities Locate. Call Diggers Hotline 811
5. Retraining
6. Vehicle Safety and Inspection

WORK AREA TRAFFIC CONTROL

All traffic control **shall** be in compliance with the WMUTCD and Departmental policies. See Standard detail drawings.

Vehicles used in highway signing operations **shall** be equipped with at least two (2) yellow, high intensity rotating beacons, clearly visible from the front, rear and both sides of the vehicle. These beacons **shall** be placed as high as possible on each vehicle. Vehicles **shall** have all warning lights operating when stopped, or moving slowly along any highway. Warning lights **SHALL NOT** be displayed while the vehicle is traveling at highway speeds or when traveling between jobs.

When conditions are less than ideal, additional advance warning signs or devices *should* be added to the traffic control layouts. In some cases, the work *should* be deferred until the conditions are more favorable.

All lane closures on two lane roadways require flagging of traffic as well as advance signing and cone placement in the work area. Remember that all flaggers **shall** use stop/slow paddles.

An encroachment into a lane of traffic *may* require cones and/or flagging. The amount of encroachment, the volume and speed of passing vehicles will determine traffic control measures required. For example, a cone *may* be sufficient to mark the point where an outrigger makes contact with the pavement outside the overall width of the truck.

PUBLIC SAFETY

Workers **shall** park vehicles off the road as far as practical. Care *should* be taken to not block the vision of existing traffic control devices such as stop signs and signals. Work activities *should* be performed with an assumption the motorist does not know what the workers are going to do.

UTILITIES

Utility Locates. Diggers Hotline (811) **shall** be called and located before any work is performed. They *should* be given at least a 3 working day notice.

The following is a five-point plan for utility locates before digging in the highway right-of-way, which covers the routine steps required by Diggers Hotline:

1. Prepare a plan or work location sketch or drawing. Indicate a 25 foot radius around the stake or lath for "MARKING INSTRUCTIONS" for Diggers Hotline.
2. At each locate site, mark with a stake or by painting the pavement or shoulder of the highway. White or pink are the approved colors for ribbons, flags or paint when marking sign locations for utility locates.
3. Identify the exact location by measuring the distance from the nearest intersecting street or highway. Indicate which side of the highway the locate is on.
4. Contact Diggers Hotline to request the area to be located. Retain ticket number for a minimum of six years after work is completed.
5. Investigate the possibility of other utilities having services at the locate site.

Utility Damage Procedure. Damage prevention is the ultimate goal. As stated above it is essential to get clearance from utilities before doing any digging.

- BEFORE YOU DIG, CONFIRM UTILITIES HAVE BEEN LOCATED

IF UTILITY DAMAGE OCCURS:

- CALL THE UTILITY FROM A SAFE LOCATION AS SOON AS POSSIBLE.
- CLEAR AREA IF NECESSARY.
- EXTINGUISH ALL FIRE SOURCES; BE MINDFUL OF LOSS OF LIFE.
- NOTIFY EMERGENCY SERVICES (IF NECESSARY).
- NOTIFY SUPERVISOR.
- BE AVAILABLE ON OR NEAR THE SITE UNTIL REPAIR CREW ARRIVES.

MAJOR EQUIPMENT OPERATIONS

It is recommended that field operations that involve digger derricks or bucket trucks will NOT be performed with fewer than two crew persons on the job site.

HAVING A UTILITY LOCATE CLEARANCE DOESN'T NECESSARILY MEAN ALL DANGER HAS BEEN REMOVED.

Derrick operators must be aware of overhead lines to be certain the boom or its attachments remain the required distance away from the overhead lines.

ACRONYMS & DESCRIPTIONS

HMA - Hot Mix Asphalt

MSDS - Material Safety Data Sheets

PCC - Portland Cement Concrete

PMC - Pavement Marking Coordinator

TMA - Transportation Maintenance Agreement

Type H Sheeting - Prismatic High Intensity

Type F Sheeting - Prismatic High Intensity Fluorescent Sheeting



GENERAL

When justified by a traffic engineering study, traffic control signals provide benefits to intersection traffic operations and *may* provide some types of safety improvements as well. While certain benefits can be realized, there *may* be potential trade-offs caused by the installation of traffic control signals including increased delay and reduced mobility on the major approaches, as well as an increase of rear-end type crashes at an intersection.

POLICY

Traffic control signals at isolated, single-source, private access points **shall not** be allowed on the STH system for the following reasons:

1. Signals at isolated, private access points disregard the public interest and investment in STH highway facilities.
2. Private access points are limited to a width of 35 feet (per Trans 231). This width *may* not be great enough to accommodate the geometry required for adequate signalized intersection operations.
3. Signal infrastructure (i.e. detection, signal bases, pull boxes, conduit) *may* need to be installed outside of the public right-of-way.

In lieu of installing traffic signals on the STH system at private access points, other alternatives *may* include:

1. Development of adjacent local street systems to concentrate traffic from other generators and/or direct traffic to intersections that are already controlled by traffic signals or roundabouts
2. Implementation of access restrictions (i.e. right-in/right-out or median modifications), or
3. Use of standard side-street stop control.

Private access point intersections that are aligned with public street connections are not the focus of this policy and are generally not considered to be in conflict with the points made above. However in these cases, it is desirable to locate signal infrastructure within public right-of-way.

The limited number of traffic control signals installed at private access points on the STH system prior to the adoption of this policy will continue to be operated by WisDOT until they are removed, replaced by other forms of intersection traffic control, or jurisdictionally transferred to local government agencies.

SUPPORT

In addition to a traffic engineering study that is performed to justify signal installations at a specific location, other factors *should* be considered. System and access issues also need to be considered when deciding whether signals are appropriate. Examples of these issues are indicated below:

1. Type of facility being proposed for signalization (i.e. it is generally not desirable to signalize expressways or high-speed bypasses around communities)
2. Signal spacing for progressive traffic flow along a corridor
3. Treatment of consolidated access points
4. Connectivity of the access point to the local roads network
5. Relative safety implications
6. Signal maintenance and operation implications.

Other guidance in this topic area *may* be found in the [Traffic Impact Analysis \(TIA\) Guidelines Manual](#), Highway Access Management Reference Guide, Administrative Rules Trans 233 and Trans 231, State Highway Maintenance Manual Chapter 91, Facilities Development Manual Chapters 7 and 11, TRB Access Management Manual, and NCHRP Report 348 Access management Guidelines for Activity Centers.

If signals are to be installed at public street connections that are aligned with private access points, from a

systems perspective, it *may* be desirable to have a portion or all of the private drive dedicated as a public street. There are several reasons for this:

- Provides system consistency for connectivity to local network
- Allows for access control on the subject approach, near the signalized intersection
- Signal infrastructure placement and signal maintenance considerations
- Will allow for greater control of features that *may* reduce sight distance (such as on-premise signing or landscaping)
- *May* provide greater design flexibility for intersection capacity.

When driveways are dedicated as public streets to meet the objectives of effective access and signal systems management, local agreements that are designed to cover or share the additional operations and maintenance costs for the additional infrastructure, *should* be considered.

4-2-4 Flashing Operations

May 2011

GENERAL

Reference is made to the MUTCD, Sections [4D.28](#), [4D.29](#), [4D.30](#), and [4D.31](#), and Wisconsin State Statute 346.37, 346.39, and 346.40.

There are four types of flashing operations for traffic control signals: start-up flash, emergency flash, program flash, and manual override flash. Each of these conditions are described briefly below:

1. New signal start-up flash operation is used to acclimate motorists to the revised form of intersection traffic control at a given location prior to initiating steady stop-and-go mode operation.
2. Emergency flash operation *may* be caused by controller malfunction, utility service disruption, or physical damage to the installation (such as a pole knock-down).
3. Program (time-of-day) flash operation is generally limited to use at pre-timed signal installations where no actuation exists to detect vehicles and provide variable green time based on actual approach demand. This type of flash operation is used during off-peak hours (for example, from 10 PM to 6 AM) to reduce intersection delay at pre-timed signals.
4. Manual override flash operation *may* be used by law enforcement officers that assume intersection traffic control associated with special events or incidents.

In addition to flash operation, two flash modes are used: red-red or yellow-red flash.

POLICY

New Signal Installation Start-Up Flash Operation

At newly installed signals that have just become operational, consideration *should* be given to using flash-mode operations if the intersection was open to traffic during construction. This is used to acclimate motorists to the revised form of intersection traffic control at a given location prior to initiating steady stop-and-go mode operation.

Engineering judgment **shall** be used to determine the need for and duration of flash-mode operations. Consideration *should* also be given to the location of the signal and type of motorists that use the route. For example, along a commuter route, new signals *may* be flashed for a length of time between Monday and Friday. Similarly, new signals along a tourist route can be flashed during a weekend period.

Start-up flash for new signals *should* reflect the prior intersection traffic control condition. That is, if a signal is installed to replace a two-way STOP condition, a yellow-red flash mode *may* be used. If a signal is installed to replace an all-way STOP condition, a red-red flash mode *may* be used.

Program (Time-of-Day) Flash Operation

Pre-timed signals on the STH system *may* use program (time-of-day) flash operations but *should* be scheduled for upgrade to semi-actuation, at a minimum. Traffic signals on the STH system that are fully or semi-actuated **shall not** use program (time-of-day) flash operations. Actuated signals can detect and respond to actual demand on conflicting approaches; efficiencies gained by this type of operation at a pre-timed signal do not necessarily exist at an actuated signal. In addition, the transition out of flash operation to steady stop-and-go operations *may* be a time of potential confusion to motorists.

Traffic signals on the STH system that are interconnected with rail-grade crossing systems **shall not** use

program (time-of-day) flash operations.

Emergency Flash Operation & Manual Override Flash Operation

Regardless of whether program flash operation is used at a particular installation, the flash mode must be determined for emergency and manual override situations. The bullet points below discuss these two modes:

1. Red-red (R-R) flash mode is prescribed for most signalized intersections, as this mode tends to reflect motorist expectancy. On multilane highways, this type of operation will benefit motorists on the side road since clearance distances can be large.
2. Yellow-red (Y-R) flash mode *may* be appropriate at signals where overall intersection volumes are relatively light and the proportions of mainline volumes significantly exceed those on the side road. This rule of thumb reflects a consideration for intersection delay and maintaining priority based on route significance. However, driver expectancy may be violated causing drivers to unnecessarily stop on yellow, thereby creating a potential safety hazard for other drivers and negating the potential delay reduction.

Even if an isolated intersection meets the broad volume criteria above for yellow-red flash mode, other signalized intersections along a corridor *may* dictate the type of flash mode that *should* be used. For example, if adjacent signalized intersections use a red-red flash mode, driver expectancy *may* determine that any additional signals in the immediate area operate in the same manner; regardless of this generalized volume criteria.

SUPPORT

Whether a signal is operating in steady stop-and-go mode, R-R or Y-R flashing mode, or non-operable (dark) mode, driver expectancy *should* be considered. Careful engineering judgment *should* be used to balance the needs of safety, efficiency and motorist expectancy.

4-2-5 Vehicle Clearance Intervals

May 2006

GENERAL

Reference is made to the MUTCD Section [4D.10](#).

According to [State Statute 346.37\(1\)\(b\)](#), "When shown with or following the green, traffic facing a yellow signal **shall** stop before entering the intersection unless so close to it that a stop *may not* be made in safety."

The purpose of the YELLOW vehicle clearance interval is to inform drivers of an impending change in right-of-way assignment. Yellow clearance intervals are normally three to six seconds in duration.

The purpose of the ALL-RED clearance interval is to allow vehicles to travel through an intersection that have lawfully entered during the yellow clearance interval. It *may* also provide a brief period of separation time between opposing movements. All-red clearance intervals normally do not exceed three seconds in duration.

POLICY

By the WisMUTCD, all traffic signal installations **shall** display a yellow indication following every green interval. In addition, by this policy, state-owned signal installations **shall** operate with an all-red clearance interval for mainline and side street intersection through-vehicle movements. All-red clearance intervals *may* be used for other intersection movements, such as protected left turns.

Fundamentally, there are three ways that yellow and all-red clearance intervals are developed: timing derived by kinematic principles, uniform timing, and rule of thumb. As a statewide organization, WisDOT routinely operates signals adjacent to various jurisdictions that *may* have differing perspectives about signal timing methodology. In the interest of providing uniform conditions to the extent possible, all methods are considered acceptable but *may* have greater applicability in certain situations or within specific areas of the state.

Kinematic Method

Develops a clearance interval duration based on driver behavior and physical principles. Clearance interval timing based on this method can be calculated for each intersection movement by using the following formula:

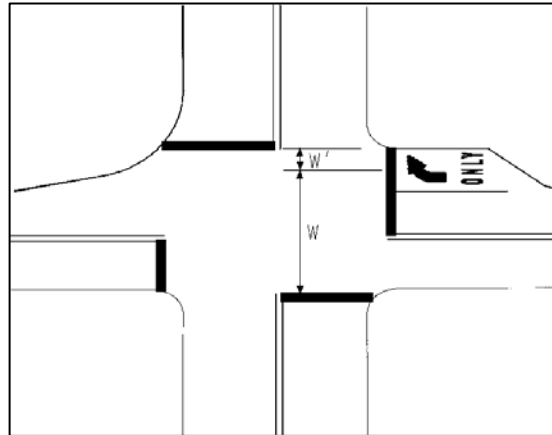
$$CT = prt + \frac{v}{2a+2Gg} + \frac{L+w}{v}$$

= yellow portion + all-red portion

Where:

- CT = clearance time (*may* be rounded up to nearest 0.5 second)
 prt = driver perception-reaction time (usually 1.0 second)
 v = vehicle approach speed (feet per second, vehicle approach speed *should* be based on the posted speed, or the 85-percentile speed if data is available)
 a = average vehicle deceleration rate (usually 10 to 15 feet per second², 10 to 12 fps² recommended)
 g = acceleration due to gravity (32 fps²)
 G = approach grade (expressed as decimal)
 L = vehicle length (usually 20 feet)
 w = intersection width (measured in feet from the near-side stop bar, see "w" diagram below)

Figure 1. Recommended Intersection Width ("w") Determination



Intersection width measured from approach stop bar to center of conflicting vehicle lane on the far side of the intersection. Width *may* also include distance from center of far lane to the outside edge of the traveled way ($w + w'$).

When used, variables within the formula above *may* need to be adjusted for various applications and for different intersection movements. For example, in the case of left-turns, driver perception-reaction times *may* be shorter and/or vehicle approach speeds lower.

As stated above, the upper limit of the yellow and all-red clearance intervals are typically 6 and 3 seconds, respectively. Longer clearance interval times *may* breed driver noncompliance that can actually degrade intersection safety benefits. Excessively long clearance interval times will also reduce the efficiency of signal operations. The lower limit of the yellow clearance interval is typically 3 seconds.

For isolated state-owned signals that can be considered outside the influence of established timing practices of adjacent jurisdictions (for purposes of driver expectancy), it is desirable to use the kinematic method of determining vehicle clearance intervals.

For given approach speeds and gradients, the table below indicates YELLOW CLEARANCE INTERVALS calculated by the equation above (considering a lower deceleration rate of 10 fps²).

Table 1. Yellow Clearance Intervals at Deceleration Rate of 10 fps²

| Approach Speed (mph) | Approach Grade | | | | | | | | |
|----------------------|----------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | +4% | +3% | +2% | +1% | 0% | -1% | -2% | -3% | -4% |
| 25 | 2.6 | 2.7 | 2.7 | 2.8 | 2.8 | 2.9 | 3.0 | 3.0 | 3.1 |
| 30 | 3.0 | 3.0 | 3.1 | 3.1 | 3.2 | 3.3 | 3.4 | 3.4 | 3.5 |
| 35 | 3.3 | 3.3 | 3.4 | 3.5 | 3.6 | 3.7 | 3.7 | 3.8 | 4.0 |
| 40 | 3.6 | 3.7 | 3.8 | 3.8 | 3.9 | 4.0 | 4.1 | 4.3 | 4.4 |
| 45 | 3.9 | 4.0 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 4.7 | 4.8 |
| 50 | 4.3 | 4.4 | 4.5 | 4.6 | 4.7 | 4.8 | 4.9 | 5.1 | 5.2 |
| 55 | 4.6 | 4.7 | 4.8 | 4.9 | 5.0 | 5.2 | 5.3 | 5.5 | 5.6 |
| 60 | 4.9 | 5.0 | 5.1 | 5.3 | 5.4 | 5.6 | 5.7 | 5.9 | 6.1 |
| 65 | 5.2 | 5.4 | 5.5 | 5.6 | 5.8 | 5.9 | 6.1 | 6.3 | 6.5 |

Gray-shaded values fall outside typical time intervals indicated. Use only as

needed and at the direction of the regional traffic engineer.

For given approach speeds and gradients, the table below indicates YELLOW CLEARANCE INTERVALS calculated by the equation above (considering a higher deceleration rate of 15 fps²)

Table 2. Yellow Clearance Intervals at Deceleration Rate of 15 fps²

| Approach Speed (mph) | Approach Grade | | | | | | | | |
|----------------------|----------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | +4% | +3% | +2% | +1% | 0% | -1% | -2% | -3% | -4% |
| 25 | 2.1 | 2.2 | 2.2 | 2.2 | 2.2 | 2.3 | 2.3 | 2.3 | 2.3 |
| 30 | 2.4 | 2.4 | 2.4 | 2.4 | 2.5 | 2.5 | 2.5 | 2.6 | 2.6 |
| 35 | 2.6 | 2.6 | 2.6 | 2.7 | 2.7 | 2.8 | 2.8 | 2.8 | 2.9 |
| 40 | 2.8 | 2.8 | 2.9 | 2.9 | 3.0 | 3.0 | 3.0 | 3.1 | 3.1 |
| 45 | 3.0 | 3.1 | 3.1 | 3.2 | 3.2 | 3.3 | 3.3 | 3.4 | 3.4 |
| 50 | 3.3 | 3.3 | 3.3 | 3.4 | 3.5 | 3.5 | 3.6 | 3.6 | 3.7 |
| 55 | 3.5 | 3.5 | 3.6 | 3.6 | 3.7 | 3.8 | 3.8 | 3.9 | 3.9 |
| 60 | 3.7 | 3.8 | 3.8 | 3.9 | 3.9 | 4.0 | 4.1 | 4.1 | 4.2 |
| 65 | 3.9 | 4.0 | 4.1 | 4.1 | 4.2 | 4.3 | 4.3 | 4.4 | 4.5 |

Grey-shaded values fall outside typical time intervals indicated. Use only as needed and at the direction of the regional traffic engineer.

For given intersection widths and approach speeds, the table below indicates ALL-RED CLEARANCE INTERVALS calculated by the equation above.

Table 3. All-Red Clearance Intervals

| Approach Speed (mph) | Intersection Width (ft) | | | | | | | | |
|----------------------|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| 25 | 1.2 | 1.5 | 1.9 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.8 |
| 30 | 1.0 | 1.3 | 1.5 | 1.8 | 2.1 | 2.4 | 2.6 | 2.9 | 3.2 |
| 35 | 0.9 | 1.1 | 1.3 | 1.6 | 1.8 | 2.0 | 2.3 | 2.5 | 2.7 |
| 40 | 0.7 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 |
| 45 | 0.7 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 1.9 | 2.1 |
| 50 | 0.6 | 0.8 | 0.9 | 1.1 | 1.3 | 1.4 | 1.6 | 1.7 | 1.9 |
| 55 | 0.5 | 0.7 | 0.8 | 1.0 | 1.1 | 1.3 | 1.4 | 1.6 | 1.7 |
| 60 | 0.5 | 0.6 | 0.8 | 0.9 | 1.0 | 1.2 | 1.3 | 1.5 | 1.6 |
| 65 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 |

Gray-shaded values fall outside typical time intervals indicated. Use only as needed and at the discretion of the region traffic engineer.

Uniform Timing

Assigns a standardized duration for the clearance interval regardless of location. In this case, times *may* be based on the type of movement being made. For example, based on higher vehicle speeds, a through movement on a mainline approach *may* have a longer yellow clearance time than for a side street through movement or for a protected left-turn.

This method *may* be used when a state-owned signal is located in close proximity to signals operated in this manner by another jurisdiction. The purpose being, to address driver expectancy issues. However, assigning a single clearance interval value for all intersections and intersection movements is not recommended.

Rule of Thumb

Assigns a standardized duration for the clearance interval based on vehicle approach speed, the type of movement being made, or roadway classification. For example, mainline and side street movements *may* have the following yellow clearance interval durations:

- Approach speed <30 mph = 3 seconds
- Approach speed between 30-50 mph = 4 seconds
- Approach speed >50 mph = 5 seconds
- Protected left turns = 3 seconds

The interval times are for demonstrative purposes only. Similarly, though, all-red clearance times *may* be

categorized.

This method *should* typically be used when a state-owned signal is located in close proximity to signals operated by another jurisdiction using this method to address driver expectancy issues.

SUPPORT

Even nationally, there is no clear consensus on appropriate methodology for determining vehicle clearance times (“Determining Vehicle Signal Change and Clearance Intervals”, ITE, August 1994). According to ITE, “Divergent and strongly held positions are common when vehicle signal change interval lengths are discussed. Some believe that a common interval length is best, while others believe that uniform yellow change interval lengths are wrong....”. This finding was verified more recently in an ITE document titled *Signal Timing Practices and Procedures – State of Practice* dated March 2004.

The kinematic methodology is typically the most desirable unless driver expectancy would be better served through the use of the other principals described above.

As stated above, since WisDOT signals routinely operate near locally owned installations, the intent *should* be uniformity across an appropriate area or along a specific corridor. As such, proper coordination with other jurisdictions *should* take place. If a crash or red light running problem exists, vehicle clearance intervals *should* be verified and, if needed, reasonably extended.

4-2-8 Battery Backup Systems

May 2006

GENERAL

The recent application of LED traffic signal indications, which consume less power than conventional incandescent lamps, has made battery-powered energy backup systems feasible. However, it is recognized that, because of the cost of such systems, that gradual deployment at strategic signalized intersection locations is appropriate.

Factors that *may* influence the placement of battery backup systems are: proximity of other transportation systems, intersection geometry, traffic volumes, corridor (i.e. progressive movement) considerations, or safety considerations.

POLICY

Location Criteria

Signalized intersection locations that meet the criteria below **shall** be equipped with a battery backup system capable of maintaining signal operation, as defined and prioritized below:

1. RR interconnected installations, or
2. Single point urban interchanges, or
3. Intersections with triple-left turn lanes.

Signalized operations *should not* need to be modified in order to reduce energy requirements or extend service time. Rather than introducing modified signal operations or displays, signals that function with battery backup systems with low power reserves *may* go into flashing operation.

Intersections and roadway lighting **shall not** be connected to battery backup systems.

SUPPORT

Battery backup systems are expected to maintain safe and efficient traffic operations at critical signalized intersections during power outages. Of particular concern are intersections that are near railroad grade crossings (for preemption) and geometrically complex intersections.

Besides providing potential benefits to traffic safety and operations, the use of battery backup systems *may* allow increased response times by electrical personnel, which could provide an advantage in light of increased signal infrastructure and associated maintenance demands.

4-2-20 Emergency Vehicle Preemption**February 2013****GENERAL**

The following applies to the installation and operation of emergency vehicle preemption (EVP) systems involving traffic control signals owned and operated by the department.

POLICYStatutory Provisions

347.255 Auxiliary lamps on emergency vehicles used to actiate traffic control signal preemption devices. (1) An authorized emergency vehicle described in [ss.340.01 \(3\)\(a\), \(c\), \(g\) or \(l\)](#) *may* be equipped and operated with lamps designed and used solely to activate official traffic control signal pre-emption devices. (2) The lamps authorized for use under this section *may* be any color and *may* be flashing, oscillating, rotating or pulsating. (3) No operator of an authorized emergency vehicle *may* use such lamps except when responding to an emergency call, when pursuing an actual or suspected violator of the law or when responding to, but not when returning from, a fire alarm.

The above does not preclude actuation by means of devices other than lamps.

Eligibility

Any local government unit, agency, or organization having responsibility for providing emergency services is eligible to request an EVP system.

Request Procedure

The local unit **shall** make the request in writing to the department. The following information *should* be included in the request:

1. Location of proposed EVP systems
2. Location of emergency facilities (fire station, police station, etc.) where vehicles will be departing from and description of the route to be provided with a preemption system
3. Listing or estimate of number of vehicles to be outfitted
4. Brand/model of equipment being requested.

Approval

1. The department **shall** review each request and respond in writing to the local unit as to the approval or denial of the request.
2. The department *may* deny any request that it deems would have an overall negative impact on the traveling public.
3. If the local agency is requesting a brand/model of EVP other than the department standard, the request must include a discussion about compatibility with neighboring agencies along the same corridor.
4. For approved requests, an official EVP System Agreement **shall** be prepared and approved by the department and the local unit. Template is included at the end of this policy. This policy **shall** be included as a supplement to the agreement. Any special terms or conditions beyond the scope of this policy **shall** be included as a supplement to the agreement. Any special terms or conditions beyond the scope of this policy **shall** be stipulated in the agreement.
5. The department *may* allow an indicator light that is intended to confirm o the driver of an emergency vehicle that the preemption signal has been received. The use of this device does not preclude the need of the vehicle operator to rely on the signal indications for assigned intersection right-of-way. Requests for EVP confirmation lights *should* be reviewed on a case-by-case basis, and are subject to the following conditions:
 - a. The department *may* deny any request for confirmation lights that it deems would have an overall negative impact on traffic safety or operations.
 - b. EVP confirmation lights **shall** only be installed at signalized intersections where:
 - i. Signal(s) on the STH system are embedded in a locally-owned system that is also equipped with confirmation lights. This implies consideration for route continuity.
 - ii. Or, multiple emergency vehicles have the potential to respond on conflicting

approaches to and from different points of origin. These conditions will typically exist in large urban areas where there are multiple precincts in the same municipality.

6. EVP equipment that has the ability to discriminate between individual responding vehicles **shall not** be used.
7. In the event that it comes to the attention of the department that the preemption is being misused, such as by unauthorized vehicles, or that the municipality is not using or intends to abandon the system, the department *may* notify the municipality of the situation. If the matter is not resolved and corrected, the department reserves the right to set about removing the equipment. The scheduled date of removal of the equipment is indicated in item 5 below.

Installation & Maintenance

1. Department forces **shall** perform the installation, maintenance, modification, or removal of the EVP system equipment that is located at the traffic signal. Generally, this equipment would include the receiving device (mounted on the mast arm or signal head), the phase selector (in the control cabinet), confirmation light, and any miscellaneous cables and wiring needed to operate and power the portion of the EVP system located at the signal.
2. The local unit will be responsible for the installation of the emitting devices in authorized vehicles.
3. The department **shall** maintain a reasonable inventory of spare parts for the department's selected standard equipment in order to service the EVP system equipment located at the traffic signal. If the local agency is requesting equipment other than the standard equipment, the local agency **shall** be responsible for maintaining and providing a reasonable inventory. Specify which in the agreement.
4. When notified, department forces will respond to correct suspected failures or breakdowns, or perform requested modifications in the EVP system equipment at the traffic signal.
5. Upon the department's request, the local unit will be responsible for verifying the working status of the EVP system by performing a field test using an emergency vehicle equipped with an EVP emitter device. The local unit is responsible for periodically checking the EVP equipment.
6. If used, the style and type of confirmation lights on state- and locally-owned signals within each municipality **shall** be standardized. Confirmation lights **shall** be a LED 120 VAC white directional light that fits into a PAR 38 socket.
7. In the event of a construction project, EVP service **shall** be maintained at any intersection with permanent EVP agreements. In addition, EVP equipment may be installed, if requested by a local unit, at any additional signals within the construction project itself, or on a designated detour route in the event of a road closure.

Operation/Phase Timing

1. The department **shall** determine the phasing and timing of the preemption sequencing with input from the local unit. There are three key features that must be considered when determining how the preemption will operate:
 - a. Left turn phasing (protected, protected/permissive, or permissive only)
 - b. Signal head configuration for left-turning movement (shared vs. exclusive head)
 - i. Shared heads: include both circular indications and arrow indications (used by through and turning vehicles)
 - ii. Exclusive heads: arrow indications only (used solely by turning vehicles)
 - c. Style of preemption sequencing (common greens vs. exclusive greens)
 - i. Common greens: indicates opposing through phases both have a green ball. The corresponding left turn phases are permissive only.
 - ii. Exclusive greens: indicates only one through movement and its corresponding left turn phase have the green ball/arrow.
2. The department offers the following operational guidance based upon the combination of those three key features identified above:
 - a. Protected only left turns

- i. Exclusive head **shall** operate with exclusive greens for the safety and ease of turning of the preempting vehicle
 - b. Permissive only left turns
 - i. Shared head
 1. Common greens *may* be used
 2. Exclusive greens *may* be used if an all-red period is introduced or a W25-2 sign is installed.
 - ii. Exclusive head:
 1. **Shall** operate with common greens since a green left turn arrow is not available for use with exclusive greens
 - c. Protective/permissive left turns
 - i. Shared head
 1. Common greens: *may* be used
 2. Exclusive greens *may* be used if an all-red period is introduced or a W25-2 sign is installed
 - ii. Exclusive head
 1. Common greens *may* be used
 2. Exclusive greens *may* be used
3. Any exceptions to the guidance in item 2 above **shall** be included as part of the special terms or conditions of the agreement.
4. If used, the operation of confirmation lights on state- and locally-owned signals **shall** be standardized such that the approach being preempted has a steady indication. Approaches with secondary calls **shall** flash. The flash rate **shall not** be between 5 and 30 flashes per second to avoid frequencies that might cause seizures.

Driver Training

1. The local unit **shall** be responsible for training the emergency services personnel on the proper operation of the system.
2. This training *should* provide clear understanding of these items:
 - a. The definition of an authorized emergency vehicle at the beginning of this policy
 - b. The conditions when preemption *may* be used
 - c. The use of preemption does not remove the responsibility of the vehicle operator from determining whether or not it is safe to enter the intersection
 - d. The operator cannot assume that the preemption has gone into effect; the operator must rely on the traffic signal indication
 - e. The proper operation of the activating device located on the vehicle.

Cost

1. The most common source of funding for a complete EVP system has been local funds or federal urban funds. However, EVP equipment at the traffic signal and installation may also be funded as part of an improvement project, provided it is incidental to the improvement. Please see [Program Management Manual 3-25-5](#) to determine the most appropriate source of funding.
2. The local municipality **shall** be responsible for all costs associated with the emitting devices for is authorized vehicles.
3. The department **shall** be responsible for all material, equipment, labor, training, and incidental costs associated with maintaining, operating, modifying, or removing the EVP system at the traffic signal unless nonstandard EVP system equipment is used. When nonstandard equipment is installed, the local unit **shall** be responsible for maintaining and supplying spare inventory to the department.

- 4. Any cost associated with the continuance of service of an EVP system on temporary signals or aon a temporary route during a construction project **shall** be borne by the project.

WISCONSIN DEPARTMENT OF TRANSPORTATION

Emergency Vehicle Pre-emption (EVP) System Agreement

This is a binding agreement between the Wisconsin Department of Transportation and the

This agreement stipulates the terms and conditions for use of Emergency Vehicle Pre-Emption (EVP) systems at the state-owned traffic control signal located at the intersection of

in the _____ of _____

Description of route: _____

Listing of estimated number of vehicles to be outfitted: _____

Inventory of spare EVP equipment shall be provided by WisDOT/Local Agency.

The Department's Policy for *Use of Emergency Vehicle Pre-emption (EVP) Systems at State-Owned Traffic Control Signals* is hereby made a part of this agreement (copy attached). The following special terms or conditions also apply to this agreement:

ACCEPTED FOR THE _____
Local Government

BY _____ DATE _____

TITLE _____

APPROVED BY THE WISCONSIN DEPARTMENT OF TRANSPORTATION

BY _____ DATE _____

TITLE _____

4-2-34 Signal Sequencing During Railroad Preemption August 2011

GENERAL

Reference is made to the MUTCD, Section [4D.27](#) and [8C.09](#).

Modern signal controllers are capable of providing alternate phasing/timing plans based on train operations. Once it has been determined that a highway-rail grade crossing flashing light signal system will be interconnected with adjacent traffic signals, the traffic signal controller *should* be programmed to run an alternate sequence during railroad preemption.

Highway-rail grade crossings can be occupied by trains for extended periods of time depending on a number of operating conditions including: reduced train speeds, train length, and/or switching movements. During the time a train is located within the approach circuit and the traffic signals remain under preempted control, any non-conflicting vehicular traffic *should* be served using specialized phasing (a.k.a. railroad preemption sequencing or railroad hold sequencing) to reduce vehicular delay.

POLICY

Even if trains are not expected to occupy crossings for long periods, signal controllers *should* be programmed to run two preemption sequences. The first preemption sequence **shall** initiate a phase to clear the tracks before

the train reaches the crossing. This advanced preemption places a call in the traffic signal controller to transfer right-of-way from the current phase to the track clearance phase(s) or hold if already in those phases, prior to activating the railroad warning devices.

The second preemption sequence *should* begin once the controller receives the gate down call from the railroad bungalow, a set time after the gate down notification, or after the track clearance green interval plus the additional time to prevent turning the signal red prior to gate down. At the onset of the second preemption, or if the crossing enters failsafe mode, a constant call **shall** be placed in the signal controller, causing the signal to remain preempted. At that time, the signal controller *should* be programmed to operate a sub-routine to serve traffic that does not move toward the tracks. Either blank-out signs or a red signal indication *should* prohibit vehicles from moving toward the tracks.

According to MUTCD Section [4D.27](#), during the transition into preempted control, the preemption sequence **shall not** shorten or omit the yellow change interval and any red clearance interval that follows. Minimum vehicular green times at actuated signals *should* be at least five seconds to allow drivers to react to the change in right-of-way and enter into the intersection.

According to MUTCD Section [4D.27](#), pedestrian WALK and/or pedestrian change intervals *may* be shortened or omitted in order to begin the track clearance interval earlier. This practice is not preferred since drivers might yield to crossing pedestrians, thereby preventing subsequent vehicles from clearing the tracks.

Shortened or omitted pedestrian clearance intervals are typically found in legacy systems where providing the full pedestrian change interval required a substantial increase in cost for the railroad track circuit.

For new signal designs, pedestrian clearance intervals *should not* be shortened or omitted unless all other methods to reduce the length of advance preemption time have been considered. Calculated pedestrian clearance time *may* include the yellow change interval and the red clearance interval to help satisfy the advance preemption requirements.

It is important to recognize the preemption capabilities of different signal controllers and firmware because they vary from one model or manufacturer to another. Some controllers allow minimum green times and pedestrian clearance times to be shortened during railroad preemption sequencing and others do not.

When a train no longer occupies the highway-rail grade crossing, the signal *should* serve the preempted approach immediately following preempted control before serving the mainline left-turn movements or mainline through movements if there are no left-turn phases. Additionally, the controller *should* be programmed to place calls on all initiated NEM phases upon exiting preemption.

According to MUTCD Section [4D.27](#), during the transition out of preempted control, the preemption sequence **shall not** shorten or omit the yellow change interval and any red clearance interval that follows.

Eliminating the Left Turn Trap

When a protected/permitted phasing sequence is used for the track clearance phase, special consideration *should* be taken to eliminate the possibility of the left-turn trap at the onset of railroad preemption.

For example, if the preempted approach is already green when the preemption call is received (beset case scenario), the signal *should* finish servicing the minimum green time and yellow change interval before going into an all-red sequence. After the all-red sequence the track clearance phase(s) *should* display a left-turn green arrow and a green ball indication. This will allow the track clearance phase to serve a protected left-turn movement and eliminate a left-turn trap condition.

Inspection of Signal Sequencing During Railroad Preemption

State-maintained traffic signals with railroad preemption sequencing **shall** be inspected on an annual basis. Regional traffic engineers are responsible for ensuring that each state-maintained traffic signal is inspected.

At a minimum, the preemption inspection team *should* consist of an individual representing the traffic signal operating agency and an individual representing the railroad authority. This cooperative approach is critical to the success of the inspection because the operation of railroad preemption systems is dependent on both the railroad and highway equipment.

A copy of the completed inspection **shall** be forwarded to the grade crossing safety engineer at the WisDOT Railroads & Harbors Section (RHS) in the Bureau of Transit & Local Roads (BTLR). The annual Highway-Railroad Preemption Inspection Form is provided below.

Second Train Re-Service Considerations

Where a railroad crossing has more than one through track, special consideration must be given to operation of

the warning devices and traffic signal when a second train follows the first train.

The point at which preemption is released from the railroad active warning devices to the traffic control signals is critical to the proper operation of preemption re-service. In order for the traffic signal controller to recognize the second train, the preempt call for first train must be released. The railroad active warning devices must release the preempt call just as the gates begin to raise, otherwise traffic *may* drive under the ascending gates and this traffic must be cleared in the event of a second train.

SUPPORT

According to MUTCD Section [4D.27](#), "Traffic control signals operating under preemption control or under priority control *should* be operated in a manner designed to keep traffic moving."

Figure 1. WisDOT Railroad Preemption Inspection Form

| WisDOT RAILROAD PREEMPTION INSPECTION FORM | | | |
|--|--|---|---|
| 1. REVIEW TEAM | | | |
| TRAFFIC SIGNAL INSPECTION COMPLETED BY: | (include name & email) | INSPECTION DATE: | |
| RAILROAD INSPECTION COMPLETED BY: | | DATE OF LAST INSPECTION: | |
| 2. LOCATION DATA | | | |
| HIGHWAY INTERSECTION: | | | |
| TRAFFIC SIGNAL OPERATING AGENCY: | WisDOT SIGNAL NO: (ex. S1056) | MUNICIPALITY: | COUNTY: |
| RAILROAD OPERATING COMPANY: | RR CROSSING ID: (ex. 391768X) | RR CONTACT: | RR CONTACT PHONE: |
| 3. RAILROAD DATA | | 4. TRAFFIC SIGNAL DATA | |
| ACTIVE WARNING DEVICES: <input type="checkbox"/> 4-Quadrant Gates <input type="checkbox"/> 2-Quadrant Gates <input type="checkbox"/> Flashers | CABINET TYPE: <input type="checkbox"/> TS1 <input type="checkbox"/> TS2 | CONTROLLER MAKE & MODEL: | |
| TYPE OF TRAIN DETECTION: | GATE-DOWN LOGIC: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not to exceed timer | TYPE OF SIGNAL PREEMPTION: <input type="checkbox"/> Advanced <input type="checkbox"/> Simultaneous | TYPE OF SIGNAL OPERATION: <input type="checkbox"/> Pretimed <input type="checkbox"/> Actuated <input type="checkbox"/> Coordinated System |
| MAXIMUM TRAIN SPEED (MPH): | SPEED RANGE OVER XING (MPH): | OTHER TYPES OF PREEMPTION: <input type="checkbox"/> Emergency Vehicle <input type="checkbox"/> Bus/Transit | DOES RR PREEMPT HAVE PRIORITY? <input type="checkbox"/> Yes <input type="checkbox"/> No |
| NUMBER OF TRAINS PER DAY: | NUMBER OF TRACKS: | GATE DOWN LOGIC INSTALLED? <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| NUMBER OF BROKEN GATES SINCE PREVIOUS INSPECTION? (explain) | | ROADWAY OR SIGNAL MODIFICATIONS SINCE PREVIOUS INSPECTION: | |
| DATE OF MOST CURRENT RAILROAD PLANS (in bungalow): | | BATTERY BACKUP PRESENT? <input type="checkbox"/> Yes <input type="checkbox"/> No | BATTERY AGE (in service reports): |
| TYPE OF COMMUNICATIONS DURING BATTERY BACKUP: | | | |
| 5. RAILROAD PREEMPTION PHASING SEQUENCE | | | |
| WORST CASE CONFLICTING PHASES | | TRACK CLEARANCE PHASE(S) | PREEMPT DWELL OR CYCLE PHASES |
| Vehicle: | Pedestrian: | | |
| 6. RAILROAD EQUIPMENT PROGRAMMED TIMINGS | | 7. NOTES | |
| Preempt Verification and Controller Response Time: | 0 sec. | | |
| Advance Preemption Time: | 0 sec. | | |
| Minimum Warning Time: | 0 sec. | | |
| Additional Clearance Time: (overspeed tolerance, wide/angled crossings) | 0 sec. | | |
| Buffer Time: | 0 sec. | | |
| Total Warning Time (Minimum Warning Time + Clearance Time + Buffer Time): | 0 sec. | | |
| 8. FIELD TESTING AND INSPECTION | | | |
| BLANKOUT SIGNS PRESENT AND WORKING PROPERLY? | <input type="checkbox"/> YES <input type="checkbox"/> NO | IF INSTALLED, BATTERY BACKUP WORKING PROPERLY? | <input type="checkbox"/> YES <input type="checkbox"/> NO |
| DOES PREEMPT RESERVICE ACTIVATE? (see instructions) | <input type="checkbox"/> YES <input type="checkbox"/> NO | PROTECTED ARROW FOR TRACK CLEARANCE? | <input type="checkbox"/> YES <input type="checkbox"/> NO |
| Test # | Example | 1 | 2 |
| Train's Direction of Travel | EB | | |
| Signal Phase Active During Preempt Call | 2 / 6 | | |
| CUMULATIVE TIME (sec) | | | |
| Preempt call received (blank out signs turn on) at | 0 | 0 | 0 |
| Begin track clearance green at | 0 | | |
| Railroad flashers activated at | 35 | | |
| Gate descent started at | 38 | | |
| Gate descent completed at | 50 | | |
| End of track clearance green (start of track clearance yellow) at | 50 | | |
| Train arrived at | 56 | | |
| Railroad flashers deactivated at | 240 | | |
| Measured Total Warning Time: | 56 - 0 = 56 | | |
| Preempt call released from signal controller at begin of gate ascent: | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO |
| Railroad equipment and lamps functioned: | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO |
| Track clearance and preempt dwell phases operated as expected: | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO |

9. OTHER INFORMATION / NOTES

A large, empty rectangular box with a black border, occupying most of the page. It is intended for providing additional information or notes related to the section header above it.



GENERAL

Reference is made to the MUTCD, Sections [4C.05](#), [4C.06](#), [4D.03](#), and [4E](#).

The design and operation of traffic control signals **shall** take into consideration the needs of pedestrian as well as vehicular traffic. The decision to signalize pedestrian movements *should* be a collaborative decision between the regional signal engineer and the regional bicycle/pedestrian safety coordinator and *should* be based upon the warrants and other criteria provided hereafter.

POLICY

Sidewalk and curb ramps **shall** be provided at locations where pedestrian signal heads are to be installed.

Per MUTCD Section [4E.03](#):

“Pedestrian signal heads **shall** be used in conjunction with vehicular traffic control signals under any of the following conditions:

- A. If a traffic control signal is justified by an engineering study and meets either Warrant 4, Pedestrian Volume or Warrant 5, School Crossing (see MUTCD, Sections [4C.05](#) and [4C.06](#));
- B. If an exclusive signal phase is provided or made available for pedestrian movements in one or more directions, with all conflicting vehicular movements being stopped;
- C. At an established school crossing at any signalized location; or
- D. Where engineering judgment determines that multi-phase signal indications (as with split-phase timing) would tend to confuse or cause conflicts with pedestrians using a crosswalk guided only by vehicular signal indications.”

“Pedestrian signal heads *should* be used in conjunction with vehicular traffic control signals under any of the following conditions:

- A. If it is necessary to assist pedestrians in deciding when to begin crossing the roadway in the chosen direction or if engineering judgment determines that pedestrian signal heads are justified to minimize vehicle-pedestrian conflicts;
- B. If pedestrians are permitted to cross a portion of a street, such as to or from a median of sufficient width for pedestrians to wait, during a particular interval but are not permitted to cross the remainder of the street during any part of the same interval; and/or
- C. If no vehicular signal indications are visible to pedestrians, or if the vehicular signal indications that are visible to pedestrians starting a crossing provide insufficient guidance for them to decide when to begin crossing the roadway in the chosen direction, such as on one-way streets, at T-intersections, or at multi-phase signal operations.”

In addition to the guidance provided above, there are a few other items to consider when deciding whether or not to install pedestrian signal indications:

1. Is a blind pedestrian requesting the accommodation? (It is WisDOT’s policy to accommodate blind pedestrians by installing pedestrian heads and APS devices, so long as the blind are the ones requesting it).
2. What is the land use adjacent to the intersection? Does the intersection serve as a connection between businesses? To a school? To a parking lot? To a transit/bus stop?

At locations where pedestrian heads and push buttons are not initially installed, the designer *should* locate all signal poles with future pedestrian accommodations in mind. This way the intersection can be easily retrofitted with pedestrian heads and push buttons once the sidewalk and curb ramps have been installed.

SUPPORT

In Wisconsin, pedestrians can legally cross a roadway at a traffic signal even if that traffic signal does not have

pedestrian signal heads.

Wisconsin State Statute [346.37 \(1\)\(a\)2](#): “Pedestrians, and persons who are riding bicycles or electric personal assistive mobility devices in a manner which is consistent with the safe use of the crosswalk by pedestrians, facing the (green) signal *may* proceed across the roadway within any marked or unmarked crosswalk.”

Wisconsin State Statute [346.37 \(1\)\(c\)2](#): “No pedestrian, bicyclist, or rider of an electric personal assistive mobility device facing such signal (red) **shall** enter the roadway unless he or she can do so safely and without interfering with any vehicular traffic.

Also, Wisconsin State Statute [346.23](#) addresses motorists’ responsibility at intersections relative to pedestrians:

(1) At an intersection or crosswalk where traffic is controlled by traffic control signals or by a traffic officer, the operator of a vehicle **shall** yield the right-of-way to a pedestrian, or to a person who is riding a bicycle or electric personal assistive mobility device in a manner which is consistent with the safe use of the crosswalk by pedestrians, who has started to cross the highway on a green or “Walk” signal and in all other cases pedestrians, bicyclists, and riders of electric personal assistive mobility devices **shall** yield the right-of-way to vehicles lawfully proceeding directly ahead on a green signal. No operator of a vehicle proceeding ahead on a green signal *may* begin a turn at a controlled intersection or crosswalk when a pedestrian, bicyclist, or rider of an electric personal assistive mobility device crossing in the crosswalk on a green or “Walk” signal would be endangered or interfered with in any way. The rules stated in this subsection are modified at intersections or crosswalks on divided highways or highways provided with safety zones in the manner and to the extent stated in sub. (2).

(2) At intersections or crosswalks on divided highways or highways provided with safety zones where traffic is controlled by traffic control signals or by a traffic officer, the operator of a vehicle **shall** yield the right-of-way to a pedestrian, bicyclist, or rider of an electric personal assistive mobility device who has started to cross the roadway either from the near curb or shoulder or from the center dividing strip or a safety zone with the green or “Walk” signal in the favor of the pedestrian, bicyclist, or rider of an electric personal assistive mobility device.

4-4-7 Animated Eyes Symbol

December 2004

GENERAL

Reference is made to the MUTCD Section [4E.04](#).

The animated eyes symbol is a dynamic display that supplements standard pedestrian signal indications within the same section. This symbol consists of illuminated eyes that scan from side to side and is meant to prompt pedestrians to be aware of approaching vehicles.

POLICY

Pedestrian signal heads **shall** not incorporate the animated eyes symbol at state-owned signal installations.

SUPPORT

WisDOT supports the use of technologies that address a distinct need related to highway safety & traffic operations. Animated eyes are expected to have a limited effect on improving intersection safety but would require an increase in capital, operations, and maintenance costs. Benefits are not expected to outweigh additional resource expenditures.



4-5-1 General Provisions

January 2018

GENERAL

Reference is made to the MUTCD Chapter [4L](#).

Flashing beacons (a.k.a. flashers, warning flashers, beacons) are a special type of signal indication used to supplement standard regulatory and warning signs. According to the MUTCD, flashing beacons have the following applications:

1. Intersection control beacon
2. Stop beacon
3. Speed limit sign beacon
4. Warning beacon.

Flashing beacons are part of a sign, as it pertains to the provisions for allowing the installation of the beacons on highway right-of-way. Statutes [84.02 \(4\)\(c\)](#) and [86.19 \(3\)](#) convey exclusive authority for signs and warning devices on the state trunk system to the department.

This policy contains provisions for proper application, design, and permitting of flashing beacons on the STH system.

POLICY

General

The following general criteria apply to all flashing beacon installations on the STH system:

1. There are two types of flashing beacons:
 - a. Red—only to be used with STOP signs
 - b. Yellow—to be used with any yellow warning (W-series) signs, speed limit, speed limit reduction, and school speed limit signs

Flashing beacons **shall** only be associated with the sign installations referred to above.

2. Flashing beacons are supplementary to signs. When used, they **shall** be mounted on the same support as the sign which the beacon supplements in accordance with MUTCD [4L.03](#).
3. Activated flashing beacons **shall not** be approved on the STH system for use in conjunction with train crossings.
4. Emergency vehicle entrances *may* have activated flashing beacons, which will cancel after a pre-timed period of flash.
5. State-owned and permitted installations
 - a. The department *may* determine that flashing beacons are needed and *may* install and maintain them at specific sites. In this case, the regional traffic engineer **shall** make a final determination regarding the use of these devices on behalf of the department.
 - b. At locations where local authorities determine that the use of flashing beacons is desirable, a permit *may* be issued for the installation and maintenance of flashing beacons. Permitted installations are subject to the approval of the department and the conditions of this policy. Additionally, permits are revocable at the discretion of the department.

Application of Flashing Beacons

The following sections highlight policy items for flashing beacons that *may* be different from those represented in MUTCD Chapter [4L](#).

Warning beacon: Refer to MUTCD Section [4L.03](#).

Speed Limit Sign Beacon: Refer to MUTCD Section [4L.04](#). The department rarely, if ever, would install and maintain flashing beacons with speed limit signs or school speed limit signs. Local authorities **shall** follow the permit requirements stated below.

Stop Beacon: Refer to MUTCD Section [4L.05](#).

Flashing Beacon Design & Installation

The following provisions pertain to the installation, operation, and maintenance of flashing beacons other than rectangular rapid flashing beacons (RRFBs) on the state trunk highway system.

1. Location
 - a. Ground mount: Flashing beacons *may* be ground mounted, where they will be approximately one foot above the sign they supplement. The sign *should* be in the lateral and vertical location as specified in the MUTCD Part 2 (no change). Illustrations of typical ground-mount installations are in Figure 1 below.
 - b. Overhead mount: A flashing beacon *may* be mounted on one or both sides of an overhead sign. It *may* be mounted above the sign if the entire assembly including the sign has a minimum clearance of 17 feet.
2. For state-maintained installations, the standard size of flashing beacons is 12 inches in diameter. At the discretion of the regional traffic engineer, permitted (not state-maintained) installations that are in areas with a posted speed less than 30mph *may* use 8-inch diameter beacons.
3. Ground-mounted supports **shall** be the same as are normally used to support the sign, and of the same cross-section as normally used. These **shall** be 4 x 4 or cross-drilled 4 x 6 posts, or in urban areas signal posts on concrete footings, or light poles or wood poles where speeds are low. Usage of any kind of pole **shall** be in conformance with the offsets specified in highway lighting permit policy, [FDM 11-15-1](#).
4. The installation of two posts, one for the sign and the other for the flashing beacon, is not permissible within the clear zone because of the unpredictable behavior of the combination of two posts when struck.
5. Service poles must be offset to the right-of-way line or in conformance with offsets in [FDM 11-15-1](#).
6. Service *may* drop to the top of the support, which would be extended to maintain an 18-foot minimum wire-to-ground clearance as per Wisconsin electrical code. Service *should* preferably be installed underground. In the latter case, the conduit **shall** be run up and attached to the post or pole. The control box *may* be mounted on the post or pole.
7. At the discretion of the regional traffic engineer, solar-powered flashing beacon installations *may* be allowed on the STH system provided the installation meets applicable electrical and crash standards.
8. According to [TEOpS 2-1-8](#), flashing beacons and STOP or STOP AHEAD signs that incorporate flashing displays (e.g. blinker signs) **shall not** be used the same intersection approach.

PERMITTING OF FLASHING BEACONS

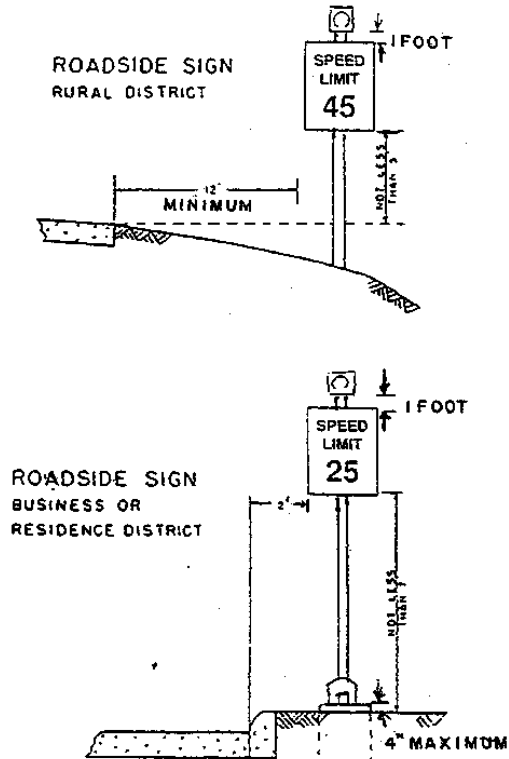
Any improperly installed electrical equipment *may* pose a hazard to the public. As such, the department spells out general and specific conditions, which are part of the permit agreement. These conditions are incorporated into the permit form, DT1877, a copy of which is appended to this policy. The MUTCD Chapter 4L and specific conditions stated above **shall** also be followed for flashing beacons installed on all state trunk highways. Flashing beacons installed on connecting highways **shall not** require a WisDOT permit.

The following information provides conditions and processes related to the issuance of permits:

1. Permit applications **shall** be received, and permits issued, by the appropriate regional office.
2. Permits for flashing beacons *may* only be issued to municipalities, not to private individuals at agencies, or to power companies. This *should* result in working with the most responsible and objective agency associated with the safety problem being addressed.
3. The region *may* rightfully deny the issuance of the permit. Reasons for denial *may* include: lack of need, conflict with other traffic control devices, vulnerable location, lack of confidence in the maintaining ability of the subject agency, or knowledge that the request is due to reaction rather than long term need of commitment.

4. The region *may* revoke the permit for any of the reasons above, especially regarding lack of maintenance, as well as for reasons cited on the permit itself.
5. For permitted flashing beacons installed on signal standards, Standard Detail Drawings [9C2](#), [9C3](#), and [9E7](#) *should* be made part of the permit. SDDs [9C5](#) and [9D3](#) for control cabinet installations *may* also apply.
6. In the event of the reconstruction of the highway, reasonable notice *should* be given to the municipality to allow their removal of the equipment and arranging for disconnecting the electrical service.

Figure 1. Standard Flashing Beacon Installations for Rural & Urban Districts



FLASHING BEACON INSTALLATION APPLICATION/PERMIT

Wisconsin Department of Transportation

DT1877 6/2010 s.86.19(3) Wis. Stats.

Submit application in triplicate to Wisconsin Department of Transportation, Regional office.
 Make separate application for each flasher or associated pair of flashers desired.
 See conditions for installation of flashing beacon on next page(s).

| | | | | | |
|---|--|--|--|---|------|
| Applicant - Municipality | | | Unit of Government (County, Town, City, Village) | | |
| Mailing Address | | | | | Date |
| Name of 24/7 Emergency Contact | | Contact Area Code – Telephone Number | | Cell or Pager Number | |
| Description of Beacon | | | Mounting Height Feet | Lateral Setback Feet From <input type="checkbox"/> Edge of Pavement <input type="checkbox"/> Face or Top of Curb | |
| Red | Incandescent <input type="checkbox"/> 165 w | LED* <input type="checkbox"/> | | | |
| Yellow | <input type="checkbox"/> 116 w | <input type="checkbox"/> | <input type="checkbox"/> Pair-as same installation for school speed limit signs only | | |
| * If LED indications are used, they shall have an equivalent output to incandescent indications. | | | | | |
| Location of Beacon | | Facing <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W | | Reference to intersection, corporate limit, etc. | |
| Associated Sign <input type="checkbox"/> Stop <input type="checkbox"/> Warning <input type="checkbox"/> Speed Limit <input type="checkbox"/> School <input type="checkbox"/> Other | | | | | |
| Reason for Erecting Beacon | | | | | |

Application is made for permission to install a flashing beacon as described above. It is understood and agreed that the design, installation and operation of the flashing beacon will comply with the regulations of the Wisconsin Department of Transportation, the State Electrical Code, local ordinances and regulations, as well as specific conditions stated on the next page(s).

The undersigned certifies that he/she is authorized to sign this application on behalf of the named unit of government.

(Authorized Representative)_____
(Date)_____
(Title)**PERMIT APPROVAL**

Permission is granted for the installation described above in compliance with the conditions specified.

| | | |
|----------------------|-------------|---|
| Permit Number FB- | Date Issued | Approved for Wisconsin Department of Transportation X |
| | | (Traffic Engineer) (Date) |

4-5-2 Rectangular Rapid Flashing Beacons

January 2018

INTRODUCTION/GENERAL

Rectangular Rapid Flashing Beacons (RRFBs) are a special type of beacon used to supplement pedestrian crossing signs at marked crosswalks. FHWA has rescinded FHWA Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11) for all new installations of RRFB devices effective December 21, 2017.

This policy contains provisions for proper application, design, and permitting of RRFBs on the STH system.

POLICY

General

As of December 21, 2017, the installation of any new or replacement RRFBs by any highway agency, including those agencies who received the FHWA's approval to use RRFBs under IA-11, **shall** be prohibited.



4-6-1 Control for Emergency Access Vehicles

May 2011

GENERAL

Reference is made to the MUTCD, Section [4G](#), and Wisconsin State Statute [346.455](#)

POLICY

The following conditions describe various forms of traffic control associated with emergency vehicle access as well as general installation, design, and operational criteria.

Condition 1: Warning Device with No Traffic Control

Prescribed practice is to use the warning sign W11-8, Fire Station Truck, with or without a flashing beacon used to supplement the sign (see [TEOpS 4-5-1](#)). Use of this type of warning is intended for use only at locations with restricted sight distances. If used with a flashing beacon, the beacon *should* be activated by a control in the firehouse for a preset period of time for the emergency vehicle to enter the highway.

An alternate method is to use a W11-8 at the emergency vehicle access with a yellow flashing beacon, and also install an advance warning sign, W54-60, Fire Trucks (Emergency Vehicles) Enter when Signal Flashes.

On the state trunk highway system, signing will be furnished, installed, and maintained by the department. The municipality *may* have an option to install a flashing beacon subject to obtaining a permit from the regional office and accepting responsibility for operating and maintaining the beacon in accordance with the permit.

Condition 2: Emergency Vehicle Hybrid Beacons and Mid-Block Access

Under this condition, the emergency vehicle access is at mid-block and controlled by a hybrid beacon.

Application

Emergency vehicle hybrid beacons **shall not** be installed mid-block on two-lane roadways. In addition to guidance provided in the MUTCD Section [4G.04](#), emergency vehicle hybrid beacons *may* be considered on multilane highways when the following volume criteria is met:

1. Traffic volume on the adjacent roadway exceeds 18,000 vehicles per day, or
2. Traffic volume on the adjacent roadway exceeds 1,800 vehicles during the peak hour of the day.

In addition to the volume criteria above, a specialized study **shall** be conducted by the agency requesting the beacons to demonstrate the need for control at emergency vehicle access points. Minimally, the study will consider adjacent roadway geometry (to include sight distance criteria), traffic volumes and characteristics, relative emergency vehicle exposure, and related vehicular conflicts (to include crash history). The study *should* also include a traffic capacity analysis to evaluate the effects of such an installation on the adjacent roadway. Such an installation *may* be denied if the study determines that a substantial, negative impact will be created by the installation of an emergency vehicle hybrid beacon.

Design and Operation

All design and operation requirements for an emergency vehicle hybrid beacon can be found in MUTCD Section [4G.04](#).

Maintenance and Funding

Since emergency vehicle hybrid beacons are installed to serve a defined community, it is reasonable to assign maintenance responsibilities to the community being served. However, for installations outside connecting highway limits, communities *may not* have resources available to manage such systems. As such, this function will likely need to be fulfilled by WisDOT. In that case, an agreement with the community *may* be developed that will establish a means to reimburse WisDOT for any time and materials spent maintaining these installations. This agreement *may* address costs to install traffic control hybrid beacons as well.

Other Traffic Control Methods for Emergency Vehicle Access

Devices used to control traffic on the STH system, including connecting highways, at locations of emergency

vehicle access are subject to Wisconsin State Statute 346.455, the WisMUTCD, and this policy. Forms of traffic control outside of these standards are not permitted. Examples of this include using red flashing beacons with signs indicating “WHEN FLASHING – STOP FOR FIRE TRUCKS” or similar messages.

SUPPORT

Regardless of the reason traffic control devices are installed, they need to convey a purposeful, clear, and consistent message to motorists.

In addition to providing these types of devices on the STH system to promote safety, drivers of emergency vehicles *should* be properly trained regarding the proper operation of emergency vehicle hybrid beacons, and the concept that use of emergency vehicle hybrid beacons does not remove the responsibility of the vehicle operator from determining whether or not it is safe to enter the highway.

The local municipality **shall** be responsible for such training programs.



GENERAL

Reference is made to the MUTCD Chapter [4N](#).

In-roadway warning lights (IRWLs) are special types of highway traffic control devices installed in the roadway pavement to warn road users that they are approaching a condition on or adjacent to the roadway that *may* not be readily apparent and might require the road users to slow down and/or yield.

IRWLs are actuated devices with flashing indications that provide real-time warning of a specific condition. In-pavement lights that supplement pavement markings by operating in a steady burn state **shall** also require WisDOT approval but are not the focus of this policy.

On the STH system in Wisconsin, IRWLs are limited to situations warning of: marked school crosswalks, marked mid-block crosswalks, marked crosswalks on uncontrolled approaches, and other roadway situations involving pedestrian crossings that are not associated with other types of traffic control.

POLICY

IRWLs, as defined herein, *may* be used on the Wisconsin STH system provided the local jurisdiction:

1. Applies for a permit
2. Agrees to fund the installation, operation, and maintenance of the device
3. Agrees to be responsible for any corresponding damage to the roadway or damage to highway maintenance equipment, and
4. Properly cites appropriate locations based on the conditions of this policy.

The municipality *should* understand that the permit may be revoked, especially in the event of safety or operational issues. In such a situation, the original costs and costs to restore the pavement are the obligation of the permit holder.

When allowed by permit, IRWLs **shall** be installed perpendicular to the direction of travel on the roadway and used to supplement crosswalk markings. IRWLs placed along the centerline of a highway, parallel to the direction of travel, **shall not** be used. IRWLs **shall not** be allowed on freeways or expressways.

Prior to the use of IRWLs, adequate trail of standard remedial measures **shall** be used to warn motorists of pedestrian crossings. IRWLs will be used only to supplement typical warning devices such as signs, markings, and crossing guards. Other strategies, such as providing a median refuge roadway lighting in advance of the crossing, or enforcement campaigns, are more universally recognizable methods of warning motorists of these conditions, and *should* also be implemented when practicable.

Location Criteria

It is recognized that the use of IRWLs *may* affect STH traffic operations by increasing delay and reducing mobility, especially if used near existing signalized or stop-controlled intersections. The following criteria **shall** be met:

1. Location is an uncontrolled pedestrian crossing.
2. Location is an established school route, accommodates a minimum pedestrian volume of 100 pedestrians/day, or location has experienced pedestrian crashes in the past 3 years.
3. Subject crossing is located in municipal (non-rural) limits.
4. There exists a minimum of 300 feet between the subject crossing and the nearest uncontrolled pedestrian crossing, or intersection traffic control device on the STH.
5. There exists a minimum of 1200 feet between the subject crossing and the nearest uncontrolled pedestrian crossing supplemented with in-roadway warning lighting, unless exceptional conditions exist.
6. Roadway has a maximum of four travel lanes with a maximum single-stage crossing distance of 50 feet.

7. Approach speed is posted at less than 50 mph.
8. Adequate stopping sight distance exists based on the following approach speeds:
 - a. 15 or 25 mph = 200 ft
 - b. 30 mph = 250 ft
 - c. 35 mph = 300 ft
 - d. 40 mph = 400 ft
 - e. 45 mph = 500 ft

Design Requirements

In the interest of uniformity, reliability, and consideration for other highway users, the following minimum design requirements for IRWLs **shall** be met:

1. Number/positioning of lights:
 - a. For two-lane undivided roadways: 5 IRWLs per direction
 - b. For four-lane undivided roadways: 7 IRWLs per direction
 - c. For four-lane divided roadways: 5 IRWLs per direction.
2. IRWLs **shall** be actuated and **shall not** flash continuously.
3. If pedestrian push buttons are used to actuate the IRWLs, a PUSH BUTTON TO TURN ON WARNING LIGHTS (R10-25) sign **shall** be mounted adjacent to or integral with each pedestrian push button.
4. For four-lane divided roadways with median widths equal to or exceeding 6 feet, pedestrian actuation in the median **shall** be provided to allow for a two-stage crossing of the roadway.
5. Lights **shall** be evenly spaced across the entire traveled way. Lights *should* be positioned outside of vehicle wheel paths and *should* also consider bicyclist routes adjacent the traveled way. Lights placed near the centerline of the roadway *should* be offset slightly to minimize interference with pavement marking operations.
6. Electrical wire **shall** be cast in a minimum of 8-inch concrete pavement. If IRWLs are being installed with an improvement project that requires a pavement section greater than 8 inches, then the pavement at the crossing *should* be made to match that of the adjacent roadway. Pavement reinforcement *may* not be required, but this decision will reside with the regional pavement design unit. Doweling to adjacent concrete pavement will also be required at the direction of the regional pavement engineer. A minimum 2 feet of clearance to the edge of the concrete **shall** be maintained. Pavement structure **shall** be installed according to WisDOT Standard Specifications. Installation in existing pavement by sawing or coring is not permissible. Minimal width of the concrete, measured longitudinally in the direction of traffic, **shall** be 12 feet.
7. Roadway profile **shall** be appropriately maintained by milling or wedging the approach to the crossing, as required.
8. IRWLs **shall** flash for the entire calculated pedestrian clearance time. Pedestrian clearance *should* be calculated based on a 3.5 ft/sec walking speed. Locations frequented by children and elderly users *may* have a pedestrian clearance based on a slower walking speed. A brief time extension of 3 to 7 seconds *may* be added to allow for vehicle/pedestrian response and separation.
9. Features meant to accommodate impaired pedestrians such as actuator buttons with locator tones, supplemental braille signing, etc., *should* be considered at individual locations on a case-by-case basis. If used, these devices **shall** be furnished and maintained by the municipality that requests the IRWLs.
10. Other design criteria **shall** conform to the manufacturer's recommendations.

SUPPORT

There are several general points of concern regarding the use of these devices:

1. IRWLs do not ensure that motorists will appropriately yield the right of way to pedestrians in the crossing.
2. A public awareness and education campaign *may* be required to educate the public prior to operating

IRWLs.

3. IRWLs *may* cause rear-end collisions similar to a signal installation.
4. Placement of IRWLs between coordinated traffic control signals *may* cause progression problems.
5. Any improperly installed electrical equipment *may* pose a hazard to the general public.
6. In Wisconsin, IRWLs *may* be susceptible to premature failure due to moisture buildup and/or snow removal operations.
7. The type of actuation used for IRWLs needs to be considered. Active detection (i.e. pushbutton) may create a false sense of security for pedestrians who are not familiar with the use of such devices or the rules of the road. Because of these factors, passive detection (i.e. infrared) is considered more appropriate for these types of applications, especially in crosswalks associated with school zones. In either case, an informational plaque should be used to briefly describe proper crossing behavior while using IRWLs. These are similar to informational plaques used at signalized pedestrian crossings (R10 series).
8. In IRWLs will be placed outside of existing connecting highway limits within a municipality, consideration *should* be given to extend those limits to include the installation location.



GENERAL

See [TEOps 17-2-1](#), Portable Changeable Message Signs (PCMS) Policies & Procedures, for information regarding procurement, use of PCMS for special events, adverse weather, and other non-work zone related events, sign control, and training.

APPLICATIONS

Since they are dynamic signs, PCMS must only be used to display real-time or changing traffic condition or traffic control information. They are used for work zone temporary traffic control, incident management, special events, and unusual or hazardous road conditions due to weather. This could include expected delay times in queue situations, warning of stopped traffic, ramp or lane closures, advisory speeds, and alternate route advisories. They *may* also be used provide advance notice (up to 10 days) prior to projects or events expected to cause congestion or that will require drivers to use alternate routes.

PCMS *should not* be used to replace static warning or regulatory signs; they *may* be considered as a supplemental device to a required static sign. In the case of a ramp or lane closure, the PCMS would supplement the static warning signs informing motorists of the closure.

Nonstandard words such as DANGER, HAZARDOUS, or CAUTION **shall not** be used. These words do not contribute any information and *may* overly concern drivers as they approach the work zone.

PCMS **shall not** be used to display generic safety messages or any other messages not necessary for specific driver action at the site. Examples of generic messages not to be used are BUCKLE UP, WELCOME TO Wisconsin, or DRIVE SAFELY. Use of these types of generic messages tends to lead to motorist disregard of critical messages and unnecessarily distracts driver attention from the roadway.

Improvement/Maintenance Projects

The signs *may* be used to advise travelers of alternate routes around construction or maintenance projects, or to notify of traffic stoppages, delays, closures, or other conditions that *may* require certain driver actions.

Signs used on improvement projects are to be supplied and maintained by the contractor. All messages displayed must be preapproved by the project engineer. Any subsequent changes to messages due to changing traffic conditions or construction operations **shall** also require approval from the project engineer, except during off-hours incidents or emergencies when the project engineer is not reachable. There is to be no additional state-owned PCMS purchased by regions through improvement projects or otherwise, including implementation in smart work zone systems. In general, improvement projects *should* provide for project-specific contractor supply of desired portable work zone management systems such as PCMS, subject to compliance with JamLogic or other standardized communications interface standards. Accessibility and operation control by the STOC *should* be accommodated, but not committed without their involvement and concurrence. If it proves absolutely necessary to procure new WisDOT-owned equipment, BTO will coordinate any procurement of this equipment and provide it for use by regions as needed.

Signs *may* be required up to 10 days prior to the beginning of an improvement or maintenance project to inform/warn the traveling public of the upcoming work. These signs *should* be provided by the contractor, but when contract timing is an impediment they *may* be provided by the department or county.

Signs owned by the department and counties **shall** be used for the purposes of temporary traffic control for maintenance work, incident management, and adverse weather road condition advisories.

The department reserves the right to use/deploy signs from its inventory on an improvement project to improve safety and optimize the operational efficiency of a construction work zone. Contractor-provided signs *should* be used for aforementioned purposes if they could be made available and deployed expeditiously and cost-effectively.

PURPOSE

As stated in the "Applications" section of this policy, signs for highway improvement projects **shall** be supplied and maintained by the contractor as part of the contract similar to flashing arrow boards, drums, and barricades.

The department would not assume any ownership of these signs.

See [TEOpS 17-2-1](#) for provisions on the purchase of PCMS for highway maintenance work and other uses.

MAINTENANCE

A memorandum of understanding (MOU) **shall** be developed for any county highway department operating state-owned PCMS on the state highway system. A sample MOU is included in [TEOpS 17-2-1](#).

For state- or county-supplied signs, arrangements *should* be made using state or county forces to maintain the signs while in use. For newly purchased signs, a warranty period is usually provided, requiring the supplier to repair any failures or breakdowns of the sign. When the county performs maintenance work on state-owned signs, charge project number 00XX-01-07 (non-interstate) or 00XX-01-08 (interstate), activity code 032. When the county provides county-owned PCMS, all maintenance responsibility rests with the county and is covered under the rental rate.

On an improvement contract, the maintenance is included in the changeable message sign bid item in the contract (Item 643.1050.S, Standard Special Provision 643-050). The contractor would be required to check the sign at regular intervals.

PCMS Usage

For PCMS placed on the STH, the PCMS **shall** either be:

1. Owned and placed by WisDOT
2. Owned and placed by contractors under contract with WisDOT
3. Owned, rented, or borrowed and placed by county highway departments under contract or permit with WisDOT.

County sheriff's departments and other local agencies **shall** work with the county highway departments to place the signs and display proper messages consistent with WisDOT policy. This includes any PCMS purchased by a county sheriff's department and other local agencies through funds received from the Bureau of Transportation Safety (BOTS).

ACCEPTABLE MESSAGES FOR WORK ZONES

The signs are generally capable of sequencing up to six frames. However, for driver comprehension, messages **shall** be limited to one or two frames (see MUTCD Section [6F.55](#)). Blank or other filler frames between the two frames of text **shall not** be used. It is desirable for the driver to be able to read the entire message sequence twice as they pass by the sign. For an interstate highway application, the total viewing time is about seven seconds. Each frame is usually displayed for 2.0 seconds or less. Using more than two frames makes it difficult for drivers to read the entire message sequence twice. Do not flash any part of a message.

It is recommended that the first frame describe the traffic condition or problem ahead, which the motorist *may* encounter. The second frame would be used to advise the driver of an appropriate action. Examples are:

| <u>1st Frame</u> | <u>2nd Frame</u> |
|-----------------------------|-----------------------------|
| CRASH AHEAD 1 MILE | LEFT LANE CLOSED |
| TRAFFIC STOPPED AHEAD | NEXT 3 MILES |
| ROAD CLOSED 2 MILES | USE EXIT #394 |

See the message list that follows for more examples.

When the State Patrol will be operating the signs for a specific project, a set of message guidelines *should* be prepared for use by the operators. This will provide consistency in the messages being displayed while various shifts of operators or troopers are working on the project.

PROBLEM/DISTANCE

| | | | | |
|--------------|---------------|----------------|------------------|--------------|
| ALL LANES | LANE SHIFT | MOVING WORK | RIGHT 2 LANES | TOW TRUCK |
|--------------|---------------|----------------|------------------|--------------|

| | | | | |
|--------------------|----------------------|-----------------------|-----------------------|--------------------|
| BLOCKED | | ZONE | CLOSED | AHEAD |
| BRIDGE CLOSED | LEFT LANE CLOSED | NEXT EXIT CLOSED | RIGHT LANE NARROWS | TRUCK CROSSING |
| CENTER LANE CLOSED | LEFT LANE NARROWS | NO OVERSIZE LOADS | RIGHT SHOULDER CLOSED | TRUCKS ENTERING |
| COLBY ROAD CLOSED | LEFT 2 LANES CLOSED | NO SHOULDER | ROAD CLOSED | UNEVEN LANES |
| DEBRIS AHEAD | LEFT SHOULDER CLOSED | ONE LANE BRIDGE | ROAD CLOSED 6 MILES | WET PAINT |
| DELAYS | LOOSE GRAVEL | ONE-WAY TRAFFIC AHEAD | ROAD WORK | WORK ZONE 12 MILES |
| EXIT 45 CLOSED | LOW SHOULDER | PAVEMENT BUMPS | ROAD WORK TOMORROW | SINGLE LANE |
| FLAGGER 2 MILES | MAJOR DELAYS | RAMP CLOSED | ROAD WORK 4 MILES | SOFT SHOULDER |
| FREEWAY CLOSED | MEDIAN WORK 5 MILES | RIGHT LANE CLOSED | SHOULDER BLOCKED | LANES NARROW |

ACTION

| | | | | |
|---------------------|--------------------|--------------------|------------------------|-----------------|
| ALL TRAFFIC EXIT RT | STAY ON US 45 | ALT ROUTE EXIT 25 | AVOID DELAYS USE US 53 | STOP AHEAD |
| STOP 5 MILES | BEST ROUTE TO I-94 | TUNE RADIO 1510 AM | DETOUR 2 MILES | USE CENTER LANE |
| DO NOT PASS | USE COLBY ROAD | FOLLOW ALT ROUTE | USE DETOUR ROUTE | FOLLOW DETOUR |
| USE LEFT LANE | FOLLOW SIGNS | USE NEXT EXIT | MERGE RIGHT 2 MILES | USE RIGHT LANE |
| ONE-WAY TRAFFIC | WATCH FOR FLAGGER | PASS TO LEFT | PASS TO RIGHT | STAY IN LANE |

MESSAGE EXAMPLES

| EVENT | PANEL 1 | PANEL 2 |
|---------------------|--|----------------------|
| Blocked | RIGHT 2 LANES CLOSED | AHEAD X MILES |
| Center | N I-39 TRAF USE CNTR LN (USE 2 PHASES) | |
| Commercial | OVERSIZE TRUCKS | USE EXIT 120 |
| Construction | WORK NEXT 7 MILES | |
| | CONCRETE CURING | LANE REOPENS July 24 |
| Entrance | TRUCK ENT AHEAD | |
| Freeway Closed | I-90 CLOSED | DETOUR EXIT 10 |
| Traffic Information | TUNE TO 1240 AM | FOR TRAFFIC INFO |
| Maintenance | MAINT WORK ON BRIDGE | |

| | | |
|-------------------|---------------------------------|------------------------------|
| Narrow Bridge | NARROW BRIDGE AHEAD | TRUCK TRAF USE ALT RTE |
| Oversize Vehicles | OVERSZ TRUCKS | MUST EXIT |
| Shoulder Work | ROADWORK ON SHLDR 3 MILES | |
| Speed | REDUCED SPD ZONE AHEAD | |



6-3-4.5 Width Restrictions

August 2016

Some highway construction projects require temporary lane width restrictions that cause problems for over-width load movements. Many of these moves are operating under annual permit and the permittees are unaware of the width restrictions. To help prevent inconvenience and the prospect of damage, signs are used to warn and direct the movers.

Multiple trip or annual permits for mobile homes are issued for loads up to 15 feet wide. Loads over 15 feet travel under single trip permits, and prior to permit issuance the route is checked. When loads up to 15 feet wide (plus one foot for shyness) cannot be accommodated through the work zone the signs described in this guideline are used. Therefore, signs are used when the effective width is less than 16 feet.

The width to be used on the signing is calculated by measuring laterally from centerline to object or object to object subtracting one foot for shyness. Drums, barricades, barriers and parapets also constitute lateral objects. Examples 1-5 at the end of this subject illustrate when width signing is required.

Post the W12-52, showing the numerical width in feet, in advance of one or more intersections or interchanges which will provide the mover an alternate route around the restriction. Check the adequacy of a logical alternate route when selecting the point at which the diversion is posted. Place a supplemental distance sign, WO57-52, installed beneath the W12-52. Post another W12-52 in advance of the restriction, generally along with the other construction warning signs. Install on both sides of a divided highway to enhance visibility

Post an R12-70 sign, Wide Loads Exceeding XX Ft, at the intersection or ramp where the diversion occurs, especially if the restricted highway is a freeway or expressway. An appropriate directional arrow is an acceptable supplement to this sign

Detour signing from the point of diversion to return to the highway is normally not needed. This is similar to a low clearance warning situation, where no alternate route is signed.

To avoid unnecessary signing and diversion of wide loads, accurate information must be obtained about the actual restriction. This information is entered into Lane Closure System (LCS) by Regional field staff. The information is used to update 511.

Projects having more than one lane open in a given direction, even though each lane might be somewhat narrowed, over-width traffic is often not diverted. Most multi-lane highways have shoulders that can be used temporarily to accommodate wide loads. An overhang from one lane to another can be tolerated for short distances such as ¼ mile. Therefore, width restriction signs are typically not necessary for restrictions on short stretches of multi-lane highways. Although, there may be higher volume segments where overhang from one lane to another is not desirable or longer stretches of multi-lane highways (1/4 mile or more) where adequate shoulders are not available, width restriction signs *may* be desirable. In these circumstances where the intent is to divert over width traffic, ensure LCS reflects what is represented on the width restriction signing.

There may be staging situations where off-peak lane closures are utilized on multi-lane highways with closed shoulders. Width restriction signing is required during off-peak operations. Cover or remove width restriction signing during peak operations.

On roadways where one lane is open in each direction, width restriction signs are not needed if the available width including shoulder (including at bridges and crossovers) is more than 16 feet.

Figure 1. Width Restrictions and Lane Closure System

Width Restrictions and Lane Closure System

Example 1



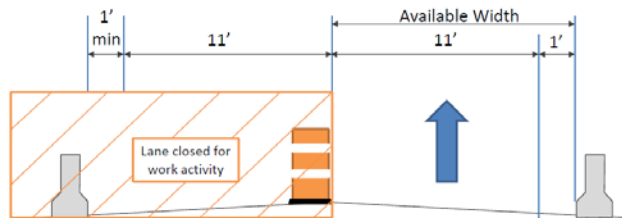
LCS Entry → Available Width - 1' Buffer = **23' Effective Width**

Available width ≥ 16': No width warning sign required.

Width Restrictions and Lane Closure System

Example 2

1 Lane Open



LCS Entry → Available Width - 1' Buffer = **11' Effective Width**

Width Signing → **11' Max Width**

Available width < 16':

Width warning sign(s) required.

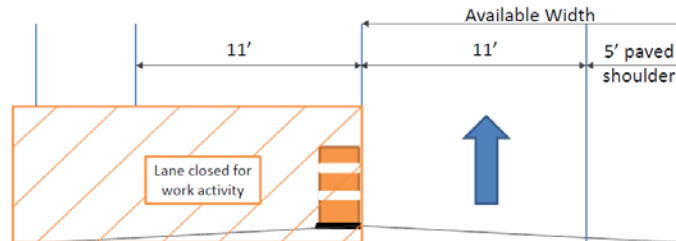
Recommend 2 Locations:

- One in WZTC advanced warning area
- One at location where a wide load could exit with supplemental **XX AHEAD** sign below

Width Restrictions and Lane Closure System

Example 3

1 Lane Open

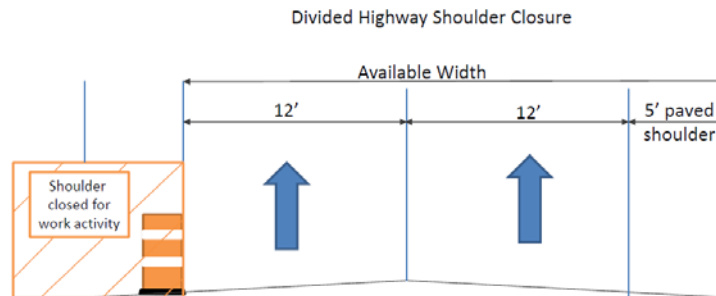


LCS Entry → Available Width - 1' Buffer = **15' Effective Width**

Available Width ≥ 16: No Width Signing Required

Width Restrictions and Lane Closure System

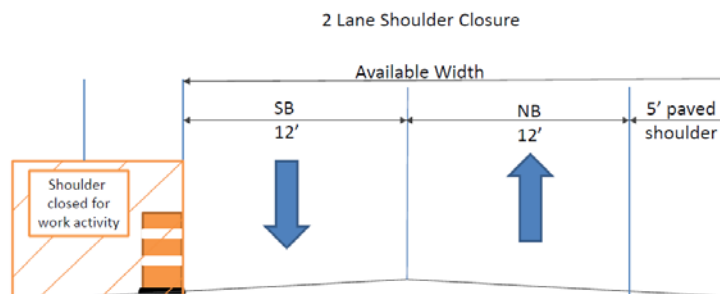
Example 4



LCS Entry → Available Width-1' Buffer=28' Effective Width
 Available width ≥ 16': **No Width Signing Required**

Width Restrictions and Lane Closure System

Example 5



SB LCS Entry → Available Width-1' Buffer=11' Effective Width
 Width Signing → **11' Max Width(Southbound Only)**

Available width < 16':

Width warning sign(s) required.

Recommend 2 Locations:

- One in WZTC advanced warning area
- One at location where a wide load could exit with supplemental **XX AHEAD** sign below

6-3-5 Mitigation Contracts: Law Enforcement, Freeway Service Teams, Emergency Services, Traffic Control/Capacity, & Multi-Modal Movements

July 2012

PURPOSE

Freeway and expressway construction projects with significant safety and mobility impacts, especially those with Type 3 or 4 Transportation Management Plans (TMPs), often employ mitigation contracts for services such as law enforcement, freeway service teams, emergency response services, traffic control or capacity improvements on alternate routes, and multi-modal improvements. This policy outlines a process to follow in determining need and scope for mitigation contracts.

LAW ENFORCEMENT SERVICES

Law enforcement support for work zones typically includes:

1. Speed enforcement, with a focus on increasing work zone safety
2. Traffic incident management efforts and facilitation of quick clearance
3. Assistance with lane/ramp closures
4. Coordination point between local law enforcement and project team.

FREEWAY SERVICE TEAMS

The purpose of the Freeway Service Team (FST) is to facilitate quick clearance by expediting the relocation of

disabled vehicles, including those involved in traffic crashes. The FST utilizes dedicated tow trucks that continuously patrol designated highway segments during specified hours of operations. The FST will relocate a disabled vehicle to a safe location, such as a crash investigation site or drop-off location, where the motorist can contact a private towing service for further help. All FST services are offered free of charge to motorists. The FST is a contracted service between WisDOT and private towing and recovery professionals.

EMERGENCY RESPONSE SERVICES

Mitigation contracts with emergency service agencies may be executed for TMP Type 4 projects to facilitate quick response to incidents for functions such as stabilizing the scene and providing necessary medical attention.

TRAFFIC CONTROL OR CAPACITY IMPROVEMENTS

For TMP Type 4 projects, arterial street capacity improvements, such as intersection turn lane improvements, may be considered on alternate routes if necessary to minimize congestion and facilitate adequate traffic operations along the route. Contracts with local agencies for traffic signal improvements on alternate routes under local jurisdiction may be considered if the existing signal system and timing do not allow adequate capacity to accommodate diverted traffic from the freeway, and frequent long traveler delays are expected to recur on the freeway throughout the construction project. Improvements to signing and pavement marking may also be considered to improve capacity (e.g. minor re-striping, parking restrictions, and lane use designations).

MULTI-MODAL IMPROVEMENTS

Improvements to pedestrian/bicycle routes and existing transit operations may be considered for TMP Type 4 projects where the multi-modal improvement provides a good substitute for the trips affected by the construction project and is determined to be cost-effective. Consult with the Bureau of Traffic Operations for guidance on procedures to determine cost effectiveness.

MITIGATION CONTRACTING PROCESS

To determine appropriate mitigation services, the project team contacts the regional traffic engineer who will work with BTO/STOC and the DSP liaison to determine scope of mitigation services necessary. The following processes should be used.

Step 1: Needs Identification

During TMP development, the project team should consult with the regional traffic engineer and review Table 1 to determine if the project meets the considerations for implementing mitigation contracts.

Table 1. Considerations for Implementing Work Zone Mitigation Support Services

| For Projects That | Law Enforcement | Freeway Service Team | Emergency Response Services | Traffic Control or Capacity Improvement | Multi-Modal Improvement |
|--|-----------------|----------------------|-----------------------------|---|-------------------------|
| Are anticipated to cause recurring delay | X | X | X | X | X |
| Require a Type 3 or 4 TMP and/or require a Work Zone Incident Management Plan | X | X | X—Type 4 | X—Type 4 | X—Type 4 |
| Include challenging geometries, such as crossovers, lane shifts, or sharp curves | X | X | X | | |
| Have reduced lane capacity or shoulder widths | X | X | X | | |
| Are on the interstate or freeway | X | X | X | | |
| Include a speed limit reduction | X | | | | |
| Require speed management | X | | | | |

Step 2a: Need for Law Enforcement Support Identified

Once the need for law enforcement support services is identified:

1. The project team should contact the regional traffic engineer, who will work with the STOC operations engineer, project team, and DSP liaison to determine the scope of law enforcement services necessary.
2. A description of the law enforcement support services and anticipated cost will be documented in the TMP.
3. If the State Patrol is only able to provide partial coverage of the services, the project manager will

coordinate the remaining service needs with local law enforcement.

4. The project manager will develop a Law Enforcement Scope of Services Proposal with assistance from the STOC.
5. The Law Enforcement Scope of Services Proposal will be presented to the DSP Bureau of Field Operations director and the DTSD Division Operations director for approval. If they are not able to reach an agreement, the proposal will be presented to the DSP/DTSD JSOOC for approval.
6. Once approved, the required contracts will be facilitate by the STOC and completed by the region. Day-to-day operations and administration of the contracts will be covered by project staff.

Step 2b: Need for Freeway Service Team (FST) Support Identified

Once the need for Freeway Service Team (FST) support services is identified:

1. The project team should contact the regional traffic engineer, who will work with the STOC TIM engineer, project team, and DSP liaison to determine the scope of services necessary.
2. The FST services will be documented in the project TMP.
3. After the scope of services is approved, the STOC will determine if the service can be provided by an existing contractor or if the services will require a bid. If necessary, the STOC will complete the bid process and select a new contractor to provide the services.
4. Once the contractor is selected, a purchase order will be issued. This process will be coordinated by the STOC.
5. Day-to-day operations and administration for the FST service will be overseen by the STOC.

Step 2c: Need for Emergency Response Services Support Identified

Once the need for emergency response services is identified:

1. The project team should contact the regional traffic engineer, who will work the STOC TIM engineer, project team, and DSP liaison to determine the scope of services necessary.
2. A description of the emergency response services, applicable local agencies, and anticipated cost will be documented in the project TMP.
3. The project manager will coordinate the service needs with the local emergency service agency.
4. The project manager will develop an Emergency Services Scope of Services Proposal for review and concurrence by the STOC.
5. The Emergency Services Scope of Services Proposal will be presented to the BPD Project Services chief for approval.
6. Once approved, the required contracts will be facilitated and completed by the region. Day-to- day operations and administration of the contracts will be covered by project staff.

Step 2d: Need for Traffic Control or Capacity Improvements

Once the need for traffic control or capacity improvements is identified:

1. The project team should contact the regional traffic engineer, who will work with the STOC work zone operations engineer, BTO traffic signal systems engineer, and project team to determine the scope of improvements necessary.
2. A description of the traffic control or capacity improvements, contracting method, applicable county or local agencies, and anticipated cost will be documented in the project TMP.
3. The project manager will develop a Traffic Control or Capacity Improvements Proposal for review and concurrence by STOC and BTO/TES.
4. The Traffic Control or Capacity Improvements Proposal will be presented to the BPD Project Services chief for approval.
5. The project manager will coordinate the preparation of any contract documents and coordinate the improvement needs with the county or local public works agency.
6. Once approved, the required contracts will be facilitated and completed by the region. Day-to-day operations and administration of the contracts will be covered by project staff.

Step 2e: Need for Multi-Modal Improvements

Once the need for multi-modal improvements is identified:

1. The project team should contact the regional traffic engineer, who will work with the STOC work zones operations engineer and project team to determine the scope of improvements necessary.
2. A description of the multi-modal improvements, contracting method, applicable county or local agencies, anticipated cost, and benefits will be documented in the project TMP.
3. The project manager will develop a Multi-Modal Improvements Proposal for review and concurrence by the STOC.
4. The Multi-Modal Improvements Proposal will be presented to the BPD Project Services chief for approval.
5. The project manager will coordinate the preparation of any contract documents and provide any necessary coordination of improvement needs with county or local agencies.
6. Once approved, the required contracts will be facilitated and completed by the region. Day-to-day operations and administration of the contracts will be covered by project staff.

MITIGATION SERVICES

The following are examples of services eligible for funding:

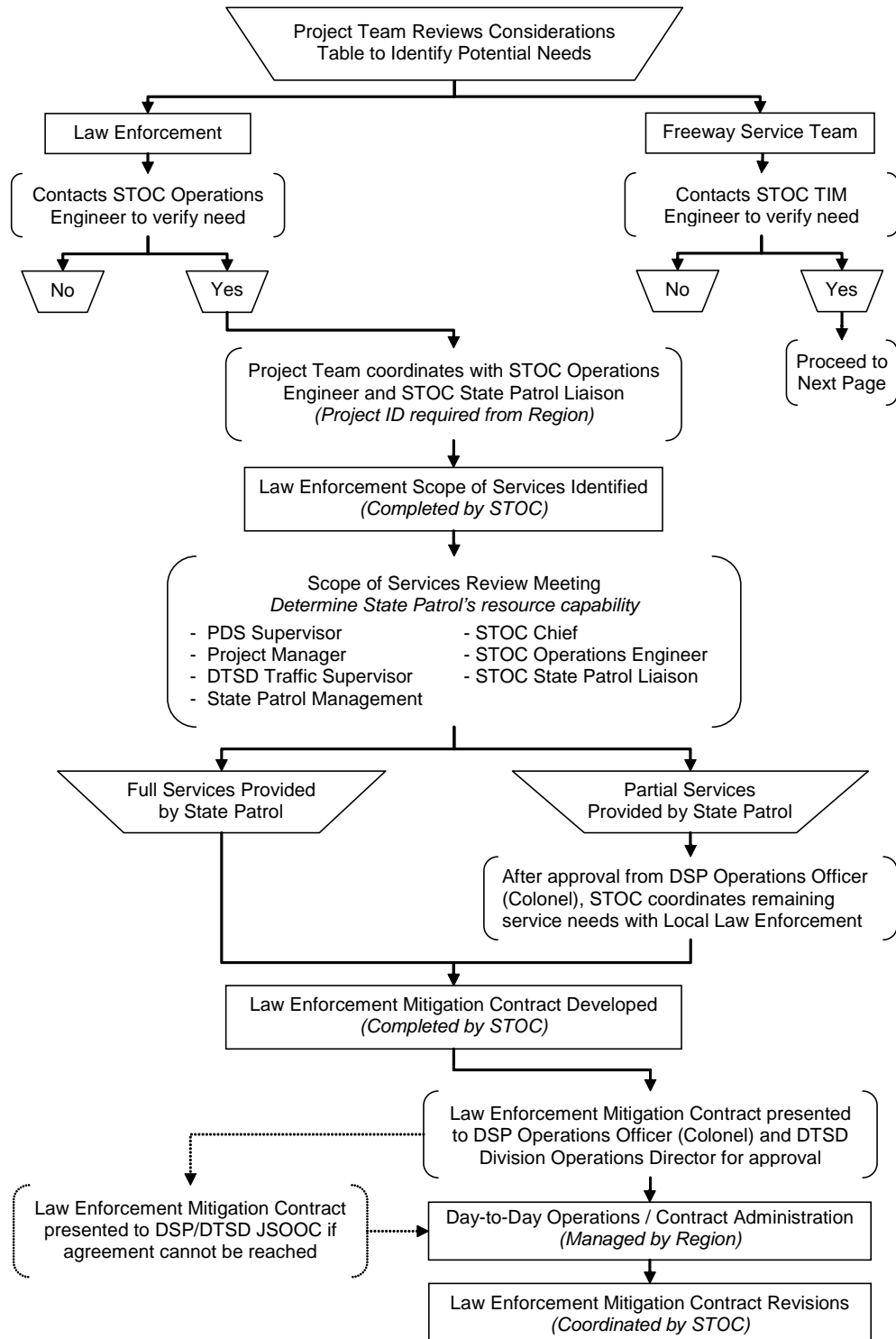
1. Law enforcement
 - a. Patrol and support services outlined above in this policy.
 - b. Staff time involving project planning, providing data, meetings, or training if a mitigation contract has been executed with the applicable agency.
2. Freeway Service Team
 - a. Continuous service patrol during specified hours
 - b. Facilitate quick clearance of incidents by expediting relocation of disabled vehicles
3. Emergency response services
 - a. Emergency services for on-site scene response
 - b. Crash/incident response
 - c. Clearing debris
4. Traffic control or capacity improvements
 - a. Traffic signal, signing, or marking improvements on alternate routes
 - b. Arterial street capacity improvements/repairs on alternate routes (Intent is to use let contracts. Work by county or local agency may be considered for minor pavement repairs on detour routes.)
5. Multi-modal improvements
 - a. Crossing guard services for school crossings on alternate routes
 - b. Pedestrian/bicycle improvements (Intent is to use let contracts. Work by county or local agency may be considered for minor improvements.)
 - c. Improvements to existing transit operations if the service is a good substitute for the trips affected by the construction project and if determined to be cost-effective (consult with the Bureau of Traffic Operations for guidance on procedures to determine cost effectiveness)

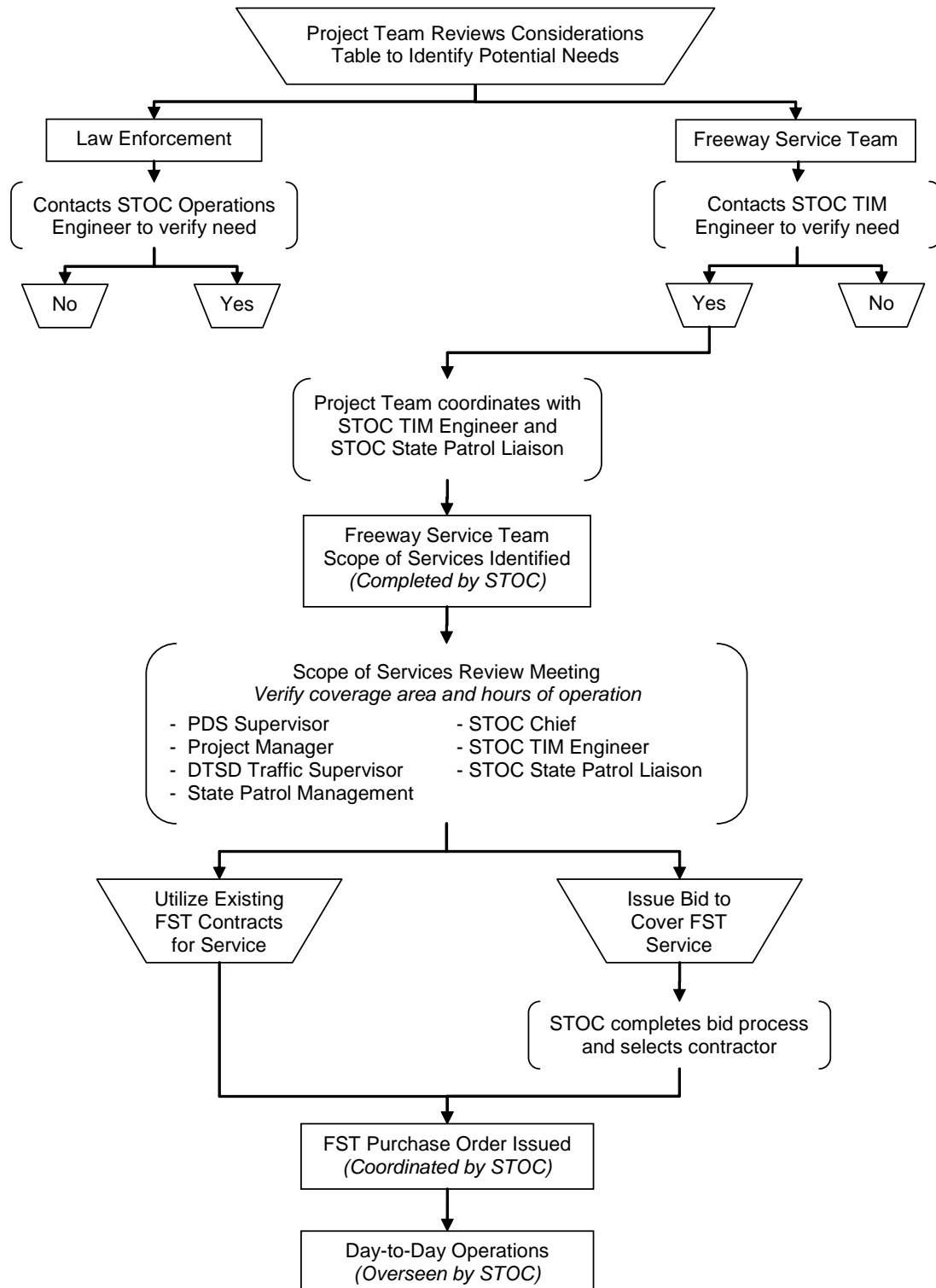
The following are examples of services that are *not* eligible for funding:

1. Procurement of equipment such as speed display boards, total stations, uniforms, traffic control devices (consider exception if can be reimbursed at a daily/weekly/monthly rate, or if equipment is consumable, i.e., typically has no useful life remaining after the project)
2. County or local agency staff time involving project planning, providing data, meetings, or training, unless related directly to project incident management such as for dry run exercises (consider exception if a

mitigation contract has been executed with the agency based on complexity of project, e.g. if there are multiple ramp/road closures involving frequent modifications to emergency access.)

Figure 2. Project Team Reviews Considerations Table to Identify Potential Needs





REQUEST FOR MITIGATION ASSISTANCE

Prior to submitting the form to request law enforcement mitigation assistance, contact the local State Patrol (see list below) to discuss your project. Determine if the post will be able to assist you with this work. If State Patrol is unable to assist with your project, contact the STOC prior to coordinating with the local county sheriff agency or municipal police department. The request for mitigation assistance form *should* be completed.

| State Patrol Contact Information | | | |
|----------------------------------|-------------------------------------|------------------|----------------|
| Region/Post | Associated Counties | Address | Phone |
| SW/DeForest | Columbia, Dane, Dodge, Green, Iowa, | 911 W. North St. | (608) 846-8500 |

| | | | |
|----------------|---|--|----------------|
| | Jefferson, Lafayette, Rock, Sauk | DeForest, WI 53532-1971 | |
| SW/Tomah | Crawford, Grant, Juneau, La Crosse, Monroe, Richland, Vernon | 23928 Lester McMullen Dr. Tomah, WI 54660-2985 | (608) 374-0513 |
| SE/Waukesha | Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, Waukesha | 21115 Highway 18 Waukesha, WI 53186-2985 | (262) 785-4700 |
| NE/Fond du Lac | Brown, Calumet, Door, Fond du Lac, Kewaunee, Manitowoc, Marinette, Oconto, Outagamie, Sheboygan, Winnebago | 851 S. Rolling Meadows Dr. PO Box 984 Fond du Lac, WI 54936-0984 | (920) 929-3700 |
| NW/Eau Claire | Buffalo, Chippewa, Clark, Dunn, Eau Claire, Jackson, Pepin, Pierce, St Croix, Trempealeau | 5005 STH 53 South Eau Claire, WI 54701-8846 | (715) 839-3800 |
| NW/Spooner | Ashland, Barron, Bayfield, Burnett, Douglas, Polk, Rusk, Sawyer, Taylor, Washburn | 7102 Green Valley Rd. Spooner, WI 54801 | (715) 635-2141 |
| NC/Wausau | Adams, Florence, Forest, Green Lake, Iron, Langlade, Lincoln, Marathon, Marquette, Menominee, Oneida, Portage, Price, Shawano, Vilas, Waupaca, Waushara, Wood | 2805 Martin Ave. Wausau, WI 54401-7172 | (715) 845-1143 |

REQUEST FOR MITIGATION ASSISTANCE

Prior to submitting this form, contact the local State Patrol Post (see list below) to discuss your project. Determine if the post will be able to assist you with this work. If State Patrol is unable to assist with your project, contact the STOC prior to coordinating with the local County Sheriff agency or municipal Police Departments.

Requester Information:

Name: _____
 Phone: _____
 Email: _____
 Region/Office: _____
 Law Enforcement Agency Providing Assistance: _____

Project Information:

Construction Project ID: _____ Mitigation Project ID: _____
 Project Termini: _____ Project Length: _____
 Highway: _____ County: _____
 Affected Municipalities: _____
 Anticipated Start Date: _____ Anticipated Completion Date: _____

Type of Mitigation Assistance Needed/Type of Work: _____

Is this a primary daily commuter route?

Does this route expect increased recreational traffic on weekends?

Rolling Lane Closures

Full Roadway Closures How many? _____

Peak Hour Lane Closures Please Describe: _____

Are there any large special events scheduled near your project?

Please Describe: _____

Will weekly meetings be held requiring attendance by law enforcement personnel?

Will the regulatory speed limit be reduced?

If so, will targeted speed enforcement be necessary?

Is there a detour/alternate route that may need extended monitoring?

Please Describe: _____

Other Comments: _____

Remit completed form to:
 STOC Operations Engineer
 433 W. St. Paul Ave, Suite 300
 Milwaukee, WI 53203

6-3-6 Freeway Service Team Policy and Procedure

January 2015

GENERAL

The Freeway Service Team (FST) provides expedited relocation of disabled and crashed vehicles made possible by the presence of FST vehicles continuously patrolling designated segments of interstate and state highways during designated hours and through designated work zones. This continuous patrol will facilitate a quick response time to non-recurring traffic incidents such as breakdowns and traffic crashes, thus reducing the

total time needed to clear the incident from the highway and restore normal traffic flow. Other examples of situations where FST services *may* be utilized include special events, inclement weather, and other highway emergencies. The primary goal of the service is safe, quick clearance of traffic incidents thereby improving safety and minimizing traffic delays and congestion. FST are frequently used as part of a project's work zone mitigation strategy and identified in the Transportation Management Plan (TMP). Please refer to [FDM 11-50-5 Attachment 5.4: "Example TMP Type Mitigation Strategies and Elements"](#) and [FDM 11-50-30.8](#).

Goals and Objectives

The goals and objectives of FST are to:

1. Maintain capacity in work zones and high volume freeway segments
2. Provide assistance free of charge to disabled motorists
3. Maintain consistent service
4. Minimize work zone delay
5. Provide scene safety
6. Clear traffic incidents
7. Provide traffic control
8. Provide scene management (law enforcement FST only)
9. Detect and verify incidents
10. Remove debris.

Applicability

Law enforcement FST operates during specified hours of the day all year round. Work zone FST contracts will be for the duration of construction projects. If FST efforts are showing that traffic is moving better when they are providing service in peak hours than in non-peak hours, the project team could extend the FST hours of operation. FST contracts include language for accommodating changing hours of service and mileage. Project managers must be aware of financial impacts as scope changes are developed.

The FST service will provide towing services to relocate a disabled vehicle to the designated drop-off locations of the highways or freeways. This service will enhance the safety and efficiency of subsequent operations by private towing service providers that remove vehicles from the designated drop-off locations.

All FST assistance and relocation services are provided free of charge to the motorist.

RESPONSIBILITIES

Bureau of Traffic Operations (BTO)

1. Management of the FST program via FST program manager
2. Procurement of FST services
3. Notify project teams of contractor and hourly rates

Regional Project Development Section

Funding to cover FST charges must be included in budget and have a chargeable project ID.

Regional Traffic Engineers

Notify contractor of project start dates and required meetings. Some meetings that *may* be required are:

1. Preconstruction
2. Incident management
3. First responders.

Other Stakeholders

1. Regional communications manager
2. Law enforcement, fire, and EMS
3. Counties and local officials

4. Towing contractors
 - a. Patrolling contract work zones
 - b. Attending required meetings listed in 42.2.3

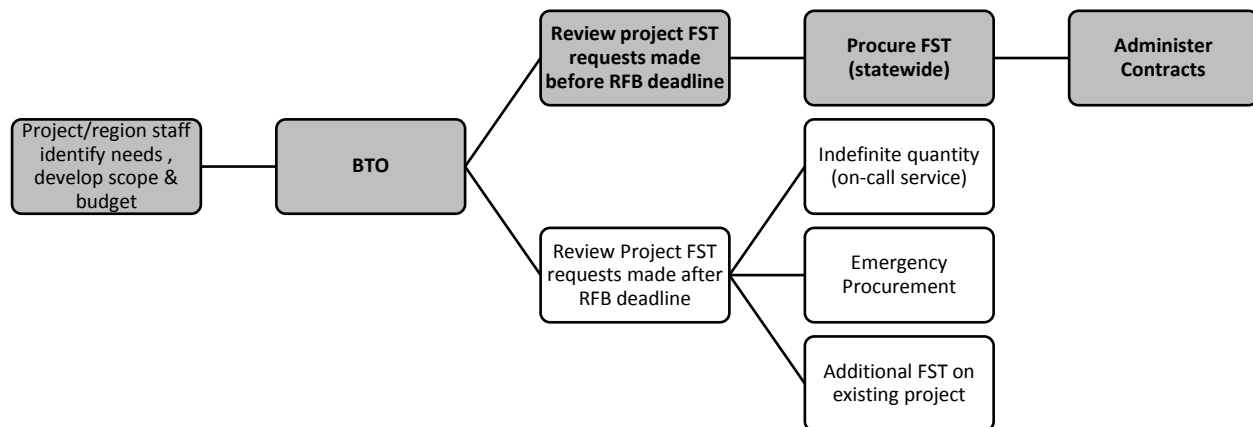
WORK ZONE FST

Project design staff will work with regional traffic operations to identify and quantify the need for FST for work zone mitigation. FST expense is paid from the project mitigation budget. Requests for work zone FST are made by December 15th of the year prior to construction via email to the FST program manager. All FST contracts are bid together in a statewide Request for Bids (RFB).

1. December 15: FST requests due for next construction year
2. February: RFB issued
3. March: RFB selections made for construction season

Figure 1 shows the flowchart for implementing work zone FST.

Figure 3. Work Zone FST Flowchart



Services to be Provided – General

The FST assists motorists whose vehicles have mechanical failure or have been involved in traffic crashes. The FST is responsible for clearing the highway of automobiles, motorcycles, small trucks, (vehicles with a gross vehicle weight of 8,000 pounds or less), and small nonhazardous debris. The FST relocates all cleared vehicles to the nearest drop-off location designated by the Contract Administrator. When responding to incident scenes, the FST provides assistance with traffic control as directed by law enforcement.

Assistance to Law Enforcement, Including Emergency Traffic Control

FST *may* be requested to lend assistance to law enforcement, specifically to assist with emergency traffic control at an incident scene. FST follows the instructions of the officer at the scene of any incident. Once temporary traffic control devices are established and it is determined that law enforcement does not need an immediate tow, the FST *should* continue to patrol the route until contacted by law enforcement for towing services or to remove the traffic control devices.

6-3-7 Freeway Service Team Sponsorship

November 2016

GENERAL

The department initiated the Freeway Service Team (FST) Sponsorship Program as an innovative source of revenue. The Sponsorship Program is intended to improve the transportation system and benefit the traveling public by increasing their awareness of available services. Additional revenues further enable WisDOT to provide necessary services and enhance the safety and efficiency of the State's highway system.

FST sponsorships offer recognition to a business or other entity for supporting FSTs that improve work zone safety. Sponsorship agreements *may* include sponsor recognition placed on FST vehicles under contract with the department and or signs as outlined in MUTCD [2H.08](#).

GOALS AND OBJECTIVES

The goals and objectives of FST Sponsorship are to:

- Create a public/private partnership to provide FST services
- Increase public awareness of program
- Provide sponsors an opportunities to promote traffic safety

RESPONSIBILITIES

Bureau of Traffic Operations (BTO)

- Management of the FST program via FST Program Manager
- Procure FST services
- Procure FST sponsorship(s)

Regional Traffic Engineers

Notify BTO of preconstruction meetings and project start dates

Other Stakeholders

- Regional Communications Manager
- Law enforcement
- Counties and local officials
- Towing contractors

ELIGIBLE SPONSORS

Eligibility for participation in the sponsorship program is limited to individuals, businesses and organizations that abide by state and federal laws that prohibit discrimination based on race, religion, color, age, sex, national origin, or sexual orientation, that do not promote illegal products or activities, and that do not harm the public image of the state or department.

SPONSORSHIP RECOGNITION

Vehicle marking, registered trademarks and lettering

- A. The Sponsorship Contractor *may* apply markings and trademarks onto the FST trucks operated by Operator Contractors. The sponsor **shall** submit a design to WisDOT for approval.
- B. No other markings *may* be placed on or in the FST vehicles, unless otherwise approved by WisDOT.
- C. Any painting, placing, maintaining, repairing, adding or removing Vehicle Markings, Logos and Lettering must be conducted in such a manner as to not reduce the FST Operator Contractor's contractually required level of performance and availability.
- D. Operator Contractors are required to have backup trucks to be used in the event the primary truck is damaged. When the backup truck is in use the Sponsorship Contractor *may* provide magnetic markings to indicate that the truck is part of the FST. The sponsor **shall** submit a design to WisDOT for approval.
- E. WisDOT will determine when FST Operator Contractor contracts will end.
- F. The sponsor is responsible for removal of all markings, logos and lettering from operator vehicles within two weeks of notification by WisDOT.
- G. The Sponsorship Contractor is responsible for any damage to Operator Contractor vehicles as a result of graphics placement or removal.

ROADSIDE SIGNAGE

The Sponsorship Contractor *may* indicate its sponsorship of the FST program through roadside signage placed at certain designated locations within or approaching work zones where FST Operator Contractor vehicles are operating.

- A. All Sponsorship Contractor signage **shall** be approved by WisDOT inclusive of design and placement.

WisDOT reserves the right to require in certain circumstances signs to be removed, or placed in other locations at WisDOT's sole discretion.

- B. All signs **shall** comply at all times with Federal Highway Administration (FHWA) guidelines, and all applicable Federal and Wisconsin rules, regulations and laws in effect at the present and in the future.
- C. Acknowledgement signs **shall** be designed and installed as follows:
 - i. No more than two signs per direction along a single work zone, in locations approved by WisDOT.
 - ii. Signs (in one direction) *may* be spaced no closer than 3 miles apart except where approved by WisDOT.
 - iii. Sign logo, layout, size and design **shall** be in accordance with the requirements of the MUTCD.
 - iv. Signs shall be considered temporary and will be mounted on wooden posts. Sign size will be approved by WisDOT.
- D. WisDOT will approve all sign locations. The standard sign location will be 800' in advance of the "Road Work Ahead" sign.
- E. The minimum spacing between sponsorship acknowledgement signs and other signs should be:
 - i. 150' on roadways with posted speed limits of 25 MPH or less.
 - ii. 200' on roadways with posted speed limits of 30 MPH to 45 MPH
 - iii. 500' on roadways with posted speed limits greater than 45 MPH
- F. WisDOT will determine when FST Operator Contractor contracts will end.
- G. Placing, replacing, maintaining, repairing, removing, covering or relocating signs must be done in accordance with WisDOT specifications. For questions contact the State Signing and Marking Engineer.

OPERATOR UNIFORMS

The Sponsorship Contractor *may* choose to provide uniforms to FST Contractor Operator drivers. Uniforms must comply with the following:

- A. ANSI Class III compliant safety vests and pants. Vests **shall** have the Sponsors logo worn above the left chest pocket. Contractor **shall** provide enough sets of vests and pants such that each vehicle operator has clean sets of pants and vests.
- B. Sponsor colored baseball type hat. The hat **shall** be made entirely of fabric (no mesh style hats) and will have the Sponsor's logo on the front of the hat above the brim. Contractor **shall** provide enough hats such that the Operator Contractor *may* provide clean, legible hats as needed. FST Operator Contractor operators are not required to wear hats.
- C. Sponsorship Contractor supplied sponsor logo patches/embroideries/prints for the uniforms, **shall** be approved by WisDOT prior to ordering.

6-3-10 Work Zone Incident Management Plans (IMPs)

December 2011

INTRODUCTION

An incident management plan is a set of strategies used to manage work zone traffic operations. These strategies include monitoring traffic conditions within the work zone and adjusting traffic operations based on changing conditions. IMPs address unplanned events or incidents for TMP project type 2 and 3 on freeways/expressways, and all TMP type 4 projects to ensure effective management of responses within the work zone. Formal IMP documents are not required for TMP type 2 and 3 projects on conventional highways, but if the project has detours or other temporary access restrictions, coordinate with emergency service providers regarding incident and access planning. Modify and update the IMP to address field issues as they occur. An IMP helps the contractor and the department to respond appropriately to incidents during construction within a reasonable timeframe in order to maintain traffic flow through the work zone safely. The IMP is part of the TMP and shall be submitted along with the TMP at the time of the completion of the draft PS&E. the draft IMP should be submitted along with the TMP worksheet at the time of the design study report (DSR).

It is the intent of WisDOT to minimize impacts and delays to motorists and to promote safety in work zones. Planning for traffic incidents that occur within work zones is a critical component of reducing delay and increasing the safety, mobility, and reliability of the highway system. The level of complexity of the IMP reflects the duration and complexity of the project and its impacts in the corridor/network. Long-term, complex reconstruction projects, such as the Marquette Interchange, necessitate comprehensive effort with procedures and processes to support the project. Short-term projects on lower-volume roads may simply require a meeting and/or some ongoing coordination with the appropriate local or regional emergency response agency.

Each project presents unique problems for emergency responders and the management of incidents that occur in the work zone. The intent of an IMP is to provide guidance and assistance in selecting mitigation strategies that meet the needs of WisDOT, the contractor, and emergency responders, while enhancing safety and mobility.

Answers to the questions listed below may help identify appropriate elements in the IMP.

1. How will this project impact emergency responses in this corridor?
2. Are there access issues for responding to incidents within the work zone?
3. If an incident closes the highway in one or both directions, how will traffic be rerouted?
4. Are there strategies to minimize project impacts on response agencies?
5. Are there strategies to minimize incident impacts on the public?
6. How will project personnel coordinate and assist emergency responders?

If it is determined that additional strategies are needed to ensure stakeholders' needs are met during construction, the strategies should be identified, documented, and implemented. They may include:

1. Contact lists for construction and utility personnel (include with IMP documentation when the contact lists become available)
2. Procedures for communicating with the contractor during an incident (include with IMP documentation when the procedures become available)
3. Procedures for updating response agencies on traffic control damages
4. Emergency access requirements
5. Variable message signs or other traveler information strategies
6. Detour routes to be used in the event of a long-term incident.

On more complex project where there is no traffic incident management in place, project staff and the contractor should meet with response agencies in the area to identify concerns and consider a full range of strategies to address these concerns. On project with multiple phases, it may be necessary to develop a plan for each phase of the project. The procedures and recommended strategies should be documented and distributed to all response agencies and construction personnel. Strategies that require implementation (e.g. signing, ITS devices, traffic management center, service patrol, etc.) should be planned and budgeted as part of the project and implemented at the start of the project. Training and follow-up sessions will be necessary to ensure that all agencies and construction personnel are familiar with the procedures in the plan. These should also be reviewed, revised, and updated as necessary throughout the life of the project.

Some of the tools that might be documented in the documentation include:

1. Incident levels and associated actions
2. List of response agencies
3. Roles and responsibilities of response agencies
4. Contact information and procedures
5. Scene management guidelines
6. Predetermined alternate routes
7. Resource information.

On any project, the minimum requirement should be to identify whether there is an existing program and determine the role of the contractor in implementing the program. Project staff or the contractor should also

contact appropriate response agencies in the corridor to discuss their concerns with the proposed work zone and agree to procedures and strategies that will support traffic incident management. This communication and coordination is essential for any work zone. On more complex projects, this coordination will become more formalized and require the involvement of more stakeholders. It will necessitate a greater commitment of time and resources on the part of the contractor.

IMP REQUIREMENTS

Identity Stakeholders

In order to ensure work zones are safe and minimize the impact and delay to the traveling public, the plan should be developed in a collaborative effort with the emergency response and public safety community and incorporated into the transportation management plan. Planning for incidents that occur within work zones is a critical component for reducing delay and increasing the safety and reliability of the transportation system. Identify special events that may occur during the construction and may affect work times. Acquire special event coordinator contact information.

The regional project development section (PDS) is responsible for developing a project's TMP. The IMP should be developed by the regional PDS in coordination with the regional traffic section and Statewide Traffic Operations Center (STOC).

Costs

Determining the costs to procure and deploy certain traffic control devices and types of mitigation strategies need to be identified during the scoping of the project. At the latest, the costs should be determined with the TMP.

Work Zone Incident Management Plan Standard Format (i.e., Incident Response Guide)

Each work zone IMP should include an incident response guide that provides a quick, in-the-field reference to response personnel. This ensures fast, effective, and consistent responses to incidents. The format listed below in Figure 1 is the standard table of contents that should be used when developing each IMP. The requirements of each section are described more in depth within this document.

Figure 5. Work Zone Incident Management Plan Outline

| |
|--|
| Project Summary |
| Checklists |
| STOC Checklist |
| Law Enforcement Checklist |
| Project Leader Checklist |
| Regional Incident Management Coordinator (RIMC) Checklist |
| Regional Duty Officer (RDO) Checklist |
| Emergency Contact Information (when it becomes available) |
| Alternate Routes |
| Work Zone Queue Backup Levels |
| Available Barricade Locations for Ramp Closures |
| Activation of Traveler Information Systems |
| Normal Configuration |
| Operational Backups (No Incident) |
| Backups (Incident) |
| Closed Highway |
| Appendices |
| A. Alternate Route Maps (develop or insert if already available) |
| B. Queue Backup and Work Zone Location Maps |
| C. Emergency Access, Pullout and Traveler Information Equipment Location Map |
| D. Project Location Map |
| E. Traffic Volume Charts |

Project Summary

The project summary and description should be described in the IMP. It may simply be the description used in the TMP document. The project summary should describe the location and type of project, the number of construction stages including where the closures will occur and anticipated dates and special events that may affect the work zone. Also include a brief description of traffic volumes and any extraordinary circumstances that need to be accounted for.

Checklists

Checklists are provided for use by the STOC, law enforcement, project leader, regional incident management coordinator (RIMC), and regional duty officer (RDO) in the event of an incident on the freeway/expressway system. Regular check-ins and after action reviews are recommended for all involved.

During an incident involving a work zone on the highway system, the STOC should follow the checklist below in order to collect the necessary information regarding the incident which occurred, contact the response team, and update the traveler information systems with appropriate up-to-date information.

STOC Checklist:

1. When receiving the call from law enforcement, ensure they provide the following information:
 - a. Location of incident
 - b. Whether it is located in a work zone
 - c. Affected lanes
 - d. Incident type
 - e. Approximate incident duration
 - f. Extent of backup
2. Must have immediate contact with:
 - a. RIMC when there is a full highway closure in one or both directions that is expected to last greater than two hours
 - b. RIMC whenever backups with or without an incident reach 3 miles or greater
 - c. PIO, if available
 - d. After incident and/or backup, ensure message boards are returned to lower level or normal configuration
 - e. RDO if contractor or project staff assistance is needed in a work zone
 - f. SINS email sent for an incident blocking 50% or more of the highway lanes and/or a system ramp
 - g. Freeway Service Team (if available)
3. Once alternate routes are implemented, STOC will refer to the alternate route guide
4. Change traveler information in the following order:
 - a. Message boards
 - b. Message on highway advisory radio
 - c. Place 511 message if necessary
5. Regular check-ins

During an incident involving a work zone on the highway system, the responsible law enforcement agency should follow the checklist listed below in order to report the necessary information regarding the incident which occurred, identify the severity of the incident, and deploy traffic control.

Law Enforcement Checklist:

1. Contact dispatch to report any incident or backups and the following information:
 - a. Incident type
 - b. Location of incident
 - c. Best route to incident
 - d. Extent of backup
 - e. Establish a field command post
 - f. Whether incident is located in a work zone
 - g. Affected lanes

2. Identify incident classification
 - a. Minor – less than 30 minutes duration
 - b. Intermediate – 30 minutes to 2 hour duration
 - c. Major – duration greater than 2 hours
3. Initiate traffic control as appropriate
 - a. If traffic message boards are required, contact STOC
4. Inform media of highway incident (TIA)
5. State Patrol dispatch will contact STOC and advise the above information
6. If assistance is needed in work zone, contact STOC
7. If specialized equipment is needed in work zone, see contact list or list contacts:
 - a. Equipment type: _____ Contractor Contact: _____
(Example: crane to move barrier wall)
 - b. At the conclusion of the incident, make appropriate demobilization notifications

The WisDOT project leader will follow the necessary steps during an incident.

Project Leader Checklist:

1. Project leader will contact event incident commander or State Patrol duty officer as situation warrants
2. Project leader will function as liaison for contractors
3. Project leader will contact project manager and/or project supervisor at backups of 5 miles or as situation warrants

The WisDOT regional incident management coordinator (RIMC) will follow the necessary steps during an incident.

RIMC Checklist:

1. RIMC will contact project leader as situation warrants
2. RIMC will contact event incident commander or State Patrol duty officer as situation warrants
3. RIMC will function as liaison for county highway departments
4. RIMC will contact DTSD regional duty officer at backups of 5 miles or as situation warrants
5. RIMC will perform regular check-ins

The WisDOT regional duty officer (RDO) will follow the necessary steps during an incident.

RDO Checklist:

1. RDO will coordinate project resources with contractor or regional staff as situation warrants
2. RDO will coordinate media release as situation warrants
3. RDO will mitigate traffic displays if possible

Emergency Contact Information

This table should be a complete list of contacts that may be notified during an incident within the work zone and completed at the time of the pre-construction meeting or as soon as the contact information is known. Additional persons may be identified.

* = Indicates number can be used 24 hours

| AGENCY | CONTACT | OFFICE | CELL/OTHER |
|---|-------------|---------------|-----------------------|
| STATE TRAFFIC OPERATIONS CENTER (STOC) | | | |
| STOC | Main Number | 800-375-7302* | 414-227-2166 (Office) |
| LAW ENFORCEMENT | | | |
| Wis. State Patrol Emergency | | | |
| State Patrol Dispatch | | | |
| State Patrol Officers | | | |
| _____ County Sheriff | | | |
| _____ County Sheriff | | | |
| _____ Police Dept. | | | |
| _____ Police Dept. | | | |
| _____ Police Dept. | | | |
| _____ Police Dept. | | | |
| _____ Police Dept. | | | |
| _____ Fire Dept. | | | |
| _____ EMS | | | |
| DOT REGION MANAGEMENT | | | |
| Regional Duty Officer | | | |
| RIMC | | | |
| DOT Supervisor – PDS | | | |
| DOT Manager – PDS | | | |
| Regional Director | | | |
| Maintenance Supervisor | | | |
| Traffic Supervisor | | | |
| COUNTY PERSONNEL | | | |
| _____ County Commissioner | | | |
| _____ County Commissioner | | | |
| PROJECT STAFF | | | |
| Project Field Office | | | |
| Project Leader | | | |
| Project Manager | | | |
| PRIME CONTRACTOR | | | |
| | | | |
| | | | |
| Specialized Equipment Contractor | | | |
| TRAFFIC CONTROL - GENERAL | | | |
| General _____ | | | |
| Message Boards _____ | | | |
| OTHER TRAFFIC/EMERGENCY CONTACTS | | | |
| DOT Public Information Officer | | | |
| Freeway Service Team | | | |
| Special Events Coordinators | | | |

Alternate Routes

If the corridor does not already have alternate routes established, project-specific alternate routes should be identified with each work zone on the highway system. Consistency in selecting alternate routes is an important aspect of the program. The following criteria provide a common starting point for evaluating potential alternate routes.

1. Use state highways whenever possible.
2. Consider long truck routes when available.
3. Avoid alternate routes with weight restrictions.
4. Avoid height restrictions imposed by bridge clearances, power lines, etc.
5. Avoid routes that require traffic to make 90-degree turns.
6. Avoid at-grade railroad crossings, especially those with a high number of trains.
7. Avoid four-way stops.
8. Select routes that carry traffic in the same general direction as the Interstate.

9. Minimize length of alternate routes.
10. Consider routes with coordinated signal timing plans or avoid routes with multiple uncoordinated signals.
11. Avoid traversing residential areas and school zones.
12. Carefully consider all routes options and closure requirements at interchanges, especially system interchanges.

Based on these criteria, a preliminary list of emergency alternate routes can be identified for freeway segments within a given study area. Potential routes should be evaluated to ensure that the roadway can handle freeway-type traffic volumes. A field review of potential emergency alternate routes should be conducted to confirm route selection. For further guidance in determining appropriate alternate routes, contact the STOC.

Provide a brief explanation of alternate routes. For example, "The preferred alternate routes for I-94 are the existing frontage roads. These provide quick access by traffic and limit the amount of adverse travel. If traffic backups extend beyond the listed access points, longer alternate routes can be implemented.

Explain alternate routes in detail below and provide alternate route maps in an appendix. For example, "For SB: Traffic can be diverted west on WIS 100 (Ryan Rd) to WIS 36, southwest on WIS 36 to US 45 to WIS 20 back to I-94. For NB: Traffic can be diverted west on WIS 20 to US 45, north on US 45 to WIS 36 to WIS 100 (Ryan Rd) and then east on WIS 100 back to I-94."

If traffic backups extend beyond the access points of the barricade locations listed, longer alternate routes can be implemented.

Provide information on who needs to be contacted for each alternate route option. For example, "Contact STOC, State Patrol, Racine County, Village of Caledonia when alternate routes are implemented. See contact list."

See appendix for alternate route map to be used for this project.

Work Zone Queue Backup Levels

Queue backups should be based on the start of the work zone for each direction that may be affected. To determine queue backups, the General Lane Closure Impact Analysis found on UW Transportal (<http://transportal.cee.wisc.edu/closures/devel/>) or a separate analysis should be used. Maps of the queue backup and work zone including crossover locations shall be provided in the appendix of the IMP.

Available Barricade Locations for Ramp Closures

The IMP shall identify a list of the available barricade locations. During an incident, the incident commander organizes the ramp closures. Locations of barricades shall be included on the specialized equipment location map in the appendix.

Available Barricade Locations

| Highway Ramp & Direction | Number of Barricades | Distance from Work Zone |
|--|----------------------|-------------------------|
| <i>Ex. Hwy KR to I-94 East (SB) ramp</i> | <i>1 ramp gate</i> | <i>1 mile</i> |
| | | |
| | | |

Activation of Traveler Information Systems Scenario Examples

Contact the STOC for activation of traveler information systems. Choose the sample messages below for use on traveler information devices.

Normal Configuration

Contact STOC

Operational Backups (No Incident)

Radio Message:

There are significant delays affecting motorists heading <direction> on <mainline highway> between <highway> and <highway> in <county> County. Motorists are encouraged to use alternate routes to avoid delays.

Message Board # _____ at _____:

Traffic Delay Ahead/Alternate Route Exit ##

Traffic Delay Ahead/Use Alternate Route

Delays XX Miles Ahead/Tune to AM #####

Additional message boards can be placed along the highway to notify the motorist.

Backups (Incident)

Radio Message:

As of <date/time>, law enforcement is reporting that a traffic incident is adversely impacting motorists heading <direction> on <mainline highway> between <highway> and <highway> in <county> County. Motorists are encouraged to use alternate routes to avoid delays.

Message Board # _____ at _____:

Incident Ahead Use/Alternate Route Exit ##

Incident Ahead/Use Alternate Route

<Left/Right/Center> Lane Blocked/Expect Delays

<Left/Right/Center> Lane Blocked/Use Alternate Route

Delays XX Miles Ahead/Tune to AM #####

Additional message boards can be placed along the highway to notify the motorist.

Blocked Highway

Radio Message:

As of <date/time>, law enforcement has closed <mainline highway> between <highway> and <highway> in <county> County to <direction> traffic. Motorists traveling <direction> must exit <mainline highway> and use alternate routes.

Message Board # _____ at _____:

Incident Ahead Use/Alternate Route Exit ##

Highway Closed Ahead/Exit at <highway>

Highway Closed Ahead/Follow Alternate Route

Highway Closed Ahead/Tune to AM #####

Additional message boards can be placed along the highway to notify the motorist.

Regularly review and revise the IMP to monitor current practices, identify and resolve issues to minimize frequency of incidents and severity. Assign an individual(s) on complex projects with the responsibilities of ensuring the IMP is up to date.



PURPOSE

The purpose of this subject is to provide some general guidelines for the selection of traffic signal control vs. stop sign controls at long-term (non-flagging) one-lane bridge construction sites. Since each one-lane bridge site is unique, a site-specific investigation of the factors affecting the selection *should* be done. A number of variables can influence the selection, so a definitive breakpoint between the two options cannot be defined. This subject will provide a discussion of the variables which *should* be analyzed and provide some general guidelines on the selection process.

FACTORS INFLUENCING THE CONTROL SELECTION

The following factors *should* be considered when evaluating the type of control at one-lane bridge sites.

1. Average Daily Traffic (ADT). This is a good general indicator in the selection process. Below 1,000 ADT or 100 vehicles per hour, a STOP sign control can usually be used without experiencing operational problems. Above 3,000 ADT, a traffic signal is usually a better choice for more efficient operation. These ADT values are not absolute and the other factors must be considered in the selection process.
2. Peak-Hour Traffic. If the bridge site is located near a larger city or on a recreational travel route or carries special event traffic, the peak-hour traffic will be a greater factor than the ADT. The bridge control must be able to accommodate the peak-hour traffic within a reasonable amount of time delay.
3. Directional Traffic Distribution. This again will be a factor if the bridge site is located just outside a large city on a route which is a major radial commuting route, or is a major recreational route.
4. Width Restriction. The width *may* influence the speed of traffic, increasing the clearance time necessary for a single vehicle to cross the bridge. The additional clearance time will reduce the capacity of both a stop-control and signal-control bridge site.
5. Time Duration of Project. For shorter projects (1-2 weeks), it *may* be acceptable to tolerate slightly oversaturated stop-control conditions, rather than implement a signal-control scheme.
6. Distance between Stoplines. This will greatly affect the one-lane capacity because it will dictate the clearance time necessary for a vehicle to cross the bridge. The stoplines *should* be kept as close as possible to the ends of the bridge allowing for necessary storage of construction equipment and placement of traffic control devices. Typically, each stopline *should* be placed about 150-250 feet from the end of the bridge. This allows workspace (usually less than 100 feet) for the contractor off the end of the bridge and a taper for the single-lane transition. With this constraint, the typical stopline-to-stopline distance is 300-500 feet, plus the length of the bridge. See SDD [15D33](#) (Traffic Control, One Lane Road with Temporary Signals) and [15D32](#) (Traffic Control, One Lane Road Stop Condition) for more details on dimensions and traffic control layout.

On projects which involve bridge approach resurfacing of several hundred feet, the bridge work involving the one-lane controls *should* be staged first, thus allowing the closest stopline-to-stopline distance possible. Then, after the bridgework is completed, the one-lane bridge controls can be removed. The approach resurfacing can be completed by using a flagging operation. Further discussion is found under Special Cases.

7. Sight Distance between Stoplines. This factor in itself could dictate the control type. If adequate sight distance is not available (if bridge is an overpass on a sharp crest, or construction equipment or temporary concrete barrier is expected to block site), then traffic signal control must be used to assign right-of-way across the one-lane bridge. The stop-control situation, which is self-regulating, would fail without adequate sight distance, because it relies on motorists to see each other in order to determine which vehicle has the right-of-way.



INTRODUCTION

Highway advisory radio (HAR) is a supplemental method of providing motorists with information about traffic conditions. HAR is basically a low-powered AM radio station located near a highway and capable of transmitting within a range of several miles. Signs posted on the highway instruct drivers to tune their vehicle radios to the appropriate broadcast frequency.

HARDWARE

The hardware consists of a radio transmitter, groundplane wiring, antenna, and message recording device. The antenna is mounted on a wood pole, and extends about 50 feet above the ground. The transmitting and recording devices are located in a rectangular grid of about 20 feet by 10 feet, or a circular pattern with wiring radiating from the pole for a distance of up to 50 feet.

BROADCAST FREQUENCY

The 530 AM band is reserved for use by traveler information stations (TIS), which includes highway advisory radios. Other types of stations classified as traveler information stations would include historical sites, airports, national parks and forests, and local tourist information offices. Until recently, the 1610 AM band was also reserved for TIS. Recent changes in FCC rules have opened up the 1610 AM band for commercial radio stations. The new rules also open up the entire 5040 AM to 1700 AM band for TIS, if there are not conflicting commercial stations operating on a close frequency to the proposed TIS frequency. Section 90.242 of the FCC guidelines summarizes the rules for TIS licensing and operation.

FCC LICENSING

If HAR operates at more than one watt power, it must be licensed by the FCC. Normally, a license approval takes 4-6 months. However, a special temporary license (special temporary authorization) *may* be obtained within 10 working days. In order to receive the special temporary authorization, a justification letter must be sent to the FCC indicating the critical need for the temporary license. The letter *should* stress the impacts (traffic delays if radio is not functional) that would result without having HAR. Usually, governmental agencies are able to receive special temporary authorization upon request.

FCC RULES FOR TRAVELER INFORMATION STATIONS (TIS)

The FCC rules are contained in Section 90.242 of the FCC guidelines (available from C.O. Traffic Operations). This includes information as to eligibility, message content, signal strength, and licensing.

Previous license requests for WisDOT have been prepared by a special radio station consultant for a fee of \$150. The consultant asks us to complete a two-page form indicating the location, elevation, nearby airports, message content, and responsible person for the proposed HAR. The consultant then transcribes this information on an official FCC application.

REMOTE CONTROL

The digital recording equipment inside the HAR cabinet is capable of storing a limited duration of messages. This allows the messages to be prerecorded, stored, retrieved, spliced, and broadcast together as a series.

The system is accessed by making a telephone call to the recording device. A menu is provided which allows the operator to record, store, retrieve, splice, and review messages by using the telephone keypad to enter specific commands. The HAR is generally operated by the State Patrol communications officers. A pass code is provided to deter unauthorized entry into the system. The system can be accessed using any touchtone phone.

UTILITIES

The HAR will need 110-volt AC power at the site. A dedicated telephone line is also needed for remote control. The telephone line *should* be a "shielded" line.

The cost to purchase the HAR hardware and install is about \$10,000 per station. Additional costs will be incurred for providing electric power and telephone lines to the transmitter site, on-highway signing to alert motorists to the HAR, and monthly power and telephone operating costs. These additional costs would be about

\$5,000 per HAR. Therefore, the project cost to install and operate a new HAR for a single construction season would be about \$15,000.

SIGNING

Signs *should* be erected in advance of the HAR to instruct motorists to tune their radios to the appropriate frequency. The signal *should* be checked before the signs are placed to ensure a good quality signal at the proposed sign location. The standard sign for construction projects is CONSTRUCTION ADVISORY TUNE RADIO TO 530 AM. A supplemental plaque stating SPECIAL INFO WHEN FLASHING *may* be added along with a pair of yellow lights. The lights would be activated only when a critical message is being broadcast. Activation of the light would be remote controlled via a telephone call to a special remote control device at the sign. If the HAR will be temporarily out of use, the signs *should* be covered or removed.

PURCHASE

The HAR stations can be purchased using highway improvement funds. Because of the specialized nature of the equipment and installation, it is desirable to purchase through the state procurement process so the state has better control over acceptance of the equipment.

MESSAGES

Messages *should* be short enough in duration that the drivers will be able to tune their radios and listen to the entire message twice while within the broadcast range. Usually, messages of about one minute. It is suggested not to exceed two minutes. The messages recycle constantly.

Usually a general message is provided and can be supplemented with additional critical messages as traffic conditions become congested. The two messages can be spliced and played back-to-back without interruption. A general message would include a distance to the project, a description of potential traffic impacts, possible alternative routes, and a suggestion to watch for additional signing (perhaps changeable message signs) for more updated information.

LOCATIONS

The locations for HAR are usually determined from the limits of the construction project or a construction bypass route exit. If a construction bypass is used, the HAR *should* be located well in advance of the exit so drivers can tune, listen, and be prepared to look for the bypass exit. A distance of at least three miles is recommended.

Interchange areas are good locations because of the usable space and availability of utilities as the crossroad. Also, the crossroad *may* provide safer access to the site than having to install and service the equipment by stopping near the live lanes of the Interstate.



GENERAL

When a local or county road is used as a STH detour route, the geometric characteristics of that route such as shoulder or pavement width or alignment often times are less than the characteristics of the STH route. Despite these conditions, the local road has been chosen as a detour route because it is the best alternative. Although the geometric standards *may* not be able to be upgraded, traffic control devices such as signing and marking *should* be upgraded to the same standards as the STH system. Exceptions are outlined below.

SIGNING

Concern has been expressed that local jurisdictions will incur some liability if signs are placed on their routes as an upgrade of their current standards during a STH detour and then removed. WisDOT General Counsel has determined that temporarily upgrading the signing along the local route does not place a liability upon the local municipality. (See attached December 3, 1991)

WARNING AND REGULATORY SIGNING

The signing along the detour route, Stop Signs, No Passing zone pennants, Curve, Turn and other warning and regulatory signs **shall** be installed along the route as if the detour route were a state trunk highway. If the detour will be in place less than two weeks, the Region will determine to what extent, if any, the signing will be upgraded. In the case of an emergency detour, the signing will be upgraded as soon as possible depending on the anticipated duration of the detour.

JUNCTION AND REASSURANCE ASSEMBLIES

Orange auxiliary arrows and detour auxiliary plaques **shall** be used in route marker assemblies in advance of and along the detour route. Reassurance markers **shall** be placed after every major intersection or at a spacing not to exceed two miles in rural areas and two blocks in urban areas.

QUALITY OF SIGNS

The condition of the signs used along the detour route **shall** be such that the signs have good daytime visibility and nighttime reflectivity. Care must be taken to ensure the signs are in good enough condition to command the respect and attention of motorists. This is especially important on detour routes since typically motorists who are unfamiliar with the route are depending on these signs for guidance.

REMOVAL OF DETOUR SIGNING

Some of the signs along the route *may* have been added to upgrade the route to STH signing standards. The local Jurisdiction *may* not wish to have these signs remain in place after the detour is no longer in place. Sign removal *should* be dependent on the wishes of the local Jurisdiction.

PAVEMENT MARKING

The condition of the marking *should* be such that it provides daytime and nighttime visibility and *should* be approximately equal in quality to that prevalent on State Trunk Highways.

CENTER LINE AND EDGE LINE MARKING

Unless the detour will be in place less than two weeks, the edge line and center line marking along the detour route *should* be in general agreement with WisDOT policy for marking on the STH System. If the detour will be in place less than two weeks, the Region will determine which, if any, markings need to be upgraded.

NO PASSING ZONE MARKING

Since local jurisdictions do not have the same No Passing zone criteria as the STH System, in some cases, the No Passing zones *may* need to be relocated using STH criteria. The Region is responsible for determining if the difference between local and STH criteria used when locating the zones differs enough to warrant remarking of the zones.

REMOVAL OF DETOUR PAVEMENT MARKING

If the marking along the route has been upgraded it is up to the Region and the local jurisdiction to determine if the marking *should* stay in place. Marking removal can be accomplished by contract or by resurfacing the roadway upon the completion of the detour.



**Wisconsin Department of Transportation
Office of General Counsel**

MEMORANDUM

To: Lee F. Crook
From: Jim Thiel *Jim Thiel*
Date: December 3, 1991
Subject: Policy on Detour No Passing Marking; OGC 91-456

You asked whether the policy of marking state trunk highway detours on local roads with the yellow and black NO PASSING ZONE warning pennants causes a legal problem of liability for the local agency when the detour is removed and the pennants are removed.

It is my opinion that the answer is NO, if the pennants are removed at the request of the local agency when the detour is removed. The reason is that installation of the NO PASSING ZONE pennant is a discretionary, policy decision on local roads by local governments. The local government traffic engineers can most appropriately decide what they want, i.e. no-passing zone pavement markings or black and white DO NOT PASS signs or combinations of the above and the NO PASSING ZONE pennants.

The Manual on Uniform Traffic Control Devices (MUTCD), paragraph 2C-38 deals with the NO PASSING ZONE sign (W14-3). It says the NO PASSING ZONE sign "should be used on two-lane roads to warn of the beginning of no-passing zones identified by either conventional pavement markings or DO NOT PASS signs or both." Our Wisconsin supplement to the MUTCD says "The W14-3 No Passing Zone sign shall be used on State Trunk Highways to designate no-passing zones." Paragraph 1A-5 of the MUTCD defines "shall" as a "mandatory condition. Where certain requirements in the design or application of the device are described with the "shall" stipulation, it is mandatory when an installation is made that these requirements be met." It defines "should" as "an advisory condition. Where the word "should" is used, it is considered to be advisable usage, recommended but not mandatory." Therefore use of the NO PASSING ZONE pennant is discretionary by local governments on local roads.

In considering whether to ask WISDOT to remove the pennants when the detour is removed, the local government is in the best position to make the policy decision whether uniformity of marking on the local system outweighs any marginal benefit of retention and maintenance of NO PASSING ZONE pennants when the STH detour is removed. There is no statutory requirement imposed on local governments to install or maintain NO PASSING ZONE pennants. There is no ministerial, mandatory duty for local governments to install them on local roads under the MUTCD. The local government may decide to retain the signs and maintain them as a safety precaution to the traveling public. Although there is no local, legal duty to erect them in the first instance, if the local government decides to keep them after the detour is removed, a court might decide there is a local, common law duty to maintain the signs in good condition if the court decides the public has developed a right to rely on their continued presence.

cc: Pete Rusch, Julie Neebel, Chuck Spang, Gerry Roth



Traffic Engineering, Operations & Safety Manual

Chapter 8 Railroad Grade Crossings

Section 2 Signs and Markings

8-2-2 Grade Crossing Sign Installation

February 2018

PURPOSE

Railroad corporations have unique legal abilities and responsibilities. Due to this fact, some signage responsibility for highway traffic falls to the railroad. These requirements are listed in various sections of the Wisconsin State Statutes. This policy will clarify installation and maintenance responsibilities for traffic signs at at-grade crossings.

DEFINITIONS

Passive Grade Crossings are defined as at-grade highway-railroad crossings without automatic gates or flashing-light signals.

Maintaining Authority is defined as the unit of government with the responsibility for roadway maintenance at a given crossing.

POLICY AND GUIDELINES

The following table summarizes the installation and maintenance responsibilities of various sign installed in conjunction with at-grade railroad crossings. See the text following the table for further details.

| SIGN | INSTALLED BY | MAINTAINED BY |
|------------------------|-----------------------|-----------------------|
| R15-1 | Railroad | Railroad |
| R15-2P | Railroad | Railroad |
| R1-2 | Railroad | Railroad |
| R1-1 | Maintaining Authority | Maintaining Authority |
| R15-3P | Maintaining Authority | Railroad |
| R8-9 | Railroad | Railroad |
| W10-1 | * | Maintaining Authority |
| W10-1A | Maintaining Authority | Maintaining Authority |
| Other W10 series signs | Maintaining Authority | Maintaining Authority |
| I-13 | Railroad | Railroad |

REGULATORY SIGNS

R15-1 (Crossbuck) signs: These signs **shall** be installed and maintained by the Railroad at all at-grade crossings, per [State Statute 192.29\(5\)\(a\)](#). The railroad **shall** also install and maintain an R15-2P (Number of Tracks) sign below the R15-1 at all non-gated grade crossings with multiple tracks.

R1-2 (Yield) signs: These signs **shall** be installed and maintained by the Railroad at all non-stop controlled passive grade crossings, per [State Statute 192.29\(5\)\(b\)](#).

R1-1 (Stop) signs: These signs *may* be installed at at-grade crossings when deemed necessary for the public safety. If installed, these signs **shall** be installed and maintained by the maintaining authority, per [State Statute 349.085](#).

R15-3P (Exempt): These signs **shall** be installed underneath the R15-1 sign (or R15-2P sign, if present) at crossings declared Exempt by the Office of the Commissioner of Railroads. The initial furnishing and installation of these signs **shall** be the responsibility of the maintaining authority, but **shall** be maintained by the Railroad. See [State Statutes 195.285](#) and [346.45\(3\)\(d\)](#).

R8-9 (Tracks Out of Service) signs: These signs should be used in place of crossbucks when railroad tracks have been taken out of service as described in the [2009 Wisconsin MUTCD](#) Section 8B.10. These signs **shall** be installed and maintained by the Railroad.

WARNING SIGNS

*W10-1 (Grade Crossing Advance Warning) sign: These signs **shall** be installed at all at-grade highway crossings, unless specifically not required in the [2009 Wisconsin MUTCD](#) Section 8B.06. When used, these signs (and any needed replacements) **shall** be furnished, upon request, by the Railroad for at-grade crossings of county or township maintained roadways, and by the maintaining authority for at-grade crossings of state, city, or village maintained roadways. These signs **shall** be installed by the maintaining authority. See [State Statute 195.286\(1\)](#).

W10-1A (Exempt) sign: These signs **shall** be installed underneath the W10-1 sign at crossings declared Exempt by the Office of the Commissioner of Railroads. These signs **shall** be installed and maintained by the maintaining authority. See [State Statutes 195.285](#) and [346.45\(3\)\(d\)](#).

All other W10 series signs – If used, these signs **shall** be installed and maintained by the maintaining authority.

OTHER SIGNS

I-13 (Emergency Notification Sign): These signs **shall** be installed and maintained by the Railroad at all at-grade highway crossings. These signs **shall** also be installed by the Railroad at all private at-grade crossings, by request of the landowner, per [State Statute 192.29\(6\)](#).

8-2-29 Dynamic Envelope Markings

November 2015

PURPOSE

The MUTCD Section [8B.29](#) defines dynamic envelope pavement markings as a 4-inch solid white line, placed parallel to and 6 feet away from the nearest rail of an at-grade crossing. The MUTCD further defines a supplemental marking consisting of 12-inch solid white lines, placed at a 45-degree angle and 5 foot spacing between the 4-inch solid lines. This policy will define when a dynamic envelope pavement marking installation *may* be desirable.

POLICY AND GUIDELINES

Between the 4-inch parallel lines, dynamic envelope markings fully cover 20 percent of the driving surface. This broad coverage area presents a potential safety hazard to bicycles and motorcyclists, as pavement marking material offers significantly less surface friction than unmarked pavement. In addition, this large amount of marking creates a maintenance issue for the department. For these reasons, the following policies **shall** apply to dynamic envelope marking installations on state maintained roadways:

1. Dynamic envelope pavement markings **shall not** be permanently installed on state maintained roadways. They **shall** only be used at at-grade crossings along detours of State, US, or Interstate highways on non-state maintained roadways.
2. Dynamic envelope pavement markings **shall not** be installed without prior approval from DTIM Rails and Harbors Section.
3. If used, dynamic envelope markings **shall** conform to the attached details (Figures 1-7).
4. Dynamic envelope markings **shall** be supplemented by appropriate signs, such as R8-8 DO NOT STOP ON TRACKS or W10-11-A Storage Space sign.
5. If installed along a detour route, the markings **shall** be either temporary paint or temporary epoxy. After construction, the department will not remove the markings. The maintaining authority of the roadway *may* remove the markings, maintain the markings, or allow the markings to fade away.

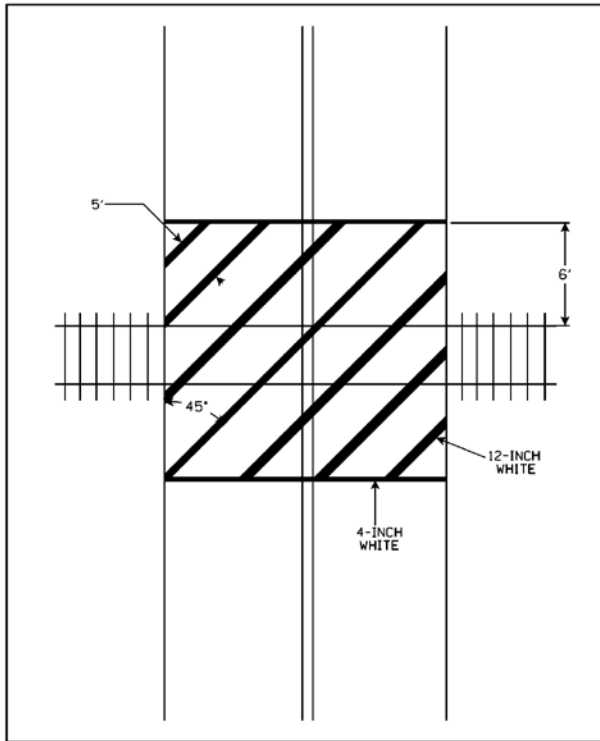


FIG. 1 90° CROSSING
DYNAMIC ENVELOPE MARKING

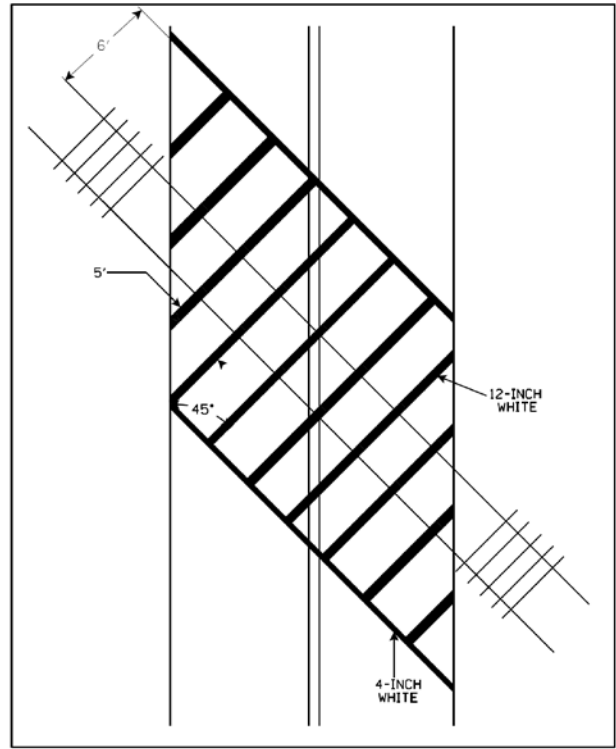


FIG. 2 LHF SKEW
DYNAMIC ENVELOPE MARKING

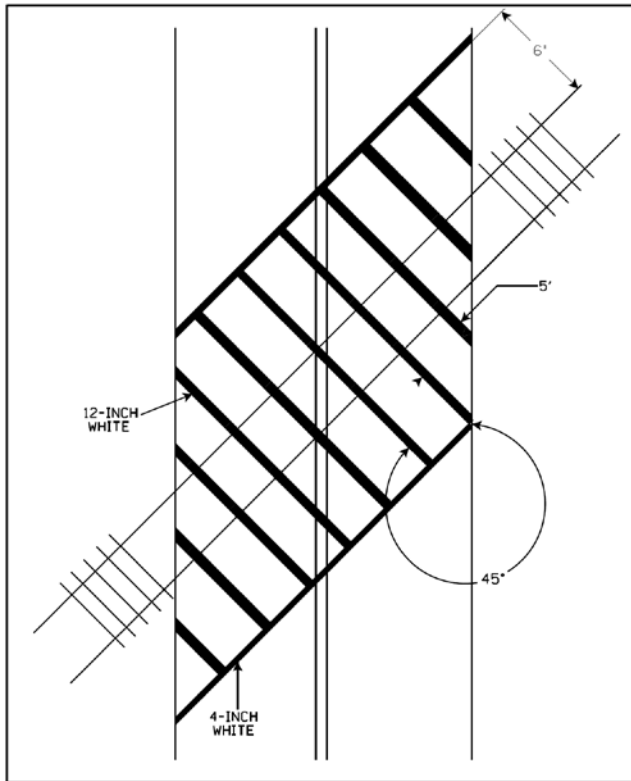


FIG. 3 RHF SKEW
DYNAMIC ENVELOPE MARKING

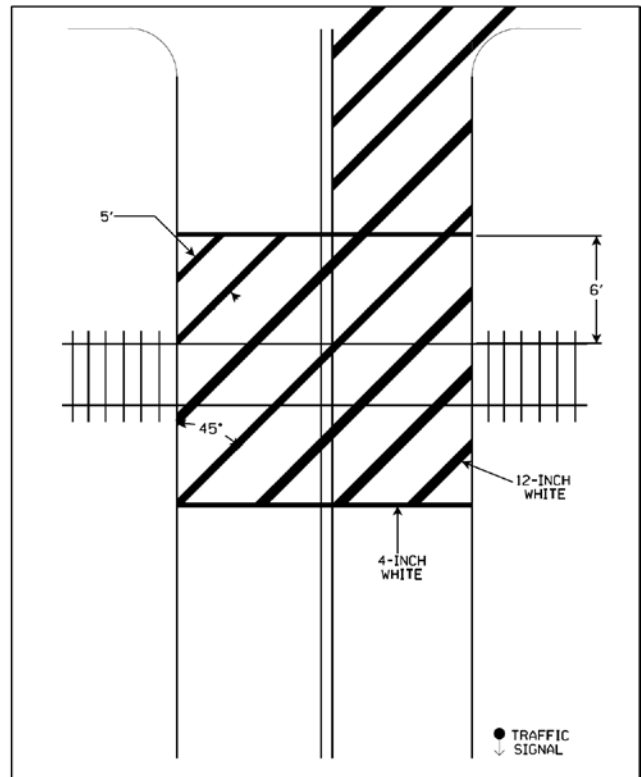


FIG. 4 90° CROSSING
SUPPLEMENTAL DYNAMIC ENVELOPE MARKING

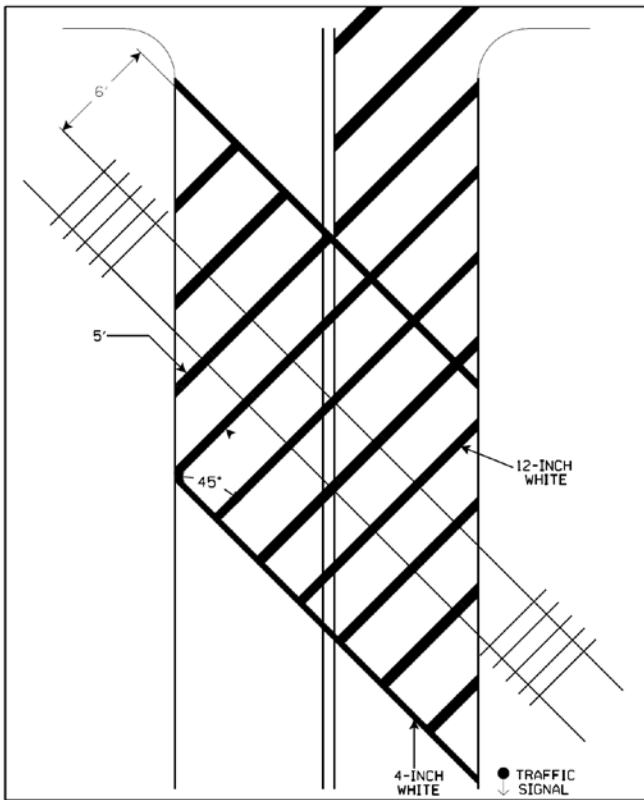


FIG. 5 LHF SKEW

SUPPLEMENTAL DYNAMIC ENVELOPE MARKING

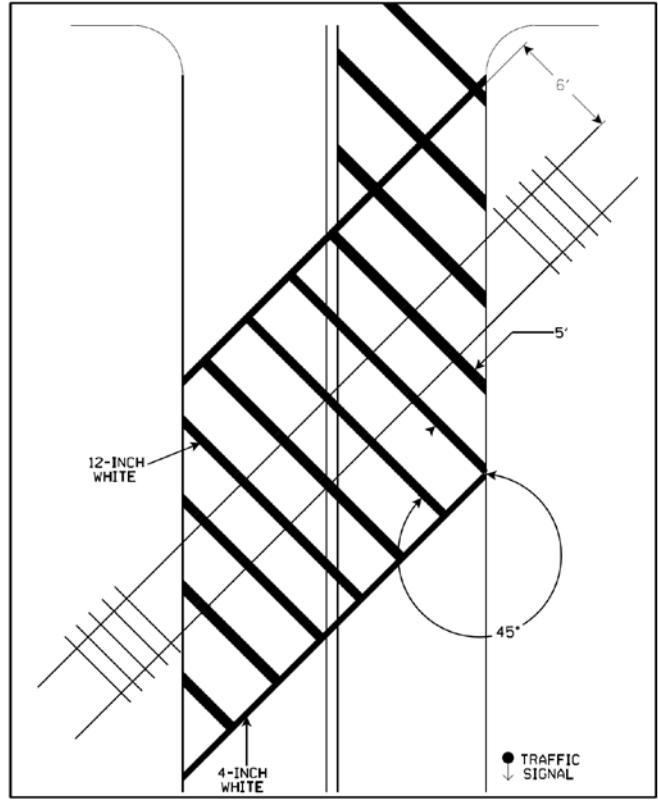


FIG. 6 RHF SKEW

SUPPLEMENTAL DYNAMIC ENVELOPE MARKING

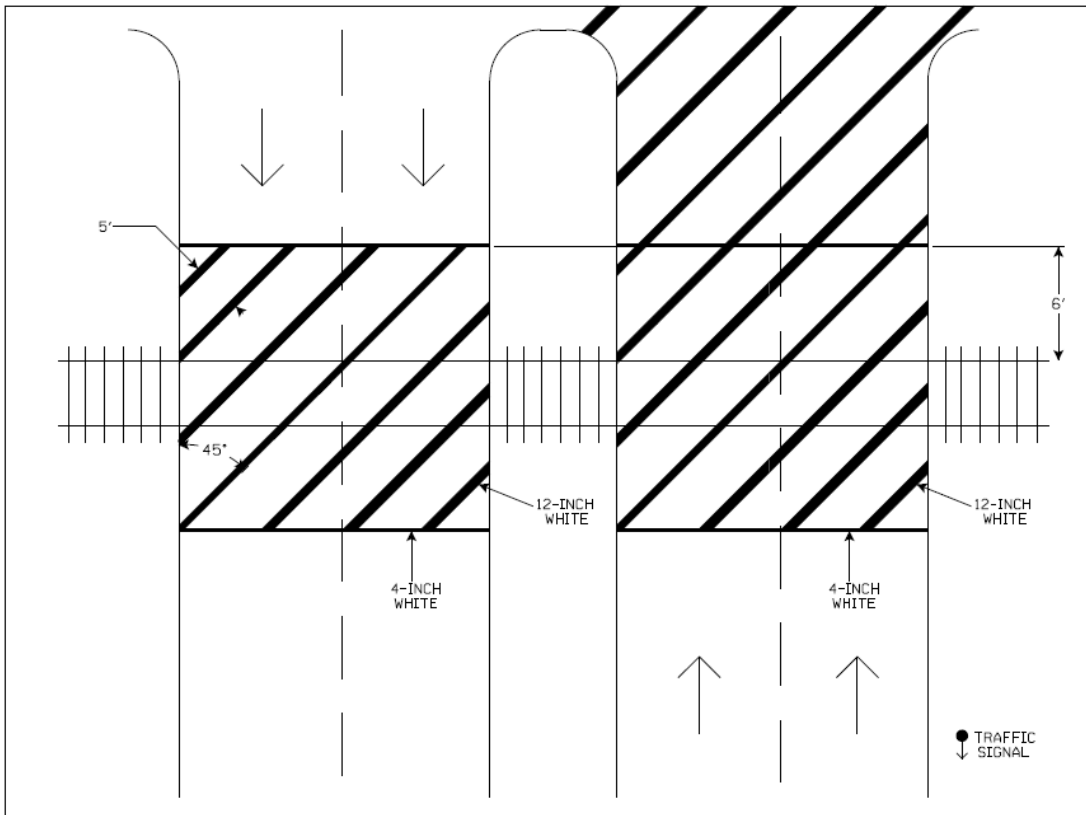


FIG. 7 4 LANE DIVIDED

SUPPLEMENTAL DYNAMIC ENVELOPE MARKING



9-2-18 SHARE THE ROAD Bicycle Warning Signs

April 2010

GENERAL

The MUTCD Section [9B.18](#) gives guidance on the usage of several types of bicycle warning signs. One warning sign mentioned is the SHARE THE ROAD (W16-1) plaque, which may be used in conjunction with the Bicycle Warning (W11-1) sign. The MUTCD states that the sign combination may be used to warn motorists to watch for bicyclists along the highway. However, the MUTCD guidance is general and does not specifically address problem areas. As a result, this sign combination has the potential to be overused and misused, which can result in motorist non-compliance of the signs in general. This policy will provide specific guidance as to where this sign combination may be used and restrict usage to areas where motorists may not be aware of bicyclists entering the roadway.

POLICY

The SHARE THE ROAD (W16-1) plaque **shall** only be used provided the following requirements are met:

1. Locations where there is a geometric change that would direct a bicyclist from a dedicated bikeway or paved shoulder into the travel lane.
2. The SHARE THE ROAD (W16-1) plaque shall not be used for roundabout locations. For roundabouts, it is expected that bicyclists and pedestrians will enter the roadway. If there are problem areas for roundabouts, the standard pedestrian crossing (W11-2) sign should be installed with supplemental arrow plaque (W16-7) sign.
3. In locations where the SHARE THE ROAD (W16-1) plaque is used, it **shall** be mounted below the standard Bicycle Warning (W11-1) sign or other appropriate warning sign (i.e. Narrow Bridge (W5-2) sign). The SHARE THE ROAD plaque **shall not** be mounted by itself on a post.
4. For locations requiring the usage of the SHARE THE ROAD (W16-1) plaque, and Bicycle Warning (W11-1) sign, WisDOT will pay for the installation and maintenance of the signs on the state highway system.

9-2-19 Bicycle Signing

June 2014

BACKGROUND

At times, the Department receives requests for the installation of signing pertaining to bicycle routes and bicycle lanes. These signs are often requested for areas where there are designated bicycle routes or lanes that run concurrent with State maintained roadways. The MUTCD Section [9B](#) provides guidance on the placement of regulatory and guide signs for bicycles in order to provide guidance of decision points and reassurances along established bike routes. The intent of this policy is to clarify the MUTCD language and to establish a policy as to where WisDOT will allow the usage of bicycle route signs on State maintained roadways.

GENERAL POLICY

Bike Route signs *may* be used on the State highway system provided the following criteria are met:

1. The bike route would need to be an official, continuous route that is part of a national, local, or regional bike route system and would generally be considered a good candidate (adequate shoulder width on roadway and/or lower than 1000 ADT) for signage. Guide sign requests for bicycle routes *should* be coordinated between the Region Traffic Engineer and Region Bike/Pedestrian Coordinator.
2. The Region Traffic Engineer will review the request with the Region Bike and Pedestrian Coordinator. If the proposed bike signing is approved, a permit **shall** be issued to the local unit of government that is accepting long-term maintenance of the signing. Permit Form DT2500₁ is attached to this policy. A copy of the approved permit **shall** be sent to the local government and a copy **shall** be filed in the Region Office.
3. For installation of the signs, WisDOT will determine the locations of the signs. For communities requesting the signs, the appropriate county highway department, municipality or a WisDOT approved

signing contractor **shall** be contacted to install the signs. For counties requesting the signs, the county highway department *may* perform the installation following approval from the traffic operations engineer at the WisDOT Regional Office.

4. As part of the permit, the community or county would agree to pay all costs associated with initial installation and long-term maintenance of the signs. Installation *may* be included as part of an Improvement Project, however long-term maintenance of the signs would be the responsibility of the community or county.
5. If the bike route is removed or moved, the signs **shall** be adjusted accordingly.
6. Bike trail map kiosks **shall** be located outside the state highway right-of-way, off of the state trunk highway system. Prior to development or placement of a kiosk, coordination **shall** be made with the Region Outdoor Advertising contact.

INSTALLATION POLICY FOR BICYCLE ROUTE GUIDE SIGNS

1. Bicycle route guide signs (D11-1 signs with supplemental M7 series arrow plaque) **shall** only be used at decision points where the bike route turns off of the state trunk highway. Reassurance markers (confirmation signs) *may* be allowed on the state trunk highway for longer bike route sections or after major intersections.
2. The D11-1, bike route sign *may* utilize a supplemental D1 series name plaque. Street names **shall not** be utilized on the D1 series name plaque, only the official bike route name. If the D1 series name plaque is used, it *should* be mounted below the D11-1 sign.
3. When installed on roadways, D1 series signs **shall** only be installed as a supplement to the D11-1 sign.
4. The M1-8 or M1-8a bicycle route sign *may* be used in lieu of the D11-1 sign if the state or local bicycle route is identified by a unique route designation number. The D1 series name plaque *should not* be used with the M1-8 or M1-8a bicycle route sign.
5. If the M1-8a bicycle route sign is used, the pictograph **shall not** contain any commercial advertising. Colors of the pictograph *should* meet the requirements defined in [TEOpS 2-15-6](#).
6. The M1-9 bicycle route sign **shall** only be used for a bicycle routes that travels through multiple states (interstate route) that is identified by a unique route designation number. This interstate bike route number is assigned by AASHTO. The D1 series name plaque *should not* be used with the M1-9 interstate bicycle route sign.

INSTALLATION POLICY FOR BICYCLE LANE REGULATORY SIGNS

1. The R3-17 Bike Lane sign **shall** only be installed at the beginning and ends of the bike lane and after major intersections or periodically along the route (refer to Figure 9C-6 in the MUTCD). The R3-17 Bike Lane sign is intended for locations where the bike lanes are continuous along the roadway. The R3-17 Bike Lane sign *should not* be used where the shoulder is the bike accommodation or where bike lanes are only provided at intersections.
2. If the R3-17 Bike Lane sign is used at the beginning or end of the bike lane, then the R3-17aP AHEAD or R3-17bP supplemental plaques **shall** be used.
3. The R4-4 Begin Right Turn Lane Yield to Bikes *may* be used for weave areas where there are demonstrated problems with motorists weaving across bicycle traffic upon entering an exclusive right turn lane. The R4-4 sign is typically not installed as part of an Improvement Project unless there were demonstrated problems with weaving prior to construction. The R4-4 sign *may* also be utilized in these locations as a replacement to the R3-20RR Begin Right Turn Lane Sign.

APPLICATION/PERMIT FOR BIKE LANE MARKING AND SIGNING

Wisconsin Department of Transportation
DT2500 5/2011 s.86.07(2) Wis. Stats.

When approved, this permit documents the terms and conditions for use by the Municipality for installation and/or maintenance of bike lane marking and signing on highways under the jurisdiction of the Wisconsin Department of Transportation. The applicant must obtain this approved permit prior to marking and signing the bike lane.

Submit the completed application to the WisDOT Regional Office that has maintenance jurisdiction of the state trunk highway in the county where the marking will be located. A single application will be made for each continuous bike lane segment.

| | | |
|--|--|---|
| Applicant – Municipality | | County |
| Mailing Address | | Area Code – Telephone Number |
| | | FAX Number |
| Type of Project <input type="checkbox"/> Improvement Project Agreement <input type="checkbox"/> Maintenance Permit <input type="checkbox"/> Retrofit Agreement | | Project ID <input type="checkbox"/> Yes, Project # _____ <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Location: On Highway / Local Street Name | Intersecting Street | |
| | From: | To: |
| Type of Bike Lane Marking (design/dimensions) <input type="checkbox"/> Other (attach detail & reason) | (material) <input type="checkbox"/> Paint <input type="checkbox"/> Epoxy <input type="checkbox"/> Preformed Plastic <input type="checkbox"/> Preformed Thermoplastic <input type="checkbox"/> Other, (specify) | Speed Limit mph |
| Operational Features <input type="checkbox"/> Yes <input type="checkbox"/> No Edge Line <input type="checkbox"/> Yes <input type="checkbox"/> No Symbols <input type="checkbox"/> Yes <input type="checkbox"/> No Words <input type="checkbox"/> Yes <input type="checkbox"/> No Signs | Description/Type of Marking and Signing | |
| Reasons for Bike Lane Marking and Signing | | |

Marking and Signing Installation Conditions

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. By entering into this agreement, the Municipality agrees to the terms and cost arrangements in this policy document. 2. The design, installation and operation shall comply with Chapter 9 of the Wisconsin Manual of Uniform Traffic Control Devices. 3. During the installation and/or maintenance, the permittee shall follow all pertinent provisions for work zone traffic control as provided in Part 6 of the Wisconsin Manual of Uniform Traffic Control Devices. 4. The permittee shall coordinate the installation with the WisDOT Regional Office and other right-of-way users (i.e., utilities, adjacent property owners, etc.), unless other arrangements have been made. 5. The permittee shall repair any damage to the pavement and/or right-of-way caused by installation or maintenance | <ol style="list-style-type: none"> 6. The permittee shall notify WisDOT after layout of the authorized work has been completed, but prior to the installation of any markings. 7. Permitted facilities shall be located as defined within this permit. Any part of the facility found to be otherwise located shall be subject to correction by and at the cost of the applicant to such extent as the WisDOT Regional Office may specify. 8. The permittee should be aware that future upgrading of the highway will remove the permitted marking and signing. A future permit will be needed to replace the marking and signing. 9. Right of way permit |
|--|---|

It is understood and agreed that approval is subject to the applicant's full compliance with the pertinent Statutes, as well as any codes, rules, regulations, and permit requirements of other jurisdictional agencies. The applicant shall also comply with all permit conditions, superimposed notes, and detail drawings, which may be added by WisDOT. Any alteration of this form by the applicant is prohibited and may be cause to revoke this permit.

The undersigned certifies that he/she is authorized to sign this application on behalf of the named unit of government.

X _____
 (Authorized Representative) (Title) (Date)

Approved for the Wisconsin Department of Transportation

Permit Number = Region (NC, NE, NW, SE, or SW) – County Number – Three-digit, consecutive permit number

| | |
|---------------|--|
| Permit Number | X |
| - - | (Regional Authorized Representative) (Area Code - Telephone Number) (Date) |

INDEMNIFICATION

The Applicant shall save and hold the State, its officers, employees, agents, and all private and governmental contractors and subcontractors with the State under Chapter 84 Wisconsin Statutes, harmless from actions of any nature whatsoever (including any by Applicant itself) which arise out of, or are connected with, or are claimed to arise out of or be connected with any of the work done by the Applicant, or the construction or maintenance of facilities by the Applicant, pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, (1) while the Applicant is performing its work, or (2) while any of the Applicant's property, equipment, or personnel, are in or about such place or the vicinity thereof, or (3) while any property constructed, placed or operated by or on behalf of Applicant remains on the State's property or right-of-way pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way; including without limiting the generality of the foregoing, all liability, damages, loss, expense, claims, demands and actions on account of personal injury, death or property loss to the State, its officers, employees, agents, contractors, subcontractors or frequenters; to the Applicant, its employees, agents, contractors, subcontractors, or frequenters; or to any other persons, whether based upon, or claimed to be based upon, statutory (including, without limiting the generality of the foregoing, worker's compensation), contractual, tort, or whether or not caused or claimed to have been caused by active or inactive negligence or other breach of duty by the State, its officers, employees, agents, contractors, subcontractors or frequenters; Applicant, its employees, agents, contractors, subcontractors or frequenters; or any other person. Without limiting the generality of the foregoing, the liability, damage, loss, expense, claims, demands and actions indemnified against shall include all liability, damage, loss, expense, claims, demands and actions for damage to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way in the past or present, or that are located on any highway or State property or right-of-way with or without a permit issued by the State, for any loss of data, information, or material; for trademark, copyright or patent infringement; for unfair competition or infringement of personal or property rights of any kind whatever. The Applicant shall at its own expense investigate all such claims and demands, attend to their settlement or other disposition, defend all actions based thereon and pay all charges of attorneys and all other costs and expenses of any kind arising from any such liability, damage, loss, claims, demands and actions.

Any transfer, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right-of-way pursuant to this permit shall not release Applicant from any of the indemnification requirements of this permit, unless the State is notified of such transfer in writing. Any acceptance by any other person or entity, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right-of-way pursuant to this permit, shall include acceptance of all of the indemnification requirements of this permit by the other person or entity receiving ownership or control.

Notwithstanding the foregoing, a private contractor or subcontractor with the State under Chapter 84 Wisconsin Statutes, that fails to comply with sections 66.047 and 182.0175 Wisconsin Statutes (1985-1986), remains subject to the payment to the Applicant of the actual cost of repair of intentional or negligent damage by the contractor or subcontractor to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, and remains subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the contractor or subcontractor.

Notwithstanding the foregoing, if the State, or its officers, employees and agents, fail to comply with sections 66.047 and 182.0175 Wisconsin Statutes (1985-1986), the State or its officers, employees and agents, remain subject to the payment to the Applicant of the actual cost of repair of willful and intentional damage by the State, or its officers, employees and agents, to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, and remain subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the State, its officers, employees and agents.

No indemnification of private contractors or subcontractors with the State under Chapter 84 Wisconsin Statutes, shall apply in the event of willful and intentional damage by such private contractors or subcontractors to the property, lines and facilities of the Applicant located on the highway right-of-way pursuant to this permit or any other permit issued by the State for the location of property, lines or facilities on highway right-of-way.



PURPOSE

WisDOT encourages bicycling by adding or utilizing space on roadways for use of bicyclists. This is done in one of three ways - paved shoulders, wide curb lanes and bicycle lanes. Of those three, only bicycle lanes are designated “bikeway” facilities as defined by AASHTO and the MUTCD. This chapter presents the appropriate markings for bicycle accommodations including bicycle lanes.

It *should* be noted that due to costs associated with maintaining bicycle lane markings and a significantly reduced maintenance budget, WisDOT has adopted the following policy to give guidance for both design and maintenance. This policy does not pertain to the connecting highway system. Connecting highways are maintained by local governments and aids are provided to cover the costs to maintain these facilities.

MARKING GUIDANCE AND POLICY

Paved Shoulders

Edge line markings for shoulders are maintained by the department along state highways. Bicyclists are the only vehicular user to be permitted to use shoulders under Wisconsin Statute 84.01 and will most often use that space when the condition of the pavement is satisfactory. When edge lines are added in urban cross-section streets to define shoulder segments or curb offsets, those markings will be maintained by the authority charged with the maintenance of the facility and will be considered part of our standard maintenance practice. These edge lines are added to prevent motorists from deviating from the travel lane or doubling up in an otherwise wide lane. Secondly they also help define the space that bicyclists will use.

Occasionally at some intersections, markings will be added to the left of the right turn lane, for a separate bike slip lane as shown in [SDD 15C 29](#) a and b and Table 1. These markings will also be maintained as part of the standard WisDOT practice if the rest of the street is not marked with bicycle lanes. If the rest of the facility is marked with bicycle lanes, the local community will be responsible for maintaining these markings along with all of the other markings.

Wide Curb Lanes

Wide curb lanes do not require markings of any kind to differentiate space for bicyclists. However, when lanes are 14’ or greater there *may* be operational reasons why an edge line is desired. Whenever a 4” edge line is added per [TEOps 3-10-1](#) for urban curb and gutter sections, WisDOT **shall** maintain these markings on WisDOT maintained facilities. A 4” edge line requires a permit when there is no operational reason for placement.

Bicycle Lanes

1. Rural Applications

Bike lane markings define preferential space for bicyclists and are considered bikeways. Bike lanes are rarely marked on rural highways.

Exception will be when **a highway is designed with 5 feet or wider paved shoulders or bike lanes to accommodate bicyclists per Wisconsin Statute 84.01(35) and Trans 75.**, then intersection treatments found in [SDD 15C 29](#) a and b **shall** follow what is prescribed in the following table:

Table 1. Type A2, B1 and B2 Rural Intersection Treatments When Side road ADT exceeds 250 for design year *

| | 2 Lane w/ signals or signed or marked for right turn only | 2 Lane without signals or signed or marked for right turn only | 4 Lane Divided with signals or signed or marked for right turn only | 4 Lane Divided without signals or signed or marked for right turn only |
|-----------------------|---|--|---|--|
| | SDD 15C 29 Drawing Detail Title, sheets a and b | | | |
| Posted Speed > 45mph | Bike Slip Lane | Wider Turn Lane or Bike Accommodations on Shoulder | N/a | Wider Turn Lane or Bike Accommodations on Shoulder |
| Posted Speed ≤ 45 mph | Bike Lane with symbols | Bike Slip Lane or Wider Turn Lane | Bike Lane 4 Lane Divided with Right Turn Lane | Bike Slip Lane or Wider Turn Lane |

* All intersection types are found in [SDD 9A 1](#) and [FDM 11-25, Attachment 1.1](#)

For A-1, C, and D intersection types no special intersection designs are necessary to accommodate bicyclists. Whenever a bike lane is marked to an intersection, it must be to the left of a right turn only lane as shown in these details.

2. Urban Applications

[SDD 15C 29](#) c and d are urban type bike lane diagrams shown with and without parking and right turn lanes. The bike lane markings shown at the intersections are part of a continuous bike lane. However, it is permissible to use the bike lane intersection markings (bike slip lanes) independent of continuous bike lane markings if there is space at an intersection and the Region Traffic Engineer believes it will better serve bicyclists and motorists at an intersection through improved lane delineation.

If bike lane markings and symbols designating the preferential space are appropriate and the need approved by the Region Traffic engineer, permit DT2500 for symbols **shall** be issued to the local unit of government that is accepting long-term maintenance of the markings. WisDOT **shall** pay to initially mark them as part of a reconstruction or resurfacing project. All costs associated with subsequent maintenance will be borne by the participating local unit of government.

Refer to [SDD 15C 29e](#) for layout of the marking symbols and words.

PERMIT PROCESS/REQUIREMENTS

The Region Traffic Engineer will review the request with the Region Bike and Pedestrian Coordinator. It is recommended developing a maintenance agreement no later than the time of design study report (DSR). This will ensure that the local unit of government will clearly have knowledge of what they are to maintain. This is important for when local jurisdictions decide to add bike lane markings. If edge lines or bike lane markings are approved, a permit **shall** be issued to the local unit of government that is accepting long-term maintenance of the markings. Permit Form DT2500, is attached to this policy. A copy of the approved permit **shall** be sent to the local government and a copy **shall** be filed in the Region Office.

Existing markings *should* be evaluated with the community, based on need and safety, individually and collectively within the community.

The permit **shall** be officially signed and approved prior to any marking of new edge line or bike lane markings. Subsequent remarking will not require a new permit.

Under "Type of Project" on the permit form, use the following guidance:

- If the bike lane marking (existing or new) is to be marked as part of an improvement project, check the "Improvement Project Agreement" box.
- If the bike lane marking is to be first-time marked on existing pavement by the local government, check the "Retrofit Agreement" box.
- If an existing bike lane marking is to be remarked on existing pavement by the local government, check the "Maintenance Permit" box.

Failure to comply with the permit provisions **shall** void the permit and the bike lane markings **shall** be removed at the local government's expense.

SUPPORTING THOUGHTS

Adding bicycle lanes is most practical and cost-effective at the time of reconstruction. There are likely to be many more opportunities for bike lane markings on the connecting highway system (590 miles) than on non-connecting state highways. This is especially true in the metropolitan areas of the state. Although there are approximately 1,175 miles of urban state highways (municipal extensions), hundreds of miles are categorized as freeways or are higher-speed rural cross-section highways at the edges of urban areas where shoulders are appropriate, but not bike lanes. While some municipal extensions of state highways will be good candidates for bicycle lanes, right of way constraints will likely limit prospects for many bike lanes on these highways. In some cases, wide curb lanes *may* still be possible candidates for these streets.

APPLICATION/PERMIT FOR BIKE LANE MARKING AND SIGNING

Wisconsin Department of Transportation
DT2500 5/2011 s.86.07(2) Wis. Stats.

When approved, this permit documents the terms and conditions for use by the Municipality for installation and/or maintenance of bike lane marking and signing on highways under the jurisdiction of the Wisconsin Department of Transportation. The applicant must obtain this approved permit prior to marking and signing the bike lane. Submit the completed application to the WisDOT Regional Office that has maintenance jurisdiction of the state trunk highway in the county where the marking will be located. A single application will be made for each continuous bike lane segment.

| | | |
|---|--|--|
| Applicant – Municipality | | County |
| Mailing Address | | Area Code – Telephone Number |
| | | FAX Number |
| Type of Project <input type="checkbox"/> Improvement Project Agreement <input type="checkbox"/> Maintenance Permit <input type="checkbox"/> Retrofit Agreement | | Project ID <input type="checkbox"/> Yes, Project # _____ <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Location: On Highway / Local Street Name | Intersecting Street From: _____ To: _____ | |
| Type of Bike Lane Marking (design/dimensions) <input type="checkbox"/> Other (attach detail & reason) | (material) <input type="checkbox"/> Paint <input type="checkbox"/> Epoxy <input type="checkbox"/> Preformed Plastic <input type="checkbox"/> Preformed Thermoplastic <input type="checkbox"/> Other, (specify) | Speed Limit mph |
| Operational Features <input type="checkbox"/> Yes <input type="checkbox"/> No Edge Line <input type="checkbox"/> Yes <input type="checkbox"/> No Symbols <input type="checkbox"/> Yes <input type="checkbox"/> No Words <input type="checkbox"/> Yes <input type="checkbox"/> No Signs | Description/Type of Marking and Signing | |
| Reasons for Bike Lane Marking and Signing | | |

Marking and Signing Installation Conditions

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. By entering into this agreement, the Municipality agrees to the terms and cost arrangements in this policy document. 2. The design, installation and operation shall comply with Chapter 9 of the Wisconsin Manual of Uniform Traffic Control Devices. 3. During the installation and/or maintenance, the permittee shall follow all pertinent provisions for work zone traffic control as provided in Part 6 of the Wisconsin Manual of Uniform Traffic Control Devices. 4. The permittee shall coordinate the installation with the WisDOT Regional Office and other right-of-way users (i.e., utilities, adjacent property owners, etc.), unless other arrangements have been made. 5. The permittee shall repair any damage to the pavement and/or right-of-way caused by installation or maintenance | <ol style="list-style-type: none"> 6. The permittee shall notify WisDOT after layout of the authorized work has been completed, but prior to the installation of any markings. 7. Permitted facilities shall be located as defined within this permit. Any part of the facility found to be otherwise located shall be subject to correction by and at the cost of the applicant to such extent as the WisDOT Regional Office may specify. 8. The permittee should be aware that future upgrading of the highway will remove the permitted marking and signing. A future permit will be needed to replace the marking and signing. 9. Right of way permit |
|--|---|

It is understood and agreed that approval is subject to the applicant's full compliance with the pertinent Statutes, as well as any codes, rules, regulations, and permit requirements of other jurisdictional agencies. The applicant shall also comply with all permit conditions, superimposed notes, and detail drawings, which may be added by WisDOT. Any alteration of this form by the applicant is prohibited and may be cause to revoke this permit.

The undersigned certifies that he/she is authorized to sign this application on behalf of the named unit of government.

X _____
 (Authorized Representative) (Title) (Date)

Approved for the Wisconsin Department of Transportation

Permit Number = Region (NC, NE, NW, SE, or SW) – County Number – Three-digit, consecutive permit number

| | |
|---------------|--|
| Permit Number | X |
| - - | (Regional Authorized Representative) (Area Code - Telephone Number) (Date) |

INDEMNIFICATION

The Applicant shall save and hold the State, its officers, employees, agents, and all private and governmental contractors and subcontractors with the State under Chapter 84 Wisconsin Statutes, harmless from actions of any nature whatsoever (including any by Applicant itself) which arise out of, or are connected with, or are claimed to arise out of or be connected with any of the work done by the Applicant, or the construction or maintenance of facilities by the Applicant, pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, (1) while the Applicant is performing its work, or (2) while any of the Applicant's property, equipment, or personnel, are in or about such place or the vicinity thereof, or (3) while any property constructed, placed or operated by or on behalf of Applicant remains on the State's property or right-of-way pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way; including without limiting the generality of the foregoing, all liability, damages, loss, expense, claims, demands and actions on account of personal injury, death or property loss to the State, its officers, employees, agents, contractors, subcontractors or frequenters; to the Applicant, its employees, agents, contractors, subcontractors, or frequenters; or to any other persons, whether based upon, or claimed to be based upon, statutory (including, without limiting the generality of the foregoing, worker's compensation), contractual, tort, or whether or not caused or claimed to have been caused by active or inactive negligence or other breach of duty by the State, its officers, employees, agents, contractors, subcontractors or frequenters; Applicant, its employees, agents, contractors, subcontractors or frequenters; or any other person. Without limiting the generality of the foregoing, the liability, damage, loss, expense, claims, demands and actions indemnified against shall include all liability, damage, loss, expense, claims, demands and actions for damage to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way in the past or present, or that are located on any highway or State property or right-of-way with or without a permit issued by the State, for any loss of data, information, or material; for trademark, copyright or patent infringement; for unfair competition or infringement of personal or property rights of any kind whatever. The Applicant shall at its own expense investigate all such claims and demands, attend to their settlement or other disposition, defend all actions based thereon and pay all charges of attorneys and all other costs and expenses of any kind arising from any such liability, damage, loss, claims, demands and actions.

Any transfer, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right-of-way pursuant to this permit shall not release Applicant from any of the indemnification requirements of this permit, unless the State is notified of such transfer in writing. Any acceptance by any other person or entity, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right-of-way pursuant to this permit, shall include acceptance of all of the indemnification requirements of this permit by the other person or entity receiving ownership or control.

Notwithstanding the foregoing, a private contractor or subcontractor with the State under Chapter 84 Wisconsin Statutes, that fails to comply with sections 66.047 and 182.0175 Wisconsin Statutes (1985-1986), remains subject to the payment to the Applicant of the actual cost of repair of intentional or negligent damage by the contractor or subcontractor to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, and remains subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the contractor or subcontractor.

Notwithstanding the foregoing, if the State, or its officers, employees and agents, fail to comply with sections 66.047 and 182.0175 Wisconsin Statutes (1985-1986), the State or its officers, employees and agents, remain subject to the payment to the Applicant of the actual cost of repair of willful and intentional damage by the State, or its officers, employees and agents, to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, and remain subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the State, its officers, employees and agents.

No indemnification of private contractors or subcontractors with the State under Chapter 84 Wisconsin Statutes, shall apply in the event of willful and intentional damage by such private contractors or subcontractors to the property, lines and facilities of the Applicant located on the highway right-of-way pursuant to this permit or any other permit issued by the State for the location of property, lines or facilities on highway right-of-way.

9-3-7 Shared Lane Markings

August 2011

PURPOSE

WisDOT encourages bicycling by adding or utilizing space on roadways, for use of bicyclists. When this cannot be done, this policy gives guidance for when both bicyclist and motorist are sharing the roadway so to minimize motorist and bicyclist crashes.

Due to costs associated with maintaining shared lane markings and a significantly reduced maintenance budget, WisDOT has adopted specific maintenance provisions as part of the following policy.

This policy does not pertain to the connecting highway system. Connecting highways are maintained by local

governments and aids are provided to cover the costs to maintain these facilities.

POLICY

Shared Lane markings

- Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist's impacting the open door of a parked vehicle.
- Assist bicyclist with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane.
- Alert road users of the lateral location bicyclists are likely to occupy within the traveled way.
- Encourage safe passing of bicyclists by motorists
- Reduce the incidence of wrong-way bicycling.

These markings *should not* be placed on roadways that have a speed limit above 35 mph. They **shall not** be used on shoulders or in designated bicycle lanes. When used, the marking *should* be placed immediately after an intersection and spaced at intervals not greater than 250 feet thereafter.

Refer to [SDD 15C 29f](#) for layout of the marking.

PERMIT PROCESS/REQUIREMENTS

The Region Traffic Engineer will review the request with the Regional Bike and Pedestrian Coordinator. If shared lane markings are approved, a permit **shall** be issued to the local unit of government that is accepting long-term maintenance of the markings.

The form DT 2137 is attached to this policy. A copy of the approved permit **shall** be sent to the local government and a copy **shall** be filed in the Region Office.

The permit **shall** be officially signed and approved prior to any marking of new shared lane markings. Subsequent remarking will not require a new permit except after upgrading of the highway.

Existing markings *should* be evaluated with the community, based on need and safety, individually and collectively within the community.

Under "Type of Project" on the permit form, use the following guidance:

- If the shared lane marking (existing or new) is to be marked as part of an improvement project, check the "Improvement Project Agreement" box.
- If the shared lane marking is to be first-time marked on existing pavement by the local government, check the "Retrofit Agreement" box.
- If an existing shared lane marking is to be remarked on existing pavement by the local government, check the "Maintenance Permit" box.

Failure to comply with the permit provisions **shall** void the permit and the shared lane markings **shall** be removed at the local government's expense.

APPLICATION/PERMIT FOR SHARED LANE MARKING

Wisconsin Department of Transportation
DT2137 5/2011 s.86.07(2) Wis. Stats.

When approved, this permit documents the terms and conditions for use by the Municipality for installation and/or maintenance of shared lane markings on highways under the jurisdiction of the Wisconsin Department of Transportation. The applicant must obtain this approved permit prior to marking a shared lane symbol.

Submit the completed application to the WisDOT Regional Office that has maintenance jurisdiction of the state trunk highway in the county where the marking will be located. A single application will be made per continuous segment of shared lane markings. A map with corresponding details is required for all applications.

| | | |
|--|--|--|
| Applicant – Municipality | | County |
| Mailing Address | | Area Code – Telephone Number |
| | | FAX Number |
| Type of Project <input type="checkbox"/> Improvement Project Agreement <input type="checkbox"/> Maintenance Permit <input type="checkbox"/> Retrofit Agreement | | Project ID <input type="checkbox"/> Yes, Project # _____ <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Location: On Highway / Local Street Name | Intersecting Street From: _____ To: _____ | |
| Type of Shared Lane Marking (material) <input type="checkbox"/> Paint <input type="checkbox"/> Epoxy <input type="checkbox"/> Preformed Plastic <input type="checkbox"/> Preformed Thermoplastic <input type="checkbox"/> Other, (specify) _____ | Speed Limit _____ mph | List supplemental signing to be used _____ |
| Operational Features <input type="checkbox"/> Yes <input type="checkbox"/> No Recognized Bike Route <input type="checkbox"/> Yes <input type="checkbox"/> No Parking <input type="checkbox"/> Yes <input type="checkbox"/> No Curbs Available | Width of Travel Lane _____ | Width of Parking Lane (if present) _____ |

Shared Lane Marking Installation Conditions

1. By entering into this agreement, the Municipality agrees to cover all costs related to the placing and maintaining of permitted shared lane markings.
2. The design, installation and operation shall comply with Chapter 9 of the Wisconsin Manual of Uniform Traffic Control Devices.
3. During the installation and/or maintenance, the permittee shall follow all pertinent provisions for work zone traffic control as provided in Part 6 of the Wisconsin Manual of Uniform Traffic Control Devices.
4. The permittee shall coordinate the installation with the WisDOT Regional Office and other right-of-way users (i.e., utilities, adjacent property owners, etc.).
5. The permittee shall repair any damage to the pavement and/or right-of-way caused by installation or maintenance of equipment. Failure to do so promptly will result in permit revocation.
6. The permittee shall notify WisDOT after layout of the authorized work has been completed, but prior to the installation of any markings.
7. Permitted facilities shall be located as defined within this permit. Any part of the facility found to be otherwise located shall be subject to correction by and at the cost of the applicant to such extent as the WisDOT Regional Office may specify.
8. The permittee should be aware that future upgrading of the highway will remove the permitted marking. A future permit may be needed to replace the marking.

It is understood and agreed that approval is subject to the applicant's full compliance with the pertinent Statutes, as well as any codes, rules, regulations, and permit requirements of other jurisdictional agencies. The applicant shall also comply with all permit conditions, superimposed notes, and detail drawings, which may be added by WisDOT. Any alteration of this form by the applicant is prohibited and may be cause to revoke this permit.

The undersigned certifies that he/she is authorized to sign this application on behalf of the named unit of government.

X _____
 (Authorized Representative) (Title) (Date)

Approved for the Wisconsin Department of Transportation

Permit Number = Region (NC, NE, NW, SE, or SW) – County Number – Three-digit, consecutive permit number

| | |
|---------------|--|
| Permit Number | X |
| - - | (Regional Authorized Representative) (Area Code - Telephone Number) (Date) |

INDEMNIFICATION

The Applicant shall save and hold the State, its officers, employees, agents, and all private and governmental contractors and subcontractors with the State under Chapter 84 Wisconsin Statutes, harmless from actions of any nature whatsoever (including any by Applicant itself) which arise out of, or are connected with, or are claimed to arise out of or be connected with any of the work done by the Applicant, or the construction or maintenance of facilities by the Applicant, pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, (1) while the Applicant is performing its work, or (2) while any of the Applicant's property, equipment, or personnel, are in or about such place or the vicinity thereof, or (3) while any property constructed, placed or operated by or on behalf of Applicant remains on the State's property or right-of-way pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way; including without limiting the generality of the foregoing, all liability, damages, loss, expense, claims, demands and actions on account of personal injury, death or property loss to the State, its officers, employees, agents, contractors, subcontractors or frequenters; to the Applicant, its employees, agents, contractors, subcontractors, or frequenters; or to any other persons, whether based upon, or claimed to be based upon, statutory (including, without limiting the generality of the foregoing, worker's compensation), contractual, tort, or whether or not caused or claimed to have been caused by active or inactive negligence or other breach of duty by the State, its officers, employees, agents, contractors, subcontractors or frequenters; Applicant, its employees, agents, contractors, subcontractors or frequenters; or any other person. Without limiting the generality of the foregoing, the liability, damage, loss, expense, claims, demands and actions indemnified against shall include all liability, damage, loss, expense, claims, demands and actions for damage to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way in the past or present, or that are located on any highway or State property or right-of-way with or without a permit issued by the State, for any loss of data, information, or material; for trademark, copyright or patent infringement; for unfair competition or infringement of personal or property rights of any kind whatever. The Applicant shall at its own expense investigate all such claims and demands, attend to their settlement or other disposition, defend all actions based thereon and pay all charges of attorneys and all other costs and expenses of any kind arising from any such liability, damage, loss, claims, demands and actions.

Any transfer, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right-of-way pursuant to this permit shall not release Applicant from any of the indemnification requirements of this permit, unless the State is notified of such transfer in writing. Any acceptance by any other person or entity, whether voluntary or involuntary, of ownership or control of any property constructed, placed or operated by or on behalf of the Applicant that remains on the State's property or right-of-way pursuant to this permit, shall include acceptance of all of the indemnification requirements of this permit by the other person or entity receiving ownership or control.

Notwithstanding the foregoing, a private contractor or subcontractor with the State under Chapter 84 Wisconsin Statutes, that fails to comply with sections 66.047 and 182.0175 Wisconsin Statutes (1985-1986), remains subject to the payment to the Applicant of the actual cost of repair of intentional or negligent damage by the contractor or subcontractor to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, and remains subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the contractor or subcontractor.

Notwithstanding the foregoing, if the State, or its officers, employees and agents, fail to comply with sections 66.047 and 182.0175 Wisconsin Statutes (1985-1986), the State or its officers, employees and agents, remain subject to the payment to the Applicant of the actual cost of repair of willful and intentional damage by the State, or its officers, employees and agents, to any property, lines or facilities placed by or on behalf of the Applicant pursuant to this permit or any other permit issued by the State for location of property, lines or facilities on highway right-of-way, and remain subject to payment to the Applicant for losses due to personal injury or death resulting from negligence by the State, its officers, employees and agents.

No indemnification of private contractors or subcontractors with the State under Chapter 84 Wisconsin Statutes, shall apply in the event of willful and intentional damage by such private contractors or subcontractors to the property, lines and facilities of the Applicant located on the highway right-of-way pursuant to this permit or any other permit issued by the State for the location of property, lines or facilities on highway right-of-way.



Traffic Engineering, Operations & Safety Manual

Chapter 11 Lighting/Electrical/Electronic Systems

Section 1 Lighting System Approval

11-1-1 Initial System Approval

May 2015

PURPOSE

This policy describes the requirements for approval of Lighting on the Wisconsin State Highway System.

POLICY

All lighting on the state trunk highway system **shall** require approval in accordance with this policy.

WisDOT Maintained Systems

The State Lighting Systems Engineer in the Bureau of Traffic Operations **shall** approve all proposed new lighting system installations on state trunk highways except as described below. When there is a possibility a project *may* include the installation of lighting, the DOT project manager for design **shall** work with the region lighting engineer in the traffic section to submit a DT1198 Roadway Lighting System Approval Request, supported by an investigation report, to the State Lighting Systems Engineer. These documents **shall** be submitted before any commitments are made concerning the installation of lighting systems.

The following lighting needs are required by the department and are exempt from the formal approval process. However, in these cases the project manager **shall** work with the region lighting engineer to accommodate coordination and oversight of the design:

- signalized intersections
- roundabouts
- metered ramps
- tunnels
- special facilities
 - Weigh stations
 - Park-rides
 - Crash investigation sites
 - Rest areas
 - Waysides

Improvement projects on roads where lighting presently exists are also exempt from the formal approval process.

The investigation report provides an objective description and analysis of the roadway/project for the State Lighting Systems Engineer to use in recommending installing and maintaining a lighting system.

The report **shall** include:

- DT1198 Roadway Lighting System Approval Request.
- Description/discussion of the project and plan drawing of the roadway project under consideration
- Data pertinent to determine the need for lighting that includes, but not limited to:
 - traffic volumes minimally broken down into day vs. night, but more specific time periods when pertinent to the investigation
 - crash history on the existing road including type of crash and if darkness was a pertinent factor
 - evaluation of other crash avoidance measures (geometric, signing, striping, etc.) being considered and/or implemented and how lighting relates to this overall safety evaluation
 - analysis based on the minimum warranting conditions as minimum thresholds for further consideration of lighting as described in the current AASHTO Roadway Lighting Design Guide
- Installation cost, maintenance cost, and what agency is funding/maintaining the system
- Discussion, correspondence, and recommendations from local jurisdictions, and any written agreements relating to lighting on the project
- A recommendation with supporting discussion based on the above evaluation

The State Lighting Systems Engineer will evaluate the proposal based on the information in the investigation report along with consideration of any additional items pertinent to the specific project and provide approval for acceptable projects.

Regardless of the need for approval, all WisDOT maintained lighting systems shall follow the design process described in other TEOpS sections.

Permitted Lighting Systems

All Locally-owned and maintained Lighting systems on the Wisconsin State Highway system shall require a permit in accordance with [TEOpS 11-3-1](#).

Aesthetic Lighting on Structures

Aesthetic lighting shall require approval in accordance with [TEOpS 11-3-2](#).

Connecting Highways

Lighting on connecting highways and permitted lighting maintained by local municipalities on state trunk highways are exempt from submitting a request for approval. However, in these cases the project manager **shall** work with the region lighting engineer to accommodate coordination and oversight of the design.

11-1-2 Lighting System Design Review

May 2015

POLICY

All DOT maintained Roadway Lighting System designs **shall** follow the process described in with this document.

POLICY APPLICATION

The purpose of this policy is to prescribe guidelines and procedures that will help ensure consistent lighting system designs statewide and clarify the review requirements.

PROCEDURAL REQUIREMENTS

For all Projects covered under this policy, after receiving the necessary Lighting System Approval described in [TEOpS 11-1-1](#), the lighting designer **shall** submit a Continuous Lighting System Illumination Application DT1886 (or Preliminary Permit Application for locally maintained systems), Roundabout Illumination form, or Signalized Intersection Illumination Form, as applicable to the project, to the DOT Regional Lighting Engineer prior to beginning the design.

The designer **shall** send a copy of all submittals to the State Lighting Engineer.

DESIGN PROCESS

The designer **shall** follow the appropriate WisDOT design standards/parameters described in later sections for the type of lighting system being proposed.

The designer **shall** follow the submittal/review procedures described in the WisDOT lighting review checklist.

DESIGN CHECKLIST FOR ROADWAY LIGHTING

System designed by: Design consultant Traffic (In-house) PDS (In-house)

Project ID (Design / Const) _____

Description _____

Highway _____ County _____

Designer Name (print/type) _____ Signature _____

Coordinate Lighting Design Process @ approximately 30% Plan

- Contact Region Traffic Section about the need for a lighting system on the project. Identify project segments.
- Prepare description of Lighting System and prepare & submit Roadway Lighting System Request Form DT1198.
- Consult current Chapter 11 of WisDOT Traffic Guidelines Manual.** Determine all Design Guidelines, Roadway and Area Classifications and Target Illumination Thresholds for the various project segments.
Obtain approval from Region Lighting Engineer in Traffic Section.
- Verify Luminaire used in the design.
- Prepare Preliminary Permit Application form, Continuous Lighting Illumination Form, Signalized Intersection Illumination Form, or Roundabout Illumination Form.
Obtain necessary Approval(s) before beginning the Design.

Preliminary Review @ approximately 60% Plan

- AGI32 Roadway Optimizer calculations for continuous roadway sections (Avg. Maintained Illumination, Uniformity) showing compliance with Application or Illumination form) N/A
- AGI32 calculations for Roundabouts showing compliance with Application or Illumination form) N/A
- AGI32 calculations for Signalized Intersections showing compliance with Application or Illumination form) N/A
- Preliminary Plan with proposed luminaire/pole locations

Final Review @ approximately 90% Plan

Submit to Region Traffic Section Lighting Engineer, with copy to State Lighting Engineer:

- Completed Lighting Permit (if applicable) N/A
- Lighting Plans (See FDM 15-1 Attachment 5.14 Sample Design Sheet). Include applicable plan details.
 - Miscellaneous Quantities
 - SPVs
 - Wiring Diagram per Sample Design Sheet
 - List of SDDs included in the Lighting Plan
- Voltage Drop Calculations for lighting (include festoon outlets where applicable)
- This Completed Checklist signed by Designer.

The following shall also be verified/checked by designer

- Miscellaneous Quantities/SPVs match the Plans.
- SPVs for luminaires on permitted projects specify compliance with permit conditions.
 - N/A
- On permitted projects, if banners, holiday decorations, or festoon outlets are to be installed or attached to the poles, the dimensions and locations must be included and shown on a detail drawing. The pole manufacturer needs this information for their pole design calculations. N/A
- The Designer has checked the design for completeness and correctness.

CONTINUOUS LIGHTING ILLUMINATION APPLICATION

DT1886 4/2015 s.84.02(4)(c) Wis. Stats.

Wisconsin Department of Transportation
State Project Number

Submit to the Regional Office of the Wisconsin Department of Transportation, including:

- This completed DT1886 Continuous Lighting Form. Provide additional forms as necessary when there are multiple Roadways and/or Roadway Types.
- Engineering drawing of the Roadway Plan, or typical section, showing edge of pavement, curb lines, shoulders, etc.
- Brief description of the project

Design Information (Provide additional forms as necessary for multiple roadways and/or roadway types)

| | |
|---------|-----------------|
| Highway | Lighting Limits |
|---------|-----------------|

Project Lighting Engineer Name, Mailing Address and Telephone

| | | | | | |
|--|---------------------------|--|------------------------|--|---------------------|
| County | Posted Speed Limit mph | ADT | Cross Section Rural | Urban | Roadway Width ft |
| Road Class <input type="checkbox"/> Major <input type="checkbox"/> Collector | | Area Class <input type="checkbox"/> Commercial <input type="checkbox"/> Intermediate | | Pavement Class <input type="checkbox"/> R1 <input type="checkbox"/> R2 | |
| <input type="checkbox"/> Minor Arterial <input type="checkbox"/> Other | | <input type="checkbox"/> Residential | | <input type="checkbox"/> R3 <input type="checkbox"/> R4 | |

Based on Roadway Information above, provide Design Criteria Values in accordance with AASHTO 2005 Roadway Lighting Guide, Table 3-5a.

| | | | | | |
|---------------------------|-----------------------|--------------------|---|-----------------------|---------|
| Luminaire LED Category | | | Mounting Height Above Pavement | | |
| Target Illuminance Values | | | Target Luminance Values | | |
| Average FC | Uniformity Ave/Min | Average cd/m sq | Veiling Luminance Ratio LV(max)/Lavg | Uniformity Ave/Min | Max/Min |

The designated engineer requests permission to begin the design of highway lighting within the limits of the right of way of the state trunk highway, all as described above.

X

(Lighting Engineer)

(Date – m/d/yy)

APPROVAL

Permission is granted to begin the highway lighting design as described above and per the attached drawings and specifications.

CONTINUOUS LIGHTING

Approved for Division of Transportation System Development

X

(Signature)

(Date Reviewed – m/d/yy)



POLICY

Unless described otherwise, all Roadway Lighting Designs on State Highways **shall** follow the general guidelines described in this section.

TYPES OF ROADWAY LIGHTING

There are a number of different types of roadway and facilities involving the consideration of lighting, most all of which are covered in more detail in the AASHTO Roadway Lighting Design Guide and ANSI / IESNA Roadway Lighting RP-8-00. In general, the following categories are covered in this document:

- Continuous lighting systems, including Continuous (corridor) Freeway Lighting; Complete Interchange Lighting; Partial Interchange Lighting; and Rural Interchanges.
- Streets and Highways Other Than Freeways, including expressways and urban streets, and rural highways, including spot locations involving special considerations.
- Intersections, including Isolated (stand-alone) Intersections; Signalized Intersections; and Roundabouts. These could include transition lighting and/or coordination with a continuous segment lighting system.
- Aesthetic Lighting

Refer to other sections for specifics on the individual design requirements for these categories.

Continuous lighting is defined as a lighting system incorporating lighting units with overlapping distribution patterns that meet average and uniformity levels as defined by AASHTO for the appropriate roadway area classification and use.

Transition lighting is defined as a gradual increase/reduction in lighting levels when entering or leaving a lighting system, most typically at a Roundabout, when the roadway is not continuously illuminated.

Isolated lighting is defined as lighting at the intersections of non-illuminated roadways or periodic lighting along a roadway where AASHTO defined light level standards for average and uniformity are not applicable.

DESIGN PARAMETERS AND CALCULATIONS

The following design parameters pertain to all roadway lighting systems:

1. Lighting systems *should* be designed in accordance with AASHTO's "Roadway Lighting Design Guide" 2005 Edition, Table 3-5a for required lighting levels. (The IES Design Guide for Roundabout Lighting DG-19-08, and the ANSI/IESNA guide RP-8-00 will be used as references where noted.)
2. Pavement classifications of R1 (concrete) or R3 (asphalt) **shall** be used depending upon the permanent roadway surface.
3. The calculation of roadway lighting levels *should* be performed using Lighting Analysts AGI32 software. This will enable the designer to share the design files generated by the software with the Department for review if necessary.
 - Unless indicated otherwise, the *Illuminance Method* of calculation **shall** be used to determine the *average maintained illumination* (in footcandles), and the *average-to-minimum* (uniformity) lighting levels for roadways, intersections and roundabouts.
 - The designer/engineer **shall** also perform the *Maximum Veiling Luminance Ratio* calculation for all continuous lighting systems. The specified *Maximum Veiling Luminance Ratio* *should not* exceed that defined in the AASHTO Roadway Lighting Design Guide.
4. Wire sizing for lighting circuits *should* be calculated with a target of 3.5% voltage drop per branch circuit, and a maximum of 5% for the total of service/feeder and branch circuit.
5. WisDOT does not currently utilize Curfews of lighting systems on DOT maintained lighting installations.

- WisDOT *may* consider curfews on permitted locally owned/maintained lighting installation with the appropriate justification.

GENERAL REQUIREMENTS FOR LUMINAIRES

LED Luminaires **shall** be used for WisDOT maintained lighting systems and **shall** be selected from the Department's Qualified Electrical Products List.

- For permitted Locally Maintained Systems, the Luminaires **shall** be selected on the basis of their distribution characteristics as they apply to the roadway geometry to ensure adequate illumination and minimum glare. They **shall** meet the roadway illumination requirements specified in this document.

A Light Loss Factor (LLF) **shall** be applied to initial lamp lumen output to calculate maintained illumination as prescribed in this section.

- The LLF for LED Luminaires on the Department's Qualified Products List **shall** be the value indicated on the List. (This value includes an adjustment for LDD.)
- The LLF for High Pressure Sodium lamps *should* be 0.75.
- When LED luminaires other than those identified on the Qualified Electrical Products List are specified for permitted locally maintained systems, the designer **shall** identify the proposed LLF and furnish justification for it with the permit application.

POLE BREAKAWAY REQUIREMENTS

Poles permitted on the rights-of-way of the State Trunk Highway System for the sole purpose of highway lighting fall into one of two categories:

1. *Breakaway Poles*. This type of lighting support is defined as a pole and/or foundation which when struck by a vehicle will fracture or slip away under the conditions prescribed by the current edition of AASHTO Standard Specifications for Structural Supports for Highway Luminaires.

No portion of the concrete footing **shall** be allowed to protrude above the ground level more than 4 inches.

2. *Non-Breakaway Poles*. Rigid lighting standards are defined as those poles and mountings which under impact conditions do not breakaway within the criteria specified for breakaway poles.

Under normal conditions, the use of lighting pole designs conforming to the breakaway requirements above is encouraged for all lighting installations.

ROADWAY AND LAND USE (AREA) CLASSIFICATIONS

There are numerous documents that define Roadway Classifications. These include:

- AASHTO Policy on Geometric Design of Highways and Streets (Green Book)
- ANSI/IESNA RP-8
- WisDOT [FDM 4-1-15](#)
- FHWA Highway Functional Classifications

Policy specifies using the AASHTO "Roadway Lighting Design Guide" 2005 Edition, Table 3-5A, which references the Green Book classifications. However, it is the responsibility of the designer to use the available resources to evaluate the section of roadway where the proposed lighting system will be installed. The functional classifications used to design the road do not necessarily address the issues that are important for lighting. Evaluation metrics include:

- Is this section of Roadway primarily used for through traffic or access, or more to local properties?
- What is the speed limit?
- What is the level of development of the surrounding area?
- What is the pedestrian conflict?

This evaluation will determine which of the AASHTO Table classifications provides the best fit for the project.

Table 1 below contains some of the key points from the 2011 AASHTO Green Book to assist the designer in the evaluation.

Table 1. Classification Descriptions

| Roadway Classifications | Description |
|--|--|
| Other Principal (Major) Arterials | That part of the roadway system that serves as the principal network for through-traffic flow, with low emphasis on local access. The routes connect areas of principal traffic generation and important roadways entering the city. Posted speeds are generally high. |
| Minor Arterials | That part of the roadway system that serves as the principal network for through-traffic flow between smaller communities, or as a secondary roadway for through traffic. These routes typically have lower traffic levels than major arterials. Although posted speeds are relatively high, these can provide more local access. |
| Collectors | Roadways servicing traffic between major and local roadways. These are streets used mainly for traffic movements within residential, commercial, and industrial areas. They do not handle long through trips, but can provide travel between towns not served by other systems. These generally have moderate posted speeds. |
| Local | Local roadways used primarily for direct access to residential, commercial, industrial, or other abutting property. They do not include roadways carrying through traffic, although an arterial passing through a small community <i>may</i> provide local functionality. Posted speeds are low. |
| Area Classifications (Pedestrian Conflict) | Description |
| Commercial (High) | The portion of the municipality in a business development where ordinarily there are large numbers of pedestrians and a heavy demand for parking spaces during periods of peak traffic or a sustained high pedestrian volume and a continuously heavy demand for off-street parking during business hours. This definition applies to densely developed business areas outside of, as well as those that are within the central part of a municipality. Areas where significant numbers of pedestrians are expected to be on the sidewalks or crossing the streets during darkness. Examples are downtown retail areas, near theaters, concert halls, stadiums, and transit terminals. |
| Intermediate (Medium) | The portion of the municipality which <i>may</i> be outside of a downtown area but generally within the zone of influence of a business or industrial development, often characterized by a moderately heavy nighttime pedestrian traffic and a somewhat lower parking turnover than is found in a larger or more active commercial area. This definition includes densely developed apartment areas, hospitals, public libraries, and neighborhood recreational areas. |
| Residential (Low) | An area characterized by few pedestrians and low parking demand or turnover at night or portions of the night. Although this definition includes areas with housing, it also includes commercial areas with low pedestrian activity. Regional parks, cemeteries and vacant lands could also be included. |

PLACEMENT OF LIGHTING POLES

The following criteria **shall** be used to ensure that the placement of poles and other lighting appurtenances adjacent to the roadway will provide an acceptable degree of safety to the public and also comply with good illumination practices. The selection of pole types and their offsets from the traveled portions of the roadway is of considerable importance in minimizing the number and severity of fixed object collisions by errant vehicles. As much as possible, the number of poles *should* be as limited as possible to decrease impact on roadway operations, potential “run-ins”; and maintenance purposes. The Traffic Signal Design Manual and the Roundabout section herein give additional information related to pole locations and co-locations for luminaires, etc.

Minimum Lateral Offset

Table 2 below is attached as a reference for the minimum lateral offset for lighting poles on state trunk highways. The values indicated in the table are based upon the current policy related to objects in clear zones as specified in [FDM 11-15-1](#). All designs **shall** comply with the FDM. Offsets greater than those prescribed *should* be provided where feasible and where special traffic and highway conditions warrant. The designer **shall** coordinate with the Project Manager regarding all pole placement considerations.

Table 2. Minimum Lateral Offsets

| FACILITY TYPE | SPEED LIMIT (MPH) | TRAFFIC VOLUME (ADT**) | MINIMUM RIGID (FEET) | OFFSET BREAKAWAY (FEET) |
|---------------|-------------------|------------------------|----------------------------------|--|
| RURAL | | | | SHOULDER width plus |
| | 35 or less 40 | ALL | 12 | 2 |
| | | 0 – 1,000 | 14 | 2 |
| | | 1,500 – 6,000 | 16 | 2 |
| | | over 6,000 | 18 | 2 |
| | 45-50 | 0 – 1,500 | 20 | 2 |
| | | 1,500-6,000 | 26 | 2 |
| | | over 6,000 | 28 | 2 |
| | 55 | 0 – 1,500 | 24 | 2 |
| 1,500 – 6,000 | | 30 | 2 | |
| over 6,000 | | 30 | 2 | |
| URBAN | | | | |
| | 40 or less | ALL | 2 from face of curb | 2 from face of curb |
| | 45 and higher | ALL | Offsets same as rural section | (Measured from the edge of thru lane) the greater of 12 or 2 from face of curb |

Offset distances are in feet, from edge of the adjacent through traffic lane to the face of the pole; or as indicated for urban sections.

1. The preceding table is based upon pole location in a flat area or without fill slope steeper than 4:1. If rigid poles are contemplated on a slope of greater steepness and significant width, advice *should* be sought from C.O. Traffic. Placement of rigid poles in this situation is discouraged.
2. A reduction in minimum offset requirement by as much as 1/3 *may* be followed where there is a pronounced back slope rising more or less directly from the shoulder. No value **shall** be less than 24 feet for 40 mph or more.
3. Where the offsets given in the above table would place rigid poles off the highway right-of-way, they *may* be permitted at or as near the right-of-way line as practical if it would not result in a significant added hazard to the public.
4. Where the offsets given in the above table require a pole to be in a ditch line, the pole *should* be located beyond the ditch line, but *may* be permitted in front of the ditch line if it would not result in significantly increased hazard.
5. Where the offsets given in the above table would require a pole to be within a sidewalk area, poles *should*, if conditions permit, be located behind the sidewalk. Locations between the walk and roadway *may* be permitted in the event no other alternative is feasible.
6. Where a tree line exists closer to the roadway than permitted by Table 2 above, lighting poles *may* be placed in that tree line, if such poles will not constitute significant additional hazards to the public.
7. Rigid poles *may* be permitted inside the limits shown in the table where they are adequately protected by barriers such as guardrails or retaining walls erected for other purposes. There *should* be at least 4 feet clearance between the guardrail and the pole to allow for deflection at higher speed locations.
8. Offset requirements for poles in the medians of divided highways along added left turn lanes **shall** be measured from the edge of the through traffic lane. A right turn lane is not considered a through lane.
9. Lighting control cabinets for distribution of energy to lighting systems *should* be placed in the least vulnerable locations available.

LIGHTING PLANS

All lighting plans **shall** include the following information:

- Roadway, Area, and Pavement Classifications used in the design
- Legend, describing the Luminaires, poles, arms, cabinet, and circuit information.
- Luminaire symbols **shall** include location and circuit information.
- System wiring diagram including conduit, conductor, and circuit information for all conduit segments.
- Maintenance Authority

A sample lighting plan sheet is located in FDM 15.1 attachment 5.14 for reference.

REFERENCE TO STANDARDS

The installation of highway lighting **shall** conform to applicable provisions of Chapter 9, Section 15 of the WisDOT Highway Maintenance Manual, except as modified herein. In addition, the highway lighting installation **shall** comply with the requirements of the latest edition of the following:

- National Electrical Code
- Wisconsin Electrical Code
- Local codes and ordinances

The following guides apply to all highway lighting installations covered by this policy. Unless otherwise indicated, the latest editions of the following guides **shall** be used.

1. American Association of State Highway and Transportation Officials (AASHTO) Roadway Lighting Design Guide, October 2005.
2. American National Standard Institute (ANSI), American National Standard Practice for Roadway Lighting RP-8-00.

The most restrictive, policy, code, standard, or guide **shall** govern. Central Office will make the final decision on the interpretation of conflicting policies, codes, or standards.

POLICY REVISIONS

The requirements of this policy *may* be updated to reflect changing technology or other conditions appropriate at the time. Such additions, revisions, and modifications will not be made retroactive to lighting installations covered by existing permits.

WisDOT *may* require the updating of all or part of an existing installation to conform to the latest criteria in the event damage to an installation, highway reconstruction, or other reasons requiring the replacement or relocation of all or part of an existing lighting installation offers an opportunity to upgrade the installation.



Traffic Engineering, Operations & Safety Manual

Chapter 11 Lighting/Electrical/Electronic Systems

Section 3 Permitted Lighting

11-3-1 Permitted Lighting Systems

May 2015

POLICY

All locally owned and maintained Roadway Lighting Systems installed on the State Trunk highway System **shall** require a permit in accordance with this document.

THIS POLICY DOES **NOT** APPLY TO LIGHTING SYSTEMS PROPOSED FOR INSTALLATION ON **LOCAL ROADWAYS OR CONNECTING HIGHWAYS**. THESE ARE THE RESPONSIBILITY OF THE LOCAL MUNICIPALITIES. THIS DOCUMENT MAY BE USED AS A REFERENCE FOR DESIGN OF SUCH SYSTEMS.

POLICY APPLICATION

The purpose of this policy is to prescribe guidelines and procedures that will provide for the uniform accommodation of roadway lighting facilities installed and maintained by others within the limits of the public highway rights-of-way of the State Trunk system.

The provisions of this policy **shall** apply to all cities, villages, counties and towns (agencies) which desire to use or occupy rights-of-way of the State Trunk Highway system for locally owned and maintained highway lighting. Public, private and municipal utilities, cooperatives, and private citizens who desire to use or occupy rights-of-way of the State Trunk Highway System for highway lighting **shall** apply to the city, village, county or town in which the State Trunk Highway is located.

PERMIT REQUIREMENTS

For all Projects covered under this policy, an application for approval to install roadway lighting **shall** be submitted to the DOT Regional Office by the city, village, county or town that will be paying for the maintenance and energy costs associated with the lighting system.

The application **shall** be submitted on the appropriate current forms and **shall** include all items outlined in this document. The forms are available on the WisDOT web site. Sample copies of the current forms follow this policy.

Permit applications that require State Lighting Engineer approval **shall** be submitted to the attention of the Regional Office.

APPROVAL AUTHORITY

The State Lighting Engineer **shall** review and approve all permits involving new continuous lighting systems.

New permits are required if an agency wishes to upgrade or otherwise modify an existing continuous system, including altering or moving lighting equipment or altering equipment associated with a lighting transition zone.

The State Lighting Engineer **shall** also review and approve applications that include:

- decorative lighting installed on the State Trunk Highway system
- lighting for a trail or walkway that is adjacent to the roadway
- receptacles for festoon lighting
- flood lighting proposed for bridges and retaining walls

The Regional Office has the approval authority to review and issue permits for isolated lighting on the State Trunk Highway system. This includes the installation of a luminaire and arm added to an existing or new utility pole. The Regional Office may review and issue a permit for continuous lighting when an agency wishes to add lighting units to an existing continuous system as long as the new lighting units match the existing equipment and generate equivalent lighting levels.

Any changes to an existing permitted installation that result in the following alterations, **shall** not be made until a new permit authorizing such changes is issued (Excludes routine maintenance activities):

- Pole locations
- Pole heights and types
- Luminaire and lamp types
- Operating conditions such as lighting curfews/dimming

- Other items affected by this policy

CONTINUOUS LIGHTING PERMIT APPLICATION

The applicant **shall** follow the following two-part process for Continuous Lighting permit applications, consisting of a preliminary and a final application form:

1. At project scoping or as soon as it is known that lighting will be included, the Applicant **shall** contact the Region Office to coordinate the submittal of a preliminary permit application. The name and address of the project electrical and lighting designer **shall** appear on the form. The applicant **shall** provide catalog cut sheets for proposed poles and luminaires. Photometric design and pole layout **should** not begin until the preliminary application is submitted and approved. The Regional Office may review the basic project information, and coordinate with State Lighting Engineer on acceptance of poles and luminaires.

As part of this preliminary process, the applicant shall describe the purpose for the proposed lighting system, such as:

- a. Roadway safety lighting in accordance with AASHTO requirements
 - b. Decorative lighting for downtown shopping, etc.
2. At or before Pre-PS&E completion, the Applicant **shall** submit the Final permit application to the Regional Office. Lighting and electrical plans, special provisions, photometric and voltage drop calculations, and pole and luminaire cut sheets **shall** be submitted with the final permit application. The name and address of the project electrical and lighting designer and appropriate signatures **shall** appear on the form. After initial review, the Regional Office **shall** forward the Application to the State Lighting Engineer.
 3. The designer **shall** include in the project plans the necessary SPV verbiage that ensures that the final luminaires provided on the project will meet the design parameters of the permit.

ISOLATED LIGHTING PERMIT APPLICATION

Since Isolated Lighting covers numerous situations, such as leased Utility lights at an intersection, the Regional Office may allow substitution of the Isolated Lighting Permit Application as conditions dictate. In any case, the Applicant **shall** contact the Regional Office at project conception to begin the permit process.

DESIGN PARAMETERS

The designer shall follow the appropriate WisDOT design standards/parameters for the type of lighting system being proposed. Unless indicated otherwise, the Illuminance Method of calculation **shall** be used to determine average and uniformity roadway lighting levels.

The designer/engineer **shall** also perform veiling luminance calculations. The specified Veiling Luminance Ratio **should not** exceed that defined in the AASHTO Roadway Lighting Design Guide.

The calculation of roadway lighting levels **should** be performed using AGI32 software.

1. For straight sections of Continuous Roadway lighting, the calculation and submittal/report **shall** be based upon The Roadway Optimizer tool.
2. For intersections, the calculation and submittal/report **shall** be calculated using a grid defining the traffic conflict areas and **shall** include the outside edges of pedestrian crosswalks. Intersection calculations **shall** be independent of any continuous roadway calculations included in the project area.
3. For roundabouts, the calculation and submittal/report **shall** be calculated using a grid defining the traffic conflict areas and **shall** include the outside edges of pedestrian crosswalks. Roundabout calculations **shall** be independent of roadway calculations

The Light Loss Factor to be applied to initial luminaire lumen output to calculate maintained illumination as prescribed in this section **shall** be justified and furnished with the permit application.

The Voltage Drop and related Wire sizing for lighting circuits and festoon receptacles *shall* be calculated in conformance with the NEC, along with any additional requirements of the applicant agency. See [TEOpS 11-2-1](#) for additional information.

Festoon receptacle branch circuits *should* be circuited independent from roadway lighting circuits unless maintaining agency has specific reasons to warrant a combined circuit.

DISTRIBUTION REQUIREMENTS FOR LUMINAIRES

No luminaire **shall** be proposed for use on the State Trunk Highway System that cannot meet the Veiling Luminance Ratio required for the Lighting System.

CURFEWS

Curfews are defined as the switching off or dimming of lights during certain off-peak hours. The Department will consider allowing curfews of a permitted lighting system if the maintaining agency can demonstrate that it will not violate the AASHTO table lighting levels. This would include:

- Evaluation of the conditions during the proposed curfew hours showing that the roadway/area is different than the normal hours such that a reduction in illumination is justified if dimming is proposed. Such an evaluation typically would typically include such items as reductions in traffic volume and/or pedestrians.
- A statement that illumination is not necessary during the proposed curfew hours if the maintaining agency desires to switch off the lights. Although AASHTO does not require roadway lighting, the maintaining agency installed it for a reason, and therefore shall evaluate the proposed switching accordingly.

FINAL PERMIT APPLICATION SUBMITTAL REQUIREMENTS

The following information **shall** be identified on the submittal:

1. Roadway names.
2. Roadway and area classifications.
3. Pavement classification.
4. Posted speed limit of roadways.
5. Local maintaining authority.
6. Catalog cut sheets for pole and luminaire which include manufacturer's luminaire catalog numbers and include wattage, light source, initial luminaire or lamp lumens, voltage, lens type, Illumination Engineering Society (IES) distributions, and options.
7. Light Loss Factor (LLF) used for the design.
8. If banners, holiday decorations or festoon receptacles are to be installed or attached to the poles, the dimensions and location **shall** be included and shown on a detail drawing in the plans.
9. Voltage Drop calculations for lighting and festoon receptacle circuits.
10. Computer design computations for illumination and spacing of computed roadway sections as described above.
11. Summary tables that include both design parameter target values and calculated results.

The Project Electrical/Lighting Engineer **shall** sign and date the final permit application.

REFERENCE TO STANDARDS

The installation of highway lighting **shall** conform to applicable provisions of Chapter 9, Section 15 of the WisDOT Highway Maintenance Manual, except as modified herein. In addition, the highway lighting installation **shall** comply with the requirements of the latest edition of the following:

- National Electrical Code
- Wisconsin Electrical Code
- Local codes and ordinances

The following guides apply to all highway lighting installations covered by this policy. Unless otherwise indicated, the latest editions of the following guides **shall** be used.

1. American Association of State Highway and Transportation Officials (AASHTO) Roadway Lighting Design Guide, October 2005.
2. American National Standard Institute (ANSI), American National Standard Practice for Roadway Lighting RP-8-00.

The most restrictive, policy, code, standard, or guide **shall** govern. State Lighting Engineer will make the final decision on the interpretation of conflicting policies, codes, or standards.

POLICY REVISIONS

The requirements of this policy *may* be updated to reflect changing technology or other conditions appropriate at the time. Such additions, revisions, and modifications will not be made retroactive to lighting installations covered by existing permits.

DOT *may* require the updating of all or part of an existing installation to conform to the latest criteria in the event damage to an installation, highway reconstruction, or other reasons requiring the replacement or relocation of all or part of an existing lighting installation offers an opportunity to upgrade the installation.

ISOLATED LIGHTING PERMIT APPLICATION

DT1885 11/2014 s. 84.02(4)(c) Wis. Stats.

Wisconsin Department of Transportation
State Project Number

| |
|--|
| |
|--|

Submit 2 copies to the Regional Office of the Wisconsin Department of Transportation, including:

- Attach engineering drawing of lighting installation including all applicable information such as location, spacing of poles, wiring, lighting units, edge of pavement, curblines and shoulders, etc. Include complete proposed installation from sourceline to lighting fixture. Include specifications and special provisions.

| | | | | | |
|--|--------------------------------|---|---|---|--|
| Highway | | Intersected Highway Name or Number; Area Limits | | | |
| Applicant Name (must be a Government Unit) | | Applicant Mailing Address, City, State, ZIP Code | | (Area Code) Telephone Number | |
| Designer Name | | Designer Mailing Address, City, State, ZIP Code | | (Area Code) Telephone Number | |
| Maintainer Name | | Maintainer Mailing Address, City, State, ZIP Code | | (Area Code) Telephone Number | |
| County | | Posted Speed Limit mph | ADT and Year vpd | Cross Section <input type="checkbox"/> Rural <input type="checkbox"/> Urban | |
| Number of Poles | Material and Class | Mast Arm Length ft | Base Type <input type="checkbox"/> Breakaway <input type="checkbox"/> Non-Breakaway <input type="checkbox"/> Direct Bury | Wiring <input type="checkbox"/> Overhead <input type="checkbox"/> Underground | |
| Number of Luminaires | Mounting Height Above Pavement | Watts Source | IES Distribution Type and BUG Rating | Initial Lumens | |

The list of attachments to this permit application includes plan sheets, calculations, specifications, etc.

The designated applicant applies to the Wisconsin Department of Transportation, Division of Transportation System Development for permission to install, operate and maintain, or to contract for the installation, operation and maintenance of highway lighting units within the limits of the right of way of the state trunk highway, all as described above.

The applicant certifies that if the proposed lighting is located in another unit of government, written consent has been obtained as required by Wisconsin Statutes from the other unit of government in which the proposed lighting units and associated power line extensions are located, and that such consent is currently valid and covers all of the proposed work.

The undersigned certifies that s/he is authorized to sign this application on behalf of the designated applicant.

X

(Applicant Signature) (Date – m/d/yyyy) (Applicant Title)

Applicant: Do Not Write Below This Line

PERMIT APPROVAL

Permission is granted to the above applicant to install, operate and maintain highway lighting units and associated power lines and poles as described in this application and the attached drawings and specifications, subject to the conditions on the following page of this application.

ISOLATED LIGHTING – Approved for Regional Office

| | | |
|---------------|------------------------|----------|
| Permit Number | Date Issued (m/d/yyyy) | X |
|---------------|------------------------|----------|

(Approval Signature)

ISOLATED LIGHTING PERMIT APPLICATION *(continued)*

Wisconsin Department of Transportation DT1885

Highway Lighting Installation Permit Conditions

1. The installation, including all wiring, supports, equipment, roadway clearance, etc., shall be in accordance with pertinent statutes, codes, and regulations as well as good trade and engineering practice, and shall be properly maintained.
2. The installation, operation, and maintenance of the highway lighting facilities shall be at the expense of the permittee. Alterations in any part of the installation as are required at any time by the Wisconsin Department of Transportation shall be made by the permittee at his/her own expense within 60 days.
3. Construction and maintenance operations shall be performed without closing the highway to traffic except as may be specifically authorized by authorized representatives of the governmental agency maintaining the highway. Unless otherwise authorized, two-way traffic shall be maintained at all times. Proper barricades, signs, flags, lights, and flagpersons shall be provided and maintained at all locations in accordance with the Manual on uniform Traffic Control Devices.
4. The permittee shall not interfere with the normal use of the adjoining land by the owners in the installation, alteration, maintenance, or removal of the facilities authorized by this permit.
5. A concrete base, if used, shall not extend more than four (4) inches above ground level at any point.
6. The highway lighting facilities installed by authority of this permit may be removed by the permittee, following 30 days written notice to the Wisconsin Department of Transportation, but such removal shall be subject to the conditions governing the installation of the lighting and associated electric power lines.
7. Any excavations necessitated by the proposed work shall be effectively backfilled and subsequent settlements after backfilling repaired to the satisfaction of the highway authority. Roadway surfaces, pavements, structures, vegetation, or other highway facilities damaged shall be repaired or restored to the satisfaction of the highway authority. Temporary sheeting and shoring shall be used as necessary to prevent soil caving in any trenches and tunnels.
8. Following any work on the highway right of way incident to an installation, alteration, or removal under this permit, the permittee shall restore the right of way to its condition previous to the work by the permittee, said restoration to meet with the approval of the Wisconsin Department of Transportation.
9. No trees or shrubs shall be cut, trimmed, or branches cut or broken in the construction or maintenance of the line without the consent of the owner of the trees or shrubs.
10. Any brush, trash, waste, or rubbish resulting from construction or maintenance of the line shall be removed from the highway right of way.
11. All wood and debris from any elm trees or other diseased trees which have been trimmed in performance of the work permitted under this permit shall be disposed of in accordance with approved Wisconsin Department of Transportation's procedure, a copy of which may be obtained from the approving district office.
12. The permittee shall immediately notify the district office when the installation has been completed.
13. Any special provisions attached shall be considered as part of this permit.

PRELIMINARY CONTINUOUS LIGHTING PERMIT APPLICATION

DT1878 10/2013 s.84.02(4)(c) Wis. Stats.

Wisconsin Department of Transportation
State Project Number

Submit 2 copies to the Regional Office of the Wisconsin Department of Transportation, including:

- Completed Preliminary Information Form. Provide additional forms as necessary when there are multiple Roadways and/or Roadway Types.
- Engineering drawing of the Roadway Plan, or typical section, showing edge of pavement, curb lines, shoulders, etc.
- Catalog cut sheets of the Proposed Poles and Luminaries.

Preliminary Information Form (Provide additional forms as necessary for multiple roadways and/or roadway types)

| | | | | | |
|---|---------------------------|---|---|--|---------------------|
| Highway | | Lighting Limits | | | |
| Applicant Name and Mailing Address (Must be a Government Unit) | | | Project Electrical Engineer Name, Mailing Address and Telephone | | |
| Maintainer Name, Mailing Address and Telephone | | | Project Lighting Engineer Name, Mailing Address and Telephone | | |
| County | Posted Speed Limit mph | ADT | Cross Section Rural | Urban | Roadway Width ft |
| Road Class <input type="checkbox"/> Major <input type="checkbox"/> Minor Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Other | | Area Class <input type="checkbox"/> Commercial <input type="checkbox"/> Residential <input type="checkbox"/> Intermediate | | Pavement Class <input type="checkbox"/> R1 <input type="checkbox"/> R3 <input type="checkbox"/> R2 <input type="checkbox"/> R4 | |

Based on Roadway information above, provide Design Criteria Values in accordance with AASHTO 2005 Roadway Lighting Guide, Table 3-5a.

| Luminaire Description | IES Distribution and BUG Rating | Mounting Height Above Pavement | Watts/Source | Initial Lumens | LLF |
|----------------------------------|---------------------------------|--|---|-----------------------|---------|
| Target Illuminance Values | | Target Luminance Values (If applicable. See Design Requirements in TGM 11-10-1) | | | |
| Average FC | Uniformity Ave/Min | Average cd/m sq | Veiling Luminance Ratio Lv(max)/Lavg | Uniformity Ave/Min | Max/Min |

The designated applicant applies to the Wisconsin Department of Transportation, Division of Transportation System Development for permission to begin the design to install, operate and maintain, or to contract for the installation, operation and maintenance of highway lighting units within the limits of the right of way of the state trunk highway, all as described above.

The applicant certifies that the Lighting Engineer has explained the WisDOT Lighting Requirements.

The undersigned certifies that s/he is authorized to sign this application on behalf of the designated applicant.

X

| | | |
|-----------------------|--------|---------|
| | | |
| (Applicant Signature) | (Date) | (Title) |

Applicant: Do Not Write Below This Line

PRELIMINARY PERMIT APPROVAL

Permission is granted to the above applicant to begin the design to install, operate and maintain highway lighting units and associated power lines and poles as described in this application and the attached drawings and specifications, subject to the conditions on the following page of this application.

CONTINUOUS LIGHTING

| | | |
|---------------|------------------------|--|
| Permit Number | Date Issued – m/d/yyyy | Approved for Division of Transportation System Development |
| | | X |

(Signature)

Highway Lighting Installation Permit Conditions

1. The installation, including all wiring, supports, equipment, roadway clearance, etc., shall be in accordance with pertinent statutes, codes, and regulations as well as good trade and engineering practice, and shall be properly maintained.
2. The installation, operation, and maintenance of the highway lighting facilities shall be at the expense of the permittee. Alterations in any part of the installation as are required at any time by the Wisconsin Department of Transportation shall be made by the permittee at his/her own expense within 60 days.
3. Construction and maintenance operations shall be performed without closing the highway to traffic except as may be specifically authorized by authorized representatives of the governmental agency maintaining the highway. Unless otherwise authorized, two-way traffic shall be maintained at all times. Proper barricades, signs, flags, lights, and flagpersons shall be provided and maintained at all locations in accordance with the Manual on uniform Traffic Control Devices.
4. The permittee shall not interfere with the normal use of the adjoining land by the owners in the installation, alteration, maintenance, or removal of the facilities authorized by this permit.
5. A concrete base, if used, shall not extend more than four (4) inches above ground level at any point.
6. The highway lighting facilities installed by authority of this permit may be removed by the permittee, following 30 days written notice to the Wisconsin Department of Transportation, but such removal shall be subject to the conditions governing the installation of the lighting and associated electric power lines.
7. Any excavations necessitated by the proposed work shall be effectively backfilled and subsequent settlements after backfilling repaired to the satisfaction of the highway authority. Roadway surfaces, pavements, structures, vegetation, or other highway facilities damaged shall be repaired or restored to the satisfaction of the highway authority. Temporary sheeting and shoring shall be used as necessary to prevent soil caving in any trenches and tunnels.
8. Following any work on the highway right of way incident to an installation, alteration, or removal under this permit, the permittee shall restore the right of way to its condition previous to the work by the permittee, said restoration to meet with the approval of the Wisconsin Department of Transportation.
9. No trees or shrubs shall be cut, trimmed, or branches cut or broken in the construction or maintenance of the line without the consent of the owner of the trees or shrubs.
10. Any brush, trash, waste, or rubbish resulting from construction or maintenance of the line shall be removed from the highway right of way.
11. All wood and debris from any elm trees or other diseased trees which have been trimmed in performance of the work permitted under this permit shall be disposed of in accordance with approved Wisconsin Department of Transportation's procedure, a copy of which may be obtained from the approving district office.
12. The permittee shall immediately notify the district office when the installation has been completed.
13. Any special provisions attached shall be considered as part of this permit.
 Special Provisions are attached, please explain:

11-3-2 Aesthetic Lighting on Structures

May 2015

DEFINITION

Decorative roadway light poles on structures, or aesthetic lighting, is a dynamic lighting system that can be operated and controlled by a central computer using fiber optic and data cable lines and software that is capable of projecting a near limitless variety of colors and color patterns on bridges and other structures. The colors can be changed at an interval or remain constant. The intensity of the lighting fixtures can be controlled from 0 to 100 percent. Typical systems have the capability to be pre-programmed so that the lighting color selections and color schemes can be approved and controlled. This type of lighting does not impact the illumination level of the roadway.

POLICY

Aesthetic lighting *may* be installed only under conditions referenced in the WisDOT Bridge Manual and DTIM cost-share policies in the [Program Management Manual 3-25-15](#). The provisions of this policy **shall** apply to all cities, villages, counties and towns (agencies) which desire to use or occupy rights-of-way of the State Trunk Highway system for locally owned and maintained highway lighting. Public, private and municipal utilities, cooperatives, and private citizens who desire to use or occupy rights-of-way of the State Trunk Highway System for aesthetic lighting **shall** apply to the city, village, county or town in which the State Trunk Highway is located.

The same permit process shall be followed as stated in [TEOpS 11-10-1](#), Permitted Lighting for Locally Owned & Maintained Lighting Systems. Form DT1885 **shall** be submitted to WisDOT Regional Traffic Operations Section. **The permittee must note that the form is for aesthetic lighting.** Approval of a decorative lighting installation is based on WisDOT Regional Traffic Operations, Bureau of Traffic Operations and Bureau of Structures review.

The installation, including all wiring, supports, equipment, roadway clearance, etc. **shall** be in accordance with pertinent statutes, codes and regulations as well as good trade and engineering practice and **shall** be properly maintained. All electrical components of the system, including conduit, cabling, pedestals, **shall** be completely separate physically from WisDOT electrical system infrastructure. All electrical systems **shall** be designed under the oversight of the State Electrical Engineer and **shall** be documented as under the operational control of WisDOT Bureau of Traffic Operations.

The operation and maintenance of the lighting system **shall** be at the expense of the maintaining agency. Removal of the system or alterations in any part of the installation that are required at any time by the WisDOT **shall** be made by the maintaining agency at his/her own expense within 60 days. Immediate action will be required if a hazardous aspect to the lighting system arises.

Construction and maintenance operations **shall** be performed without closing the highway to traffic except as *may* be specifically authorized by authorized representatives of the agency maintaining the highway. A work on right of way permit will be required by the appropriate regional office prior to any work being done on the right of way.

Aesthetic lighting schemes **shall not** present a distraction to traveling public. The lighting system **shall** be designed to minimize light trespass. When programmed to do so, the colors will remain fixed no less than 8 seconds. When lighting is in close proximity to the traveling public, certain colors (i.e., red, blue, amber), text, or images *may* be prohibited. At no time *may* the lights or colors flash or blink. The WisDOT Regional Traffic Operations Section will conduct a lighting review on driver effects.

Any requests from the public for change in operation of the lighting will be directed to the maintaining agency of the lighting system. The WisDOT Regional Traffic Operations Section in coordination with the Bureau of Traffic Operations will approve all non-standard lighting patterns prior to use. Requests *should* be made at least seven (7) days prior to the event to provide time for WisDOT consideration and approval. WisDOT *may* provide requests to the maintaining agency for certain public awareness campaigns (i.e., orange lighting for Work Zone Awareness Week).

WisDOT *may* require the aesthetic lighting be turned off under conditions or circumstances of adverse weather like heavy snow, fog or accidents which *may* have an impact on the traveling public.



Traffic Engineering, Operations & Safety Manual

Chapter 11 Lighting/Electrical/Electronic Systems

Section 4 Roundabout Lighting

11-4-1 Policy and Design Guidelines

May 2015

POLICY

All DOT maintained roundabouts **shall** be illuminated.

All roundabout roadway luminaires on state maintained highway systems **shall** be LED and selected from the Qualified Products List.

Locally maintained Roundabouts **shall** follow the requirements for permitted lighting.

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

- Copy of approved roundabout illumination form
- design layout
- photometric calculations with summary information showing compliance with illumination and uniformity criteria
- voltage drop calculations

A Roundabout Illumination Form is included to aid in identifying the appropriate roadway and pedestrian classifications and subsequent light levels. The designer **shall** complete this form and submit it to the Region Lighting Engineer for approval prior to beginning the design for a roundabout on the state maintained highway system.

ILLUMINATION DESIGN VALUES AND CALCULATIONS

The roundabout intersection illumination area **shall** be calculated by using the illumination method.

[TEOps 11-2-1](#) explains Roadway and Pedestrian Area Classifications used to determine the recommended Illuminance levels outlined below in Table 1. Note: AASHTO refers to the Pedestrian Area Classifications as Commercial, Intermediate, and Residential Land Uses.

The Recommended Illuminance Levels at Roundabouts is the sum of the recommended values for continuously illuminated approaching roadways.

Table 1 below, based on these Roadway and Pedestrian Classifications, for R2 and R3 pavement, summarizes these values. "Minor" is used to identify Minor Arterial.

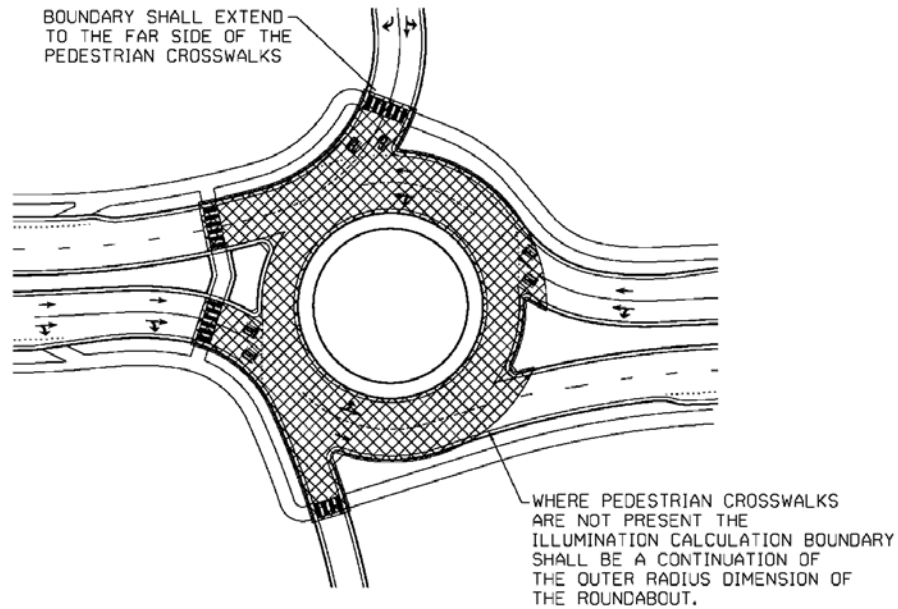
| Roadway Classification | Average Maintained Illumination At Pavement by Pedestrian Area Classification in FC | | | E _{avg} /E _{min} |
|------------------------|---|--------|------|------------------------------------|
| | High | Medium | Low | |
| Major/Major | 3.16 | 2.42 | 1.67 | 3:1 |
| Major/Minor | 2.97 | 2.23 | 1.49 | 3:1 |
| Major/Collector | 2.70 | 2.04 | 1.39 | 3:1 |
| Major/Local | 2.42 | 1.86 | 1.21 | 3:1 |
| Minor/Minor | 2.79 | 2.04 | 1.30 | 4:1 |
| Minor/Collector | 2.51 | 1.86 | 1.21 | 4:1 |
| Minor/Local | 2.23 | 1.67 | 1.02 | 4:1 |
| Collector/Collector | 2.23 | 1.67 | 1.12 | 4:1 |
| Collector/Local | 1.95 | 1.49 | 0.93 | 4:1 |
| Local/Local | 1.67 | 1.30 | 0.74 | 6:1 |

For roundabouts where roadways that are not continuously illuminated, the values for Local/Local *should* be used.

ROUNABOUT CALCULATION BOUNDARIES

The calculation boundary is the area to which the illumination levels in Table 1 apply. This area includes the traffic conflict area extending to the far side of the pedestrian path on each of the approaching roadways. If a pedestrian path is not present, the calculation area extends to the outside radius of the roundabout entrance and exit including the entire traffic conflict area. Refer to Figure 1.

Figure 1. Roundabout Illumination Calculation Boundary



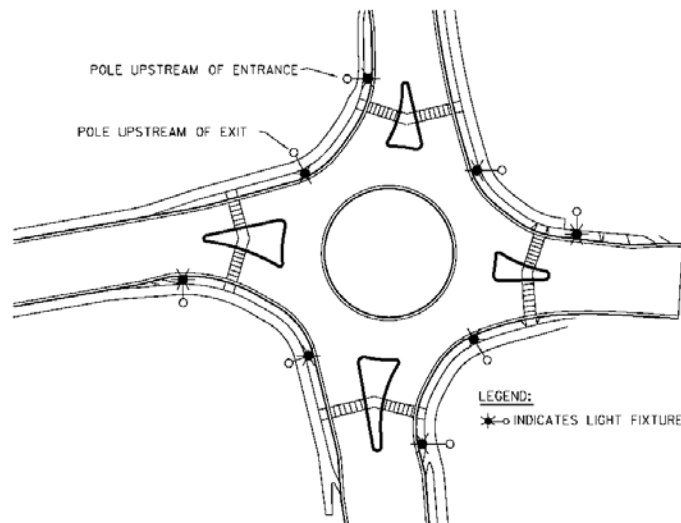
EQUIPMENT PLACEMENT

Light poles *should* be located according to these considerations:

- Minimize the impedance of roundabout approach signage sight lines.
- Place lighting poles on the right hand perimeter just upstream of entrance and exit points.
- Use Engineering judgment to determine appropriate light pole locations and at locations that *may* be too close to errant vehicle paths. In some instances it *may* be necessary to place light poles in larger splitter islands in order to provide good pedestrian recognition.
- Coordinate all clear zone issues with Project Engineer.

Figure 2 below illustrates basic pole placement.

Figure 2. Roundabout lighting placement



TRANSITION LIGHTING

Transition lighting *should* be provided at all roundabouts requiring illumination where the approach roads are not illuminated, and have posted speeds greater than or equal to 35 mph. Transition lighting is implemented to allow the users eyes to adjust from the non-illuminated to the illuminated roadway surface. This gradual lighting adjustment is accomplished incrementally based on the posted speed of the roadway. Recommended transition lighting distances *should* be based on Table 2.

| Table 2. Transition Lighting Lengths | | | | | | |
|--------------------------------------|----|----|----|----|----|----|
| Posted Speed Limit (MPH) | 30 | 35 | 40 | 45 | 50 | 55 |

| Minimum Transition Lighting Distance (Feet) | - | 175 | 200 | 250 | 275 | 325 |
|---|---|-----|-----|-----|-----|-----|
|---|---|-----|-----|-----|-----|-----|

Transition lighting *should* be measured from the outside limits of the Roundabout calculation boundary as shown in Figure 2.

Transition lighting for Highway On-Off ramps *should* be a minimum 275 feet or as dictated by design speed considerations.

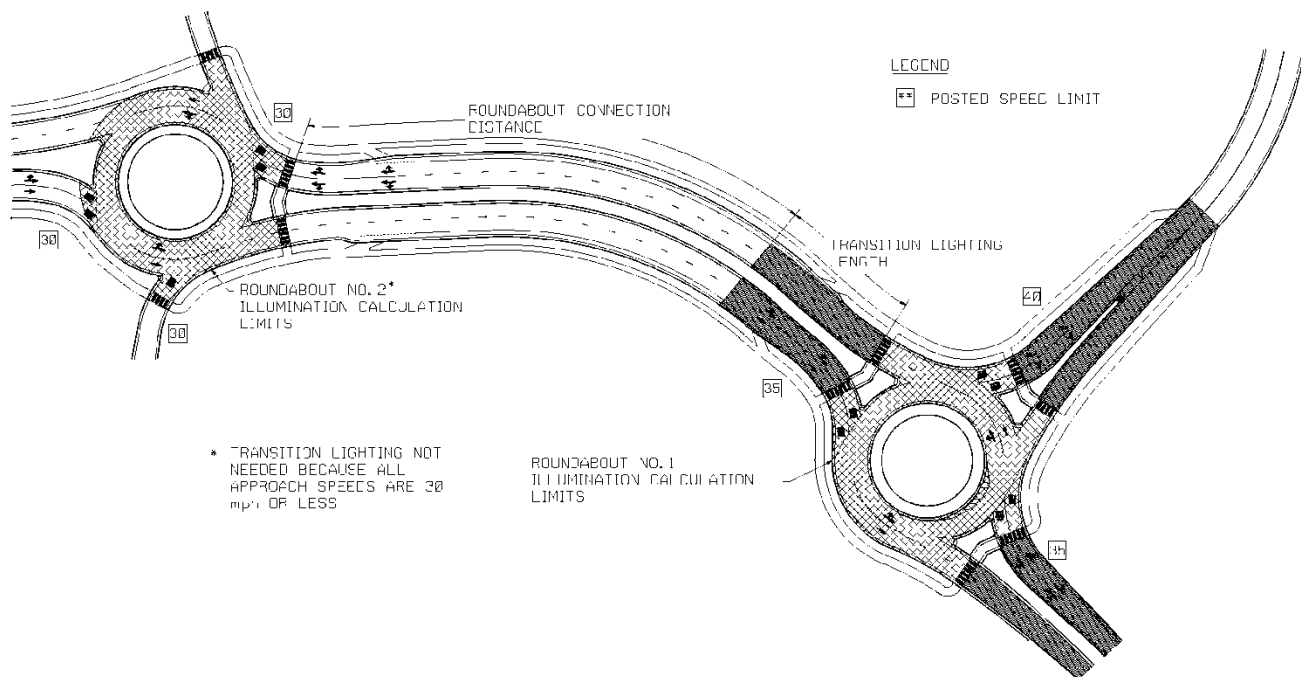
Recommended distances for transition lighting can sometimes extend beyond WisDOT right-of-way. Local municipalities electing not to extend transition lighting to the recommended distance must address this condition in the local agreement.

LIGHTING BETWEEN ADJACENT ROUNDABOUTS

If multiple illuminated roundabouts are placed adjacent to each other, e.g., freeway on/off ramps, the area between the roundabouts *should* be illuminated if the distance is less than or equal to that shown in Table 3. Include transition lighting if applicable. Illumination levels for the span of roadway between the roundabouts **shall** be based on the illumination of the roundabouts.

| Posted Speed Limit (MPH) | If Distance <= (Feet) |
|--------------------------|-----------------------|
| 30 mph or less | 500 |
| Over 30 mph to 45 mph | 750 |
| Greater than 45 mph | 1000 |

Figure 3. Sample transition and connection distance lighting areas



SOURCES

- Design Guide for Roundabout Lighting, DG-19-08, Illuminating Engineering Society of North America (IESNA), 2008.
- Roundabouts: An Informational Guide – U.S. Department of Transportation, Federal Highway Administration, June 2000.
- Roadway Lighting Design Guide, American Association of State Highway and Transportation Officials (AASHTO), 2005.
- The Illumination of Roundabout Intersections, Technical Guide – Centre d'Etudes des Transports Urbain, France.
- Florida Roundabout Guide, Second Edition, Florida Department of Transportation, May 1998.
- General Guidelines for Lighting Design, Plan Preparation and Highway Lighting by Permit, Illinois Department of Transportation, April 2006.

ROUNDAABOUT ILLUMINATION FORM

(To be completed prior to design)

| |
|-------------------------------|
| GENERAL INFORMATION: |
| Location: _____ |
| Street 1: _____ ADT: _____ |
| Street 2: _____ ADT: _____ |
| Pedestrian Count (1Hr): _____ |

| |
|---|
| ROADWAY AND AREA CLASSIFICATION: |
| Street 1: _____ |
| Street 2: _____ |

| |
|---|
| DETERMINATION OF ILLUMINATION VALUES: |
| <i>Use values from Recommended Illuminance Levels at Roundabouts, Table 1 in 11-4-1</i> |
| Illuminance Value: _____ Eavg/Emin Value: _____ |



Traffic Engineering, Operations & Safety Manual

Chapter 11 Lighting/Electrical/Electronic Systems

Section 5 Signalized Intersection Lighting

11-5-1 Policy and Design Guidelines

May 2015

APPLICATION

This policy and the related information apply to all State maintained signalized intersections on the Wisconsin State Trunk Highway System.

POLICY

All WisDOT maintained signalized intersections **shall** include lighting in accordance with this document.

Luminaires **shall** be LED.

Power for the lighting of WisDOT maintained signalized intersections *should* be fed from circuits from the signal cabinet. If the amperage of the proposed intersection lighting exceeds the capacity of the traffic signal cabinet, a separate lighting cabinet **shall** be evaluated.

When slotted left turn lanes are illuminated, these *should* be part of the intersection, subject to coordination with locally maintained continuous lighting where applicable.

DESIGN CONSIDERATIONS

Several factors affect the design of lighting for Signalized Intersections. The desired illumination level and the constraints of pole locations are the important factors, and are sometimes incompatible.

Illumination

The decision to signalize an intersection is based on the results of a signal investigation study of safety and operational factors.

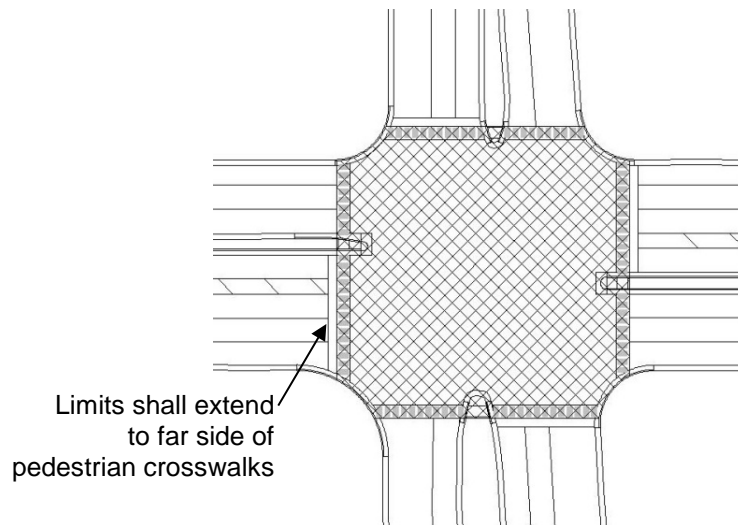
These factors typically relate to important visual tasks, and to conflicts with other vehicles and with pedestrians. These are important when considering lighting. These are discussed in IESNA RP-8-00, which is a reference for this document.

Generally, signalized intersections are located in urban areas along continuously lighted streets. The IESNA Recommended Illuminance Levels for the Intersections of continuously illuminated urban streets is, essentially, the sum of the recommended values for the intersecting roadways. The table below, based on Roadway and Pedestrian Classifications, for R2 and R3 pavement, summarizes these values. "Minor" is used to identify Minor Arterial.

Note: AASHTO refers to the Pedestrian Area Classifications as Commercial, Intermediate, and Residential Land Uses.

| Roadway Classification | Average Maintained Illumination At Pavement by Pedestrian Area Classification in FC | | | avg/min |
|------------------------|---|--------|------|---------|
| | High | Medium | Low | |
| Major/Major | 3.16 | 2.42 | 1.67 | 3:1 |
| Major/Minor | 2.97 | 2.23 | 1.49 | 3:1 |
| Major/Collector | 2.70 | 2.04 | 1.39 | 3:1 |
| Major/Local | 2.42 | 1.86 | 1.21 | 3:1 |
| Minor/Minor | 2.79 | 2.04 | 1.30 | 4:1 |
| Minor/Collector | 2.51 | 1.86 | 1.21 | 4:1 |
| Minor/Local | 2.23 | 1.67 | 1.02 | 4:1 |
| Collector/Collector | 2.23 | 1.67 | 1.12 | 4:1 |
| Collector/Local | 1.95 | 1.49 | 0.93 | 4:1 |
| Local/Local | 1.67 | 1.30 | 0.74 | 6:1 |

The calculation boundary shown in Figure 1 below is the area to which the illumination levels in the Table apply. This boundary area includes the area bound by the far side of the pedestrian crosswalks on all approaching roadways. If a pedestrian crosswalk is not present, the calculation area **shall** be similar to that identified in the figure.

Figure 1. Intersection Illumination Calculation Boundary

Pole Placement

History has illustrated the importance of minimizing poles within the intersection boundary. For this reason, the lighting designer **shall** install luminaires on traffic signal poles whenever possible. The designer **shall not** begin the lighting layout before obtaining the signal plan.

Particularly for large or otherwise complex intersections, it *may* be difficult to achieve the illumination and uniformity levels identified in Table 1 without additional poles. In such cases, it may be necessary to make an engineering judgment and not meet recommended uniformity. In such cases, the designer **shall** consider and prioritize the design considerations:

- Illuminate the far right of the intersection to help clearly identify fixed elements in the path of the vehicle, whether turning or going straight.
- Pedestrians in crosswalks are dark objects, difficult to see, particularly when the vehicle is making a right turn. Illuminating the crosswalk is high priority.
- It is unlikely that the driver will encounter any dark objects in the very center of the intersection or within straight driving lanes, where headlights illuminate the area. If the uniformity is not met, having the low points here *may* be acceptable.

Where illumination of slotted left turn lanes is included, the poles *should* be located in the raised median on the driver's side. The intersection calculations **shall not** include these overlapping luminaires.

DESIGN PROCEDURAL REQUIREMENTS

The designer **shall** contact the Region Lighting Engineer to verify roadway and pedestrian/land use classifications prior to beginning the design for signalized intersection illumination.

A Signalized Intersection Illumination Form is included to assist in identifying the appropriate roadway and pedestrian/land use classifications and subsequent light levels.

The designer *should* prepare intersection illumination calculations using AGI32 software using the calculation boundaries described in this document.

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

- Copy of approved illumination form
- design layout
- photometric calculations with summary information showing and uniformity
- voltage drop calculations

SIGNALIZED INTERSECTION LUMINAIRES

LED luminaires **shall** be used for all WisDOT owned and maintained intersection and roadway lighting systems. WisDOT's Qualified Electrical Products List outlines the specific LED luminaires that are permitted to be installed within these systems.

SIGNALIZED INTERSECTION ILLUMINATION FORM

(To be completed prior to design)

| |
|-------------------------------|
| GENERAL INFORMATION: |
| Location: _____ |
| Street 1: _____ ADT: _____ |
| Street 2: _____ ADT: _____ |
| Pedestrian Count (1Hr): _____ |

| |
|---|
| ROADWAY AND AREA CLASSIFICATION: |
| Street 1: _____ |
| Street 2: _____ |

| |
|---|
| DETERMINATION OF ILLUMINATION VALUES: |
| <i>Use values from Illuminance Levels for Intersections Table in 11-5-1</i> |
| Illuminance Value: _____ Avg/Min Value: _____ |



Traffic Engineering, Operations & Safety Manual

Chapter 11 Lighting/Electrical/Electronic Systems

Section 13 Electrical Maintenance Guidelines

11-13-1 Incident Management Protocols

May 2006

PURPOSE

The purpose of the incident management protocols for Department electrical systems is to provide guidelines for the regional electricians to follow in order to maintain conformity statewide.

The times indicated are the desired Department practices for identified incident response time. It is recognized there *may* be isolated occasions where the Department's ability to meet these guidelines are negatively impacted by certain factors such as: simultaneous calls, inclement driving conditions, and location of the actual incident. On those occasions where the response times are not met, reasons for non-attainment *should* be noted in the service reports.

DEFINITIONS

Response Time – The time from when we receive the initial service request to the time we arrive at the location.

Type 1 (Safety) – Urgent, respond immediately (day, night, weekends, or holidays), within three hours. Safety hazards to the public.

Type 2 (Efficiency) – Repairs *should* be done as soon as practicable or the next business day during normal working hours.

Type 3 (Routine) – Repairs *should* be done as scheduling permits.

QUALIFICATIONS FOR MAINTENANCE AND REPAIR OF SYSTEMS

1. Any and all repairs to the electrical systems **shall** be made by qualified personnel.
2. A qualified person **shall** be an Electrical Journey Person, who has successfully indentured as an apprentice and has completed the required academic curriculum established by DWD. In addition, the Journey must have gained the necessary electrical experience that relates to installation and maintenance of traffic signals, roadway lighting, and structures via on the job training at an established agency.
3. A fourth year DWD indentured apprentice *may* perform repairs under the guidance of a Journey person.

SERVICE CALL GUIDELINES MATRICES

TRAFFIC

| Type of call | Primary Response Reason | Procedural Guide | Estimated Response Time |
|---|-------------------------|--|---|
| Traffic signal going in and out of flash | Safety | | Type 1 |
| Traffic signal on flash | Safety | | Type 1 |
| All traffic signal indications dark or out at intersection | Safety | Ask caller to ensure its not just one lamp out where only one signal <i>may</i> be without an indication. Check with power company for possible power outage in area. Ask Law Enforcement to call back if signals do not come back on after power is restored in the area. | No response needed if utility power outage. Type 1 |
| Conflicting traffic signal indications on an approach or the same head. | Safety | Ask caller to describe the malfunction | Type 1 |
| Specific/one direction gets too much green time | Efficiency | Ask caller to describe malfunction. Ask caller if it is cycling. | Type 2 |
| Skipping specific traffic movement | Safety | Ask caller to describe malfunction | Type 1 |
| Traffic signal stuck on and/or in single direction | Safety | Ask caller to describe malfunction | Type 1 |
| Too little time to walk across road. | Efficiency | Ask caller to describe malfunction | Type 2 |
| Some traffic signals dim and/or some show multiple indications. | Safety | Ask caller to describe malfunction | Type 1 |
| Traffic signal damage or knockdown | Safety | Ask for the status of damage. Ask caller if the signal is still operating or if it's on flash. | Type 1 |
| Turned signal head. | Safety | Ask caller of the direction and location of signal head. | Type 1 |
| Traffic signal lamp outage | Safety | Ask the caller for specifics on which indication and what color is not working. | |

| | | | |
|---|------------|---|--------|
| | | Red or Yellow not working | Type 1 |
| | | Green not working | Type 2 |
| Pedestrian signal lamp outage | Efficiency | Ask caller for specifics on which indication is not working. Ask for the travel direction. | Type 2 |
| Short green time | Efficiency | Ask caller for specifics on what the caller has seen. Ask for the direction of travel. | Type 2 |
| Can't make it from one intersection to another on green. Always get stopped at the next intersection. | Routine | Obtain specifics as to what time of day this problem is noted, the direction of travel at the time. | Type 3 |

LIGHTING

| Type of call | Primary Response Reason | Procedural Guide | Estimated Response Time |
|--|--------------------------------|--|--------------------------------|
| Street light (Luminaire) pole damaged or knocked down (if WisDOT maintained) | Safety | Ask the caller for the status of damage. Is the pole still standing or is the pole leaning? | Type 1 |
| All street lights (Luminaires) are out (if WisDOT maintained) | Efficiency | Are the traffic signals still operational? If no, see traffic calls above. | Type 2 |
| Street light (Luminaire) is out (if WisDOT maintained) | Routine | Is it an overhead luminaire outage or a traffic signal indication? If traffic signal, see traffic calls above. | Type 3 |

FLASHERS

| Type of call | Primary Response Reason | Procedural Guide | Estimated Response Time |
|---|--------------------------------|-------------------------------------|--------------------------------|
| Traffic signal flasher damage/knockdown | Safety | Ask caller on the status of damage. | Type 1 |
| Traffic signal flasher out | Efficiency | Ask caller if flashers are working. | Type 2 |

DIGGERS HOTLINE

| Type of call | Primary Response Reason | Procedural Guide | Estimated Response Time |
|---|--------------------------------|--|--------------------------------|
| Emergency Diggers Hotline locate/repair | Efficiency | If cannot clear via phone, field locate required | Type 2 |



Traffic Engineering, Operations & Safety Manual

Chapter 11 Lighting/Electrical/Electronic Systems

Section 14 Electrical Inventory Numbering

11-14-1 Electrical Inventory Numbering System Guidelines

January 2009

GENERAL INFORMATION

In light of recent inventory tools & new methods of tracking existing equipment, the following outlines the use of installation ID numbers for *state-maintained* &/or *state-maintained electrical equipment* installed in the field & serviced by WisDOT staff. There are multiple reasons installation numbers are used to track installations internally: plan development, signal timing plan development, management of asset inventories, utility service tracking, service reporting, providing locates, etc.

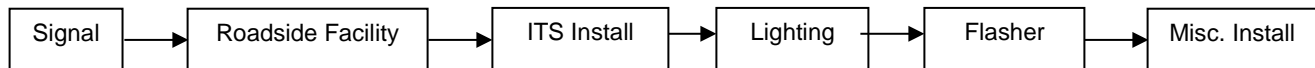
All electrical installations need to be identified by the appropriate alphanumeric codes. The correct format is indicated in [brackets] & is described for each installation described by this memo. If being viewed electronically, clicking on the specific installation indicated below will direct you to the corresponding section of this memo.

| Installation ID's for Traffic Operations | Installation ID's for ITS | Installation ID's for Roadside Facilities |
|--|---|--|
| 1) Signal ("S") Numbers | 10) Closed Circuit TV ("CCTV") Numbers | 19) Rest Area ("R") Numbers |
| 2) WisDOT Maint Temp Signal ("T") Numbers | 11) Dynamic Message Sign ("DMS") Numbers | 20) Seasonal Wayside ("W") Numbers |
| 3) Contractor Maint Temp Signal ("TC") Numbers | 12) Portable Changeable Msg Sign ("PCMS") Numbers | 21) Safety & Weight Enfrmnt ("SWEF") Numbers |
| 4) Underground Signal Facility ("U") Numbers | 13) Traffic Gate ("GATE") Numbers | 22) Miscellaneous Roadside Facilities ("MRSF") Numbers |
| 5) Signal System ("SS") Numbers | 14) Ramp Meter ("RM") Numbers | Other Installations |
| 6) Lighting ("L") Numbers | 15) Highway Advisory Radio ("HAR") Numbers | |
| 7) Flashing Beacon ("F") Numbers | 16) System Detector Station ("SDS") Numbers | |
| 8) Navigation Lighting ("NB") Numbers | 17) Vehicle Classification Site ("VC") Numbers | |
| 9) Portable Bridge Signal ("PBS") Numbers | 18) Road Weather Info Sign ("RWIS") Numbers | |

Questions regarding information contained within this policy can be directed to the Bureau of Traffic Operations State Traffic Signal Systems Engineer, (608) 261-5845.

ASSIGNMENT & TRACKING

Installation ID's will be assigned for each electrical device that requires utility service. A hierarchy based on the primary function of the cabinet is also used. The assigned installation hierarchy from left (highest) to right (lowest) is:



For example, if a signal cabinet provides service for the associated intersection lighting & an advanced warning flasher, they will all be tracked under the same "S" number. In the example above, the advance flasher & intersection lighting are essentially incidental to the traffic signal.

Unless noted otherwise below, the State Electrical Shop in BTO – Electrical creates & assigns all relevant information regarding installation numbers.

INSTALLATION ID's FOR TRAFFIC OPERATIONS

The electrical devices described in this section are considered to be fundamental for traffic control (in addition to signing & marking) on the STH system. The following installations are tracked, designed, operated & maintained by WisDOT BTO & Regional staff.

- 1) **"S" (Permanent Signal) Numbers** – "S" numbers are used for all permanent traffic control signals.

The format for “S” numbers is...[S0000]. The numbering system, represented here by “0000”, applies statewide & is sequential in the order the Regional staff request them of BTO – State Traffic Signal Systems Engineer.

- 2) **“T” (WisDOT Maintained Temporary Signal) Numbers** – “T” numbers *may* be applied to state-maintained installations that typically are not associated with a construction project (i.e. an interim improvement until a grade-separation can be constructed). “T” numbers will provide a tracking mechanism for WisDOT facilities that *may* need field-located or for utility charging.

The format for “T” numbers is...[T0000]. The numbering system, represented here by “0000”, applies statewide & sequential in the order the Regional staff request them of BTO – State Traffic Signal Systems Engineer.

- 3) **“TC” (Contractor Maintained Temporary Signal) Numbers** – “TC” numbers are applied to contractor-maintained installations that typically are associated with a construction project *on the STH system only* (i.e. as interim intersection traffic control along a detour). “TC” numbers will provide an ID for information to be tracked, specifically related to the appropriate maintenance authority for incident response purposes.

The format for “TC” numbers is...[TC-00-9999]. The first two-digit number, represented by “00”, is given based on the appropriate county code. The second four-digit number, represented by “9999”, is applies countywide & is sequential in the order Regional staff assign them.

- 4) **“U” (Underground Signal Equipment) Numbers** – “U” numbers *should* be used when intersections have been constructed with underground equipment such as conduit & pull boxes for future signalization. “U” numbers will provide an ID for WisDOT facilities when responding/referring to locate requests by Diggers Hotline, etc.

The format for “U” numbers is...[U0000]. The numbering system, represented here by “0000”, applies statewide & is sequential in the order the Regional staff request them of BTO – State Traffic Signal Systems Engineer.

- 5) **“SS” (Signal System) Numbers** – “SS” numbers are used to track coordinated signal systems. To do so, individual “S” numbers that comprise the system are related to a unique “SS” number. These ID’s are assigned to internally track the quantity & types of coordinated systems, as well as streamlining service reports. For example, if time clocks are checked at five time-based controllers, only a single service report will need to be completed.

The format for “SS” numbers is...[SS0000]. The numbering system, represented here by “0000”, applies statewide & is sequential in the order the Regional staff request them of BTO – Electrical.

- 6) **“L” (Lighting) Numbers** – Historically, the convention for lighting numbers has been established differently between Regional offices. Some offices tracked lighting for Park & Ride lots as “L” numbers; others were tracked under a “PR” ID. Tracking of high mast & highway system lighting installations created some additional differences.

Any stand-alone highway lighting installations are tracked as “L” numbers. Highway lighting associated with other facilities/installations are tracked under the ID of the primary installation based on the installation [hierarchy](#) described above. Examples of this logic include:

- System highway lighting – tracked by “L” number,
- Isolated intersection lighting – tracked by “L” number,
- High mast lighting – tracked by “L” number,
- Roundabout lighting – tracked by “L” number,
- Park & Ride lot lighting – tracked by “L” number,
- Rest Area lighting – tracked by “R” number,
- Signalized intersection lighting (out of same cabinet) – tracked by “S” number,
- Signalized intersection lighting (out of separate cabinet) – tracked by “L” number,

The format for “L” numbers is...[L0000]. The numbering system, represented here by “0000”, applies statewide & is sequential in the order the Regional staff request them of BTO – Electrical. Intersection lighting installed under permit to the local city, town or village are not tracked.

NOTE: Existing “HL” & “HML” (that represented high mast & highway lighting in some Districts) numbers will be converted to “L” numbers in continued sequential order as described.

- 7) **“F” (Flashing Beacon) Numbers** – “F” numbers are used for all installations of flashing beacons (typically single section signal heads). *Flashing beacons do not include signs with incorporated LED’s (i.e. Blinker STOPS).*

The format for “F” numbers is...[F0000]. The numbering system, represented here by “0000”, applies statewide & is sequential in the order the Regional staff request them of BTO – Electrical.

NOTE: “MF” numbers had been tracked separately due to historic signal maintenance reasons in Milwaukee County (old Transportation District 9). *In the future, flashers in Milwaukee Co. will be tracked as “F” numbers & as described above. Existing “MF” numbers will be converted to “F” numbers in continued sequential order as described.*

- 8) **“NB” (Navigation Beacon) Numbers** – “NB” numbers are used for all marine & aerial navigation lighting. Typically, this lighting is attached to bridge structures.

The format for “NB” numbers is...[NB0000]. The numbering system, represented here by “0000”, applies statewide & is sequential in the order the Regional staff request them of BTO – Electrical.

- 9) **“PBS” (Portable Bridge Signal) Numbers** – “PBS” numbers are used for state-owned, trailer mounted, two-way bridge signals.

The format for “PBS” numbers is...[PBS00]. The numbering system, represented here by “00”, applies statewide & is assigned & tracked by BTO – Electrical.

INSTALLATION ID’s FOR ITS

The primary responsibility for WisDOT electrical staff related to ITS facilities are for emergency response only. ID’s for ITS facilities are assigned & maintained by the Statewide Traffic Operations Center (STOC). Work performed by WisDOT electrical staff at these locations is tracked based on the installation type, as described:

- 10) **“CCTV” (Closed Circuit Television) Numbers** – “CCTV” numbers are used to track closed circuit TV installations used for highway surveillance.
- 11) **“DMS” (Dynamic Message Sign) Numbers** – “DMS” numbers are used to track permanent dynamic message signs installations. These installations are not the same as PCMS devices listed below.
- 12) **“PCMS” (Portable Changeable Message Sign) Numbers** – “PCMS” numbers are used to track individual portable change message signs (trailer mounted) that are owned by WisDOT & *may* be deployed by State or County crews. These devices are not the same as DMS installations listed above.
- 13) **“GATE” (Traffic Gate) Numbers** – “GATE” numbers are used to track traffic gates used to perform freeway ramp closures.
- 14) **“RM” (Ramp Meter) Numbers** – “RM” numbers are used to track individual ramp signal installations at freeway entrance points.
- 15) **“HAR” (Highway Advisory Radio) Numbers** – “HAR” numbers are used to track equipment related to highway advisory radio functionality. Such equipment *may* include flashing beacon installations (associated with static information signs) or radio transmitters.
- 16) **“SDS” (System Detector Station) Numbers** – “SDS” numbers are used to track equipment used to collect system traffic data. Such equipment *may* include microwave, video imaging or inductive loops.
- 17) **“VC” (Vehicle Classification Site) Numbers** – “VC” numbers are used to track equipment used to collect vehicle classification data. Such equipment *may* include overhead microwave detectors or inductive loops.
- 18) **“RWIS” (Road Weather Information Station) Numbers** – “RWIS” numbers are used to track equipment used to collect & transmit road weather data.

INSTALLATION ID’s FOR ROADSIDE FACILITIES

BHM – Maintenance contracts for much of the maintenance activities at roadside locations since they are not critical to highway safety.

The primary responsibility for WisDOT electrical staff at these locations is lighting maintenance only. ID's for roadside facilities are assigned & maintained by BHM – Maintenance. Lighting & any other electrical maintenance performed at roadside facilities are tracked under the following ID's:

- 19) **“R” (Rest Area) Numbers** – “R” numbers (formerly “RA”) are used to track rest area facilities, generally located along freeway routes.
- 20) **“W” (Seasonal Wayside) Numbers** – “W” numbers (formerly “RSP”) are used to track wayside facilities, generally located along conventional highway routes.
- 21) **“SWEF” (Safety & Weight Enforcement Facilities) Numbers** – “SWEF” numbers (formerly “WS”) are used to track weigh scale facilities, generally located along IH routes.
- 22) **“MRSF” (Miscellaneous Roadside Facility) Numbers** – “MRSF” numbers are used to track work performed by WisDOT electrical staff on other roadside facilities. Examples of these installations include: Welcome Signs, Scenic Overlooks, Tourist Information Centers, etc.

The format for “MRSF” numbers is...[MRSF-XXX]. The letters, represented here by “XXX”, correspond to the regional ID as indicated for **“MITS”** numbers above. For example, EAU represents the Eau Claire Regional office.

RELEVANT INFORMATION

Relevant information for the various installations described above is collected & tracked in WisDOT database systems. This information will generally include the following data fields:

| | |
|---|-----------------------|
| Installation type | RP Number & offset |
| Owner/Maintainer (State, County, Local) | Regional Office ID |
| Date unique ID was requested | Intersection/Location |
| Unique Installation ID | Municipality |
| Project ID | County |

NON-CONFORMING INSTALLATION ID'S

Existing installation ID's that do not conform the definitions described above will be allowed to remain until that installation is reconstructed or removed from service. These ID's will be included as an alias ID in WisDOT inventory management systems for the purpose of tracking historical information.

INSTALLATION TYPES

To further aggregate an installation by type, WisDOT electrical inventory systems will have a data field to describe the basic device & function, if needed. For example, L0854 *may* be associated with a roundabout installation on the STH system. In that case the Installation Type will be “Lighting – Roundabout”. The following installation types are used to further clarify the application of the various installation ID's described above.



PURPOSE

This policy outlines the use of WisDOT's crash modification factor (CMF) table for evaluating safety treatments/countermeasures on the Wisconsin state trunk highway system. The purpose of the WisDOT CMF table is to provide acceptable CMFs for use on WisDOT projects to ensure consistent application statewide and reduce the amount of time needed to find an applicable CMF. As more applicable research becomes available, the WisDOT CMF table will be updated accordingly.

BACKGROUND

What is a CMF?

Definition

A CMF is an estimate of the change in expected average crash frequency as a result of a particular treatment or design element. CMFs are used to quantify the effectiveness of a safety countermeasure.

$$CMF = \frac{\text{Expected Crash Frequency WITH Countermeasure}}{\text{Expected Crash Frequency WITHOUT Countermeasure}}$$

- A CMF < 1.0 indicates that a treatment has the potential to reduce crashes.
- A CMF > 1.0 indicates that a treatment has the potential to increase crashes.
- The percent crash reduction is $(1 - CMF) * 100\%$

Standard Error

The CMF value is only an estimate of the expected average crash frequency based on a statistical analysis of crash data. The true value of the CMF for any treatment is unknown. Many CMFs include a standard error which serves as a measure of the reliability of that estimate. A lower standard error means a more reliable estimate. This standard error can be used to calculate a confidence interval, which provides a range that the true value of the CMF *should* fall within. Additional information about CMFs can be found in chapter 3 of the 1st Edition of the American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual (HSM).

How Are CMFs Used?

CMFs are used to estimate the safety performance of a variety of different safety countermeasures. CMFs are typically applied:

1. By multiplying the CMF with the observed¹ crash frequency of an existing site to estimate the crash frequency after installation of a treatment. This is done when a site-specific safety performance function (SPF²) is not available for the treated site. See application example 1 below.
2. By multiplying a SPF's crash frequency values with one or more CMFs to obtain a site specific predicted³ crash frequency. This is done to account for differences between the base conditions and actual site conditions. See application example 2 below.

POLICY

Applying CMFs on WisDOT Projects

CMFs can be applied to total crashes or to target crash types and severities. It is often useful to estimate the change in crashes by type and severity, but this *should* only be done when there are CMFs available for the specific crash types and severities in question. The crash type associated with a CMF defines the crashes for

¹ Observed crash frequency is the number of crashes that have occurred within the limits of the site being investigated over one or more years.

² A Safety Performance Function (SPF) is a statistically derived equation used to predict the expected average crash frequency of a site based on specific traffic volumes and roadway or intersection characteristics. Refer to Chapter 3.5.2 of the HSM for more information regarding SPFs and how they are used.

³ Predicted crash frequency is the estimated number of crashes determined with a SPF.

which the related CMF is applicable. Crash severity is defined by the most severe outcome of those involved in the crash. It is not appropriate to apply a CMF for a specific crash type or severity to other crash types and severities because a countermeasure *may* reduce certain crash types or severities while increasing other crash types or severities. If a CMF is available for a specific crash type, it *should* be used instead of the CMF for 'All' crash types.

Applying Multiple CMFs

Many projects propose several different safety treatments. Currently, limited research is available documenting the combined effect of multiple countermeasures so there **shall** be a maximum of two CMFs applied to a particular location. Implementing several countermeasures might be more effective than just one, however, it is unlikely that the full effect of each countermeasure would be realized when they are implemented concurrently. Unless the countermeasures act independently, multiplying several CMFs together can lead to overestimation of the safety benefit.

If multiple safety treatments are proposed for a project, include the CMFs that provide the most benefit to the existing crash trends at the location. If two non-independent CMFs are used for a location, the following methodology **shall** be used to determine the estimated combined effect of both countermeasures. Engineering judgement *should* be applied in these situations.

Systematic Reduction of Subsequent CMFs⁴

With this method the effect of the second countermeasure is systematically diminished. First identify the more effective of the two countermeasures (CMF with the lower value). Then reduce the second CMF using the equation below:

$$CMF_{2,Reduced} = \frac{1-CMF_2}{2} + CMF_2$$

After the value of $CMF_{2,Reduced}$ is determined, multiply the first CMF by the reduced second CMF to get the combined CMF for the location.

$$CMF_{combined} = CMF_1 * CMF_{2,Reduced}$$

WisDOT CMF Table

There are a large number of CMFs available in the HSM, CMF Clearinghouse, and many other sources. In many cases, several CMFs exist for a given treatment, making it challenging for engineers to determine the most appropriate CMF to apply on a project. Most of the CMFs included in the table are for treatments commonly used in Wisconsin. Therefore, the WisDOT CMF table *should* be used unless a CMF is not available for the countermeasure in question or the CMF in the table does not apply to the location in question. The WisDOT CMF table can be found here:

<http://wisconsindot.gov/dtsdManuals/traffic-ops/manuals-and-standards/teops/cmf-table.xlsm>

Selection Process

The CMF selection process involves several considerations, including the availability, applicability, and quality of the CMF, along with the location of the sites used to develop the CMF. CMFs in the WisDOT CMF table were selected based on the following factors in order of importance:

1. Location of sites in study (*Preference given to sites near Wisconsin with similar climates, driver behavior, design standards, etc.*)
2. Star rating (*Preference given to higher star ratings from CMF Clearinghouse*)
 - For more information about star ratings: <http://www.cmfclearinghouse.org/sqr.cfm>
3. CMF provided in HSM (*unless better data has been published since the HSM*)
4. General applicability determined upon review of available CMFs

WisDOT CMF Table Features

The table is separated into 4 different categories:

⁴ For more information: http://www.cmfclearinghouse.org/collateral/Combining_Multiple_CMFs_Final.pdf

1. Countermeasure Identification
2. Countermeasure Characteristics and Filtering Tools
3. CMF by Crash Severity
4. Countermeasure Source and Other Information

1. Countermeasure Identification

This section provides the name of the countermeasure and a unique CMF number. This number *should* be used when referencing the CMF in WisDOT documents.

2. Countermeasure Characteristics and Filtering Tools

For each CMF, information is provided about the characteristics of the sites used to generate the CMF. To identify an applicable CMF, select the characteristics that best match the characteristics of the site being evaluated.

Area Type is broken down into urban, rural, and all classifications. Definitions for urban and rural are defined by the study in which the CMF was developed. A link to the source of the CMF can be found in the table under the Countermeasure Source and Other Information category. Review of the study and engineering judgement *should* be used to determine what area type *should* be used for a particular location.

In some cases, safety countermeasures target wet-weather crashes so CMFs are developed accordingly. It is important that the driving conditions of the site or crashes in question match the driving conditions of the CMF when applicable.

In most cases, safety countermeasures target specific crash types so CMFs are developed accordingly. If a CMF is available for a specific crash type, it *should* be used instead of the CMF for 'All' crash types.

The expected service life of the countermeasure can be used in calculating benefit to cost (B/C) ratios. Service life values will be included in future versions of the table.

3. CMF by Crash Severity

The CMF table breaks down crash severity terms differently than the standard KABCO scale. The following *should* be used for comparison purposes:

- Fatal (Ftl) = K
- Serious Injury (SI) = A-level & B-level
- Minor Injury (MI) = C-level
- Property Damage Only (PDO) = O

More information on crash severity can be found in the FAQ's of the *CMF Clearinghouse*.

4. Countermeasure Source and Other Information

Information about the source of each countermeasure can be found here. Reading the research that generated the CMF can provide additional information about where the CMF *should* be applied. This section also has a comment area which provides additional information.

Applying CMFs from Other Resources

As mentioned above, the purpose of the WisDOT CMF table is to ensure consistent application of CMFs on WisDOT projects; therefore, the WisDOT CMF table *should* be used unless a CMF is not available for the countermeasure in question or the CMF in the table does not apply to the location in question. In these cases, explanation **shall** be provided to justify use of a CMF from another source. The following resources and guidelines *should* be used in these cases:

CMF Resources

- HSM (1st Edition)
 - Provided in Volume 3 of the HSM
 - CMFs provided went under a literature review process, an inclusion process, and a series of expert panels before being accepted into the manual
- CMF Clearinghouse
 - Web-based source of CMFs, which is updated regularly
 - Includes CMFs compiled in the first edition of the HSM along with many other available CMFs published since the release of the HSM

- Includes a star rating system to indicate the quality or confidence in the results of the study producing the CMF
- Provides supporting documentation to help users identify the most appropriate countermeasures for their safety needs

Guidelines for Using Other Resources

- Use the HSM or CMF Clearinghouse:
 - CMFs *should* have a minimum of a 3 star rating
 - Choose the CMF that most closely matches the characteristics of the site being analyzed.
- If no CMF is Available:
 - When there are no CMF's available, evaluate other sources and studies to see if any information is available regarding the specific safety treatment. This *may* include research from other states or countries that have applied the same countermeasure.

APPLICATION EXAMPLES

Example 1

Problem:

A rural two-lane undivided highway segment has experienced an average of 9 crashes/year. To reduce crashes, the shoulder will be widened from 3 ft. to 6 ft. and shoulder rumble strips will be installed. Determine the estimated crash frequency for this segment with the proposed treatments.

Solution:

From the WisDOT CMF table, the CMF for increasing shoulder width from 3 ft. to 6 ft. is 0.82 and adding shoulder rumble strips is 0.87. Since the CMF for both of these treatments apply to similar crash types (Run Off Road), we can combine the two CMFs to determine the estimated crash frequency. Based on the CMFs for both countermeasures, the less effective CMF is shoulder rumble strips and will be reduced accordingly.

$$CMF_{2,Reduced} = \frac{1-CMF_2}{2} + CMF_2$$

$$CMF_{2,Reduced} = \frac{1-0.87}{2} + 0.87$$

$$CMF_{2,Reduced} = 0.935$$

The combined effect of the two CMFs is:

$$CMF_{combined} = CMF_1 * CMF_{2,Reduced}$$

$$CMF_{combined} = 0.82 * 0.935$$

$$CMF_{combined} = 0.77$$

Estimated crash frequency = 9 x 0.77 = 6.9 crashes/year.

Example 2

Problem:

An urban 4-legged signalized intersection has a predicted average crash frequency of 20 crashes/year determined with an SPF. 10 of the 20 crashes are related to left-turning vehicles, 3 of the 20 crashes involve a pedestrian, and the remaining 7 crashes are other crash types. Improvements are being considered at this intersection, including changing the left-turn phasing from permissive to protected/permissive and adding pedestrian countdown timers. Determine the crash frequency for this signalized intersection with the proposed treatments.

Solution:

From the WisDOT CMF table, the CMF for changing from permissive left-turn phasing to protected/permissive phasing is 0.862 and the CMF for installing pedestrian countdown timers is 0.3. Since these two treatments impact different crash types, the two treatments and CMFs are treated independently.

Predicted left-turn crashes = $10 \times 0.862 = 8.62$ crashes/year.

Predicted pedestrian crashes = $3 \times 0.3 = 0.9$ crashes/year.

Overall predicted crash frequency with both treatments is $8.62 + 0.9 + 7 = 16.52$ crashes/year

HELPFUL LINKS

- WisDOT CMF table: (<http://wisconsindot.gov/dtsdManuals/traffic-ops/manuals-and-standards/teops/cmf-table.xlsm>)
- CMF Clearinghouse: (<http://www.cmfclearinghouse.org/>)
- CMF Clearinghouse User Guide: (<http://www.cmfclearinghouse.org/userguide.cfm>)
- CMFs in Practice: (<http://safety.fhwa.dot.gov/tools/crf/resources/cmfs/>)
- CMF Clearinghouse FAQ's: (<http://www.cmfclearinghouse.org/faqs.cfm>)



Traffic Engineering, Operations & Safety Manual

Chapter 13 Traffic Regulations

Section 1 Through Highway Declarations

13-1-1 Statutory Authority

October 1995

The fundamental principle of the Through Highway Declarations is that no STOP sign **shall** be erected facing traffic on a state trunk highway nor **shall** traffic on any non-state trunk highway be permitted to enter a state trunk highway without stopping, unless specifically provided for in the Declarations.

AUTHORITY

[Section 349.07](#), Wis. Stats., provides the Department with the authority to "...declare any state trunk highway or connecting highway or portion thereof to be a through highway."

A "through highway" is defined in s. [340.01\(67\)](#), Wis. Stats., as:

"...every highway or portion thereof which has been declared by the state or local authorities pursuant to s. 349.07 to be a through highway and at the entrances to which vehicular traffic from intersecting highways is required by traffic control signals or stop signs to stop."

On November 30, 1950, the Highway Commission took action pursuant to the existing statutory authority and implemented a systematic method for establishing and documenting all of its declared through highways. This action was as follow:

"The Commission took up for consideration the matter of declaring all state trunk highways to be arteries for through traffic. Attention was directed to the fact that many state trunk highways are now arterials, that it will be necessary to coordinate the old and new arterial declarations, and that all highways cannot immediately be signed as arterials."

"It was moved, seconded, and carried that all state trunk highways and the urban extensions thereof (designated by the statutes as 'connecting streets') be declared arteries for through traffic pursuant to Section 85.68, Wisconsin Statutes, and that arterial STOP signs be erected stopping traffic on all county trunk highways, town roads, and local city and village street entering said state trunk highway routes unless specifically excepted in this or subsequent actions of the Commission."

"It was further moved, seconded, and carried that traffic on any state trunk highway (and connecting street) **shall not** be required to stop at the intersection with any other state trunk highway (or connecting street), or at the intersection with a county trunk highway, town road, or local city or village street unless specifically required to stop at such intersection by this or subsequent actions of the Commission..."

Following these brief introductory paragraphs was the listing of the highways declared as arteries for through traffic and the descriptive paragraphs delineating the exceptions to each. These descriptive paragraphs (the exceptions) defined all instances where traffic on a state trunk highway was required to stop and where traffic on other streets/highways was permitted to enter a state trunk highway without stopping.

On November 13, 1962, the Highway Commission delegated its statutory authority to declare and regulate through highways to the Chief Traffic Engineer, and established the Chief Traffic Engineer as being responsible for maintaining the official records.

Since that time, the title of Chief Traffic Engineer has been changed to Director, Bureau of Traffic Operations. The Director has notified the Regions that, as of October 16, 1995, the approval authority for Through Highway Declarations is delegated to the Regions. The Regional Transportation Directors were requested to appoint an approval authority and inform the Director of BTO as to the appointment.

13-1-2 Approval Process

October 1995

CHANGES TO THE DECLARATIONS

From time to time, it becomes necessary to make changes in the Declarations. Changes *may* be required due to additions to the state trunk system, deletions from the system, rerouting or renumbering of highways, reconstruction of intersections, or changes in traffic conditions.

Since the exceptions are arranged in geographic order it is desirable that the exceptions for concurrent routes be listed under each appropriate highway number, not just the lowest numbered route. Intersecting state trunk

highways must be investigated and exceptions corrected where necessary, under each appropriate highway number.

THE APPROVAL PROCESS

Whether a proposal involves creation of a new exception paragraph, or the revision or deletion of an existing paragraph, the Region prepares their recommended exception paragraphs for each through highway route and intersection involved. The authority for approval resides with the designated Region approval authority. A copy of the approved declaration is to be sent to the Central Office of Traffic to serve as information for others, and to provide a backup record.

TEMPORARY CHANGES DUE TO CONSTRUCTION

Where construction activities result in necessary temporary changes in arterial arrangements, it is suggested that the Regional office write the changes in the form of declarations as a memo to file. It is not necessary to send a copy to the Central Office.

13-1-5 Declaration Format

April 1996

NUMBERING OF THE DECLARATIONS

The delegation of the authority to approve through highway declarations also carries with it the responsibility for numbering the exception paragraphs in a uniform and sensible manner. The following is a recommendation on a uniform system of numbering which *should* give all the information necessary to find the paragraphs, keep them in order and identify the location to ourselves and others.

An example of the first page of each highway's declarations is given below:

Through Highway Declarations - State Trunk Highway System

Northcentral Region, Waushara County

File: TH 469073

| | |
|---------------|--|
| TH-4-69-073.1 | Northbound traffic on State Trunk Highway 73 shall stop before entering the east junction of State Trunk Highways 73 and 21. |
| | Approved Date: 02/24/85 Installed Date: 03/31/86 |
| TH-4-69-073.2 | When the traffic control signal at the intersection of State Trunk Highways 73 - 21 (Main Street) and Saint Marie Street in the City of Wautoma, is not operating, traffic on Saint Marie Street shall stop before entering the intersection. |
| | Approved Date: 07/26/89 Installed Date: |

The title indicates to others what the document is, such as when it is mailed out or brought into court. The file number is condensed to be usable in Word Perfect. Each paragraph has a number which contains all the information necessary to identify its location, so that each page stands by itself. The prefix indicates it is Through Highway; the first number is the Region; the second two digits are the county number (which is listed in Figure 1); the next three digits are the highway; and the decimal is the paragraph sequence number.

Following the paragraph it is recommended that the approval date and the installation date be shown. It has also been recommended but not shown at this time that the RP number can be added for future look-up convenience, such as with a GIS system. This would certainly be a Region option.

For sections which have concurrent highways, duplicate paragraphs will be necessary under each highway.

EXCEPTIONS

The exceptions appear in the list following each designated through highway. One descriptive paragraph is devoted to each intersection where an exception occurs and the paragraphs are sequentially numbered geographically for each route. If an intersection is not addressed in the exceptions, the fundamental principle of the Declarations applies: The state trunk highway does not STOP and all non-state trunk highways do.

The exception paragraphs for any through highway route are numbered consecutively in each Region beginning with .1. From time to time, it becomes necessary to add paragraphs within this structure. The following system is typically used:

To insert a new paragraph between paragraphs one (1) and two (2), the new paragraph becomes paragraph .1.1 as follows, or the Region *may* choose to correct the numbering each time.

WRITING EXCEPTIONS

Standard writing formats have been developed for the Declarations to ensure uniformity of application and consistency of interpretation.

The basic exception paragraph takes the following form:

TH-5-52-080.9 North and southbound traffic on State Trunk Highway 80 **shall** stop before entering the intersection of State Trunk Highways 80 and 60.
Approved Date: xxx Installed Date: yyy

1. The traffic is first identified:

“North and southbound traffic”
2. Then the highway on which it is moving (or in the case of turn lanes or ramps, the highway which the traffic is leaving) is identified:

“on State Trunk Highway 80”
3. Then the action this traffic must take is specified:

“shall stop”
4. Then the location where this action is to be taken is identified:

“before entering the intersection of State Trunk Highways 80 and 60”
(The county does not have to be repeated in each paragraph if the format at the beginning of this procedure is used.)

Within city and village limits, in addition to the highway numbers, the names of streets *may* be included in parentheses to document the location of the State Trunk Highway or Connecting Highway at the time of the action.

TYPICAL EXCEPTION SITUATIONS

Many intersections present similar control situations and are merely variations of the basic exception paragraph discussed earlier. Some of these more common variations will now be addressed.

Permitting Non-STH traffic to enter without stopping

TH-2-51-020.14 Southbound traffic on State Trunk Highway 20 **shall** stop before entering the intersection of State Trunk Highway 20 and County Trunk Highway “D”, but eastbound traffic on county trunk Highway “D” **shall** not be required to stop.
Approved Date: xxx Installed Date: yyy

Permitting right turns without stopping

TH-6-47-010.2 Southbound traffic on U.S. Highway 10 (Cedar Street) **shall** stop before entering the intersection of U.S. Highway 10 (Cedar Street) and Cherry Street in the city of Prescott, but traffic making a right turn to go west on Cherry Street **shall** not be required to stop.
Approved Date: xxx Installed Date: yyy

Exceptions for signal flashing arrangement

TH-2-51-011.3 When the traffic control signal at the intersection of State Trunk Highway 11 (Durand Avenue), Ohio Street/Meachem Road in the city of Racine is not operating, east and westbound traffic on State Trunk Highway 11 (Durand Avenue) **shall** stop before entering the intersection.

Approved Date: xxx

Installed Date: yyy

Exceptions for simple interchanges

For simple interchanges the interchange can be considered as single intersection for the purpose of writing the exception. This eliminates the need to prepare an exception for each ramp intersection in the interchange. Shown below are three examples of such interchanges.

TH-4-37-051.20 North and southbound traffic on the ramps in the southeast and northwest quadrants of the interchange of U.S. Highway 51 and State Trunk Highway 153, **shall** stop before entering the intersections of the ramps and State Trunk Highway 153.

Approved Date: xxx

Installed Date: yyy

This exception paragraph was included under the Through Highway listing for U.S. Highway 51, as the traffic required to stop is identifiable as U.S. Highway 51 ramp traffic. No entry is included under the Through Highway listing for STH 153, as STH 153 traffic is not required to stop at these intersections.

TH-4-49-051.15 North and southbound traffic on the ramps in the southeast and northeast quadrants of the interchange of U.S. Highway 51 and County Trunk Highway "B", **shall** stop before entering the intersections of the ramps and County Trunk Highway "B".

Approved Date: xxx

Installed Date: yyy

Note that this paragraph mentions nothing about arterial controls on CTH "B". This is because CTH "B" stops at those locations and the fundamental principle of the declarations is that all non-STH traffic will be required to stop unless specifically accepted in the declarations.

TH-3-36-043.10 North and southbound traffic on the ramps in the southeast and northwest quadrants of the interchange of Interstate Highway 43 and County Trunk Highway "JJ" **shall** stop before entering the intersections of the ramps and County Trunk Highway "JJ", but eastbound and westbound traffic on County Trunk Highway "JJ" **shall not** be required to stop.

Approved Date: xxx

Installed Date: yyy

The through movement on "JJ" had to be covered.

Exceptions of interchanges with multiple controls

The following is an example of a descriptive paragraph dealing with an individual ramp terminal within an interchange.

TH-2-67-094.12 Eastbound traffic on the ramp in the southwest quadrant of the interchange of Interstate Highway 94 and Moorland Road, in the city of Brookfield, **shall** stop before entering the intersection of the ramp and the southbound roadway of Moorland Road, but eastbound traffic turning right to go south on Moorland Road **shall** yield before entering the southbound roadway of Moorland Road. Southbound traffic on Moorland Road **shall not** be required to stop.

Approved Date: xxx

Installed Date: yyy

No turn on red

TH-1-13-051.18 North and southbound traffic on U.S. Highway 51 in the city of Madison controlled by the traffic control signal at its intersection with U.S. Highway 151 **shall not** turn right during steady red signal indications.

Approved Date: xxx

Installed Date: yyy

CHANGES IN THE DECLARATIONS

For the files, the Region *may* prepare a formal action memo documenting changes. Changes in the Arterial Highway Declarations usually take one or a combination of the following forms:

1. Deletion of an existing exception;
2. Addition of a new exception;
3. Amendment of an existing exception;
4. Addition of a new highway to the list of through highways; and
5. Deletion of an existing highway from the list of through highways.

Deletion of an existing exception

State Trunk Highway 12:

Delete paragraph TH-8-57-002.3 approved on November 30, 1988.

Addition of new exception

U.S. Highway 12:

Add the following:

TH-5-27-012.38 Southeast bound traffic on U.S. Highway 12 **shall** stop before entering the west intersection of U.S. Highway 12, U.S. Highway 10, and State Trunk Highway 27.

Approved Date: xxx

Installed Date: yyy

Substitution of a new exception for an existing one

U.S. Highway 151:

Delete paragraph TH-2-13-151.17 on July 16, 1988 and substitute the following:

TH-2-13-151.17 _____

Amendment of an existing exception

Use the substitution procedure above.

Deletion of a through highway

State Trunk Highway 152:

Delete in its entirety.



Traffic Engineering, Operations & Safety Manual

Chapter 13 Traffic Regulations

Section 2 Trucking

13-2-5 Temporary Long Truck Routes

April 1996

Circumstances *may* require that the Department establish a temporary long truck route on a highway which is not designated as a long truck route. In order to clearly and simply provide for the temporary situation it is recommended that the Region prepare a rule in the following form:

TEMPORARY DESIGNATED HIGHWAY FOR LONG TRUCK ROUTE

The following highway **shall** be a designated highway for the duration of the improvement project 1234-56-78, according to [ss.348.07\(4\)](#) Wisconsin Statutes, and [Trans 276.08](#) Wisconsin Administrative Code:

(Highway) from STH XX to STH YY.

Authorized by Regional Trans. Director

Date

13-2-10 Oversize/Overweight Single Trip Permitting

July 2012

PURPOSE

The purpose of this document is to provide internal guidance for all primary and secondary region staff regarding the routing and permitting of any given oversize/overweight (OSOW) load the region may be asked to review. The guidelines contained herein may not perfectly apply to every instance, request, or situation encountered, but the guidelines will serve as a solid foundation. All issues or concerns which arise that are not covered or discussed herein are subject to the discretion of the Region.

DEFINITIONS

Freeway/Expressway - Four-lane divided highway facilities with full or partial control of access by means of grade separation.

Multi-Trip Permit - A permit that is valid for unlimited, non-specific route trips during a range of 3 to 12 months. For example construction companies frequently move large construction equipment to and from job sites.

Oversize/Overweight Load - A load that requires a permit due to exceeding certain dimensions and weights.

OSOW Freight Network -The OSOW FN is a map which depicts the preferred statewide travel routes for OSOW loads. The map is maintained by, and available from, the Regional Freight Operations Unit.

Local Law Enforcement - Local law enforcement consists of municipal (city, village, or town) police or county sheriff. Local law enforcement does not include State Patrol.

Pole Car - A pole car is an escort vehicle equipped with a height sensor. A pole car must precede the load and move sufficiently ahead of the oversize vehicle when approaching structures to ascertain clearance prior to the load arriving. The height sensor pole is made of a non-conductive, non-destructive, flexible material, and shall be set 6-inches above the true height of the load.

Single Trip Permit - A permit that is valid for 14 days and for one trip only. The carrier specifies the route, and the return trip is allowed at no charge if requested with the original permit application.

Urbanized Area - A populated area that normally experiences peak hour traffic volumes in the morning, afternoon and evening travel periods. (As defined and updated by DTIM traffic model analysis that is updated on two year intervals).

PERMITTING

1. Requests and Approvals - The submittal and approval permit process shall be handled electronically.

2. Review - The automated permit system is not designed to identify all geometric scenarios. For example, the routing system does not evaluate for length or turning capabilities. Region review shall be required when:
 - a. Width exceeds 15'11" per [Trans 250.05\(a\)](#), [Trans 254.12](#), [Trans 260](#), and the business routes are coded into the oversize/overweight automated issuance system, Superload.
 - b. The proposed route for loads with an overall length of 100' to 139'11", and less than 16' in overall width will be reused on the same route within a three month period.
 - c. Construction staging and detours will impact loads with an overall length of less 140' and less than 16' in overall width. The automated permit system is not designed to identify any routes deficiencies for such loads.
3. Denial or Restrictions
 - a. The following issues shall result in the denial of a permit:
 - Proposed moves resulting in interrupted power or other utility service to essential services, such as hospitals, fire stations, etc..
 - b. The following issues may result in the denial of a permit or substantial restrictions by the Region:
 - Exceed roadway plus shoulder width;
 - Exceed bridge or structure width;
 - Require 'wrong way' vehicle movement when a suitable alternative route is available;
 - Occur at times of the year that may cause excessive roadway damage;
 - Interfere with high traffic volumes;
 - Substantially impair power service to customers on route as determined by affected utility company;
 - Require excessive removal or rearrangement of permanent or temporary traffic control devices;
 - Utilize a route that is unsuitable due to construction constraints, geometric limitations, and/or unsafe passing conditions. Applicant will be advised to submit another route;
 - Impact state maintained traffic signal equipment (e.g. temporary removal). Any removals shall be approved by the Region and shall be completed by or at the direction and in the presence of WisDOT electricians. Removal of monotube signal arms may require additional (contracted) forces. Any approved removals will be at the expense of the carrier.
 - Reject the proposed route for radioactive materials if another route other than Wisconsin is reasonably available
4. Special Circumstances
 - a. Ramp-Off/Ramp-On (RORO). At the discretion of the Region, RORO may be permissible where conditions would result in an excessive route detour. The Region shall determine the appropriateness of RORO based upon load type and load frequency.
 - b. Sign Removal. Sign removal may be permitted to alleviate geometric deficiencies due to load length or width. Removal must be previously authorized by the Region, and the carrier is responsible for the immediately replacement of all removed signs.

Sign removal shall be coordinated through the regional traffic unit. The preferred method of sign removal/replacement is by the appropriate County Highway Department. If a specific project has a large number of loads and/or scheduling prohibits County Highway Department involvement, WisDOT Regional staff may consider authorizing hauler removal/replacement signs. OSOW load hauler may be required to complete an "Approved Traffic Sign/Post Removal and Replacement Log."

Figure 1. Approved Traffic Sign/Post Removal and Replacement Log

Instructions:

1. Attach photograph showing original sign installation for each intersection that requires removal/replacement (R/R) of traffic signs. Label intersection photo by naming the photo as the load approaches and leaves the intersection (ex. I43 SB/WIS 96 WB)
2. For multiple signs/posts requiring R/R at an individual intersection label each sign/post from left to right as viewed on the intersection photo.
3. Complete each field below on log
4. Within 24 hours of R/R, fax this log (including) photos to (xxx) xxx-xxxx. Send/email copies of original to WisDOT at: XXXXXXXX
 - A. WisDOT Permit Number: _____
 - B. Date of Pre-Approved Traffic sign/Post Removal and Replacement: _____
 - C. OSOW Permit Holder Contact Information (Company Name, POC, address, office phone, cell phone, fax, email): _____
 - D. Escort Company Contact Information (Company Name, POC, address, office phone, cell phone, fax, email): _____
 - E. Individual Conducting Pre-Approved traffic Sign/Post Removal and Replacement (Company Name, POC, address, office phone, cell phone, fax, email): _____

Include a table identifying the following information:

Intersection/sign number, date/time of R/R, printed name of individual(s) conducting R/R, signature certifying sign replaced properly and with same orientation as shown in original photos.

- c. Counter-directional Movements. The Region shall review and approve counter-direction movements of loads at modern intersections including roundabouts.
 - d. Loads with Low Level Radiation. DMV will notify DTSD OSOW Unit that a load, consistent with a regional review requirement as prescribed in Trans Rules or this guidance (see Permitting Section 2 above), is radioactive. Upon notice OSOW Unit will work with regions reviewers who shall review the following:
 - i. the location, number, and extent of slows,
 - ii. expected conflict with other traffic due to volumes and congestion,
 - iii. proximity of route to population centers,
 - iv. general level of radiation,
 - v. availability of other routes in Wisconsin other than those proposed,
 - vi. outreach and notification 2 weeks before the move with local communities on route
 - vii. other objective risks and issues associated with the load and route
 - e. Other. Other special circumstances not specifically listed here shall be subject to the review and approval of the Region.
5. Suspension
- a. Frequent Violators. Carriers which evidence frequent and/or serious infringement of permit, equipment or traffic regulations will face suspension of existing permits, ineligibility for multiple trip permits or outright denial of future WisDOT oversize/overweight permits, as deemed necessary by the DMV/BHM.
 - b. Appeal. The right of the hauler to appeal is established under Wis. Stats. 348.25(9).
6. Conflict Resolution
- a. External. When carriers, county officials, local law enforcement, or external DOT staff raise issues, questions, or concerns regarding permits, the DMV should be contact at (608) 266-7320.
 - b. Interregional field recommendation discrepancies. The Bureau of Highway Maintenance (BHM) will make the final recommendations based on coordination between the Regions when a vehicle is traveling through multiple Regions and when regional recommendations conflict.

Primary and secondary contacts are provided in the list below.

| Regional Office | Contact |
|---|---|
| SW Region, Madison | Jeff Gustafson Jim Pavelski |
| SW Region, La Crosse | Joe Schneider Andrew Winga |
| SE Region, Waukesha | Eric Perea Allison Blackwood Stacey Pierce Dan Dedrick |
| NE Region, Green Bay | Rod Hamilton Jodi Marsh |
| NC Region, Wisconsin Rapids & Rhinelander | Laurie Miller Jack Keiffer |
| NW Region, Eau Claire | Gary Coequyt Greg Mattson Jeff Olson |
| NW Region, Superior | Greg Mattson Gary Coequyt Jeff Olson Joe Whirry |
| Bureau of Technical Services Pavement Section | Laura Fenley Bob Arndorfer |
| Bureau of Highway Maintenance Freight Section | Dan Mulder |

ROUTE CONDITIONS

It is recognized that physical roadway conditions may change at the time of the move and the carrier must be aware that they are ultimately responsible for maintaining safe operating conditions and reviewing roadway and vehicle characteristics (i.e., horizontal and vertical clearances, intersection geometrics, load height, tire pressure, etc.).

HOURS OF OPERATIONAL LIMITATIONS

1. The Region shall review permits for hours or days of operation and any other special conditions of operation for escorted loads with an overall length over 160', regardless of overall width.
2. Per Trans 254.11(3), no oversize vehicle that exceeds 12' in width, 13'6" in height, or 100' in length is allowed to operate during the hours of darkness, unless specifically directed and authorized by WisDOT Regional Office.
3. No Region-reviewed oversize vehicle moves shall be made within urbanized areas as defined by DTIM traffic modeling analysis between the hours of 6:00am – 9:00am and 3:00pm – 6:00 pm, or if the area experiences a noon peak period, which will be listed in the Regional recommendations.
4. OSOW vehicles moving at speeds of 25 mph or less (notwithstanding bridge restrictions listed on the permit) should be required to move from 9:30pm – 5:30am to maintain consistent and safe operations for motorists in metro areas and on conventional highways of the State Highway System. Travel time shall be subject to Region discretion and approval.
5. Loads with a width in excess of 16' may be required to move at night, subject to the discretion of the Region.

ESCORT GUIDELINES

1. General. The following Table provides escort vehicle guidance based upon oversize/overweight load type. Final escort configurations shall be at the direction of the Region. For Wind see Escorts in [TEOpS 13-2-11](#).

| WEIGHT | LENGTH | WIDTH | HEIGHT | ESCORT |
|------------|------------------|----------------|---------|--|
| Up to 350K | Any | Any | <16'01" | Pole car requirement subject to Region review. |
| Up to 350K | Legal to 139'11" | 15'01" -16'0" | >16'01" | Pole car is required. Must lead the load by a minimum of 0.5-miles. |
| Up to 350K | Legal to 139'11" | 16'0" – 17'11" | Any | Two (2) private vehicles. |
| Up to 350K | Legal to 139'11" | 18' – 20' | Any | One (1) law enforcement vehicle and one (1) private vehicle. |
| Up to 350K | Legal to 139'11" | >20' | Any | Two (2) law enforcement vehicles and one (1) private vehicle. |
| Up to 350K | >140' | <10' | Any | On freeways and expressways, private escort vehicles may be used in lieu of law enforcement escorts. |
| Up to 350K | 140' – 159'11" | Up to 17'11" | Any | One (1) law enforcement vehicle and one (1) private vehicle at the determination of the Region. |

| | | | | |
|------------|-----------------|----------------|----------------|--|
| Up to 350K | >160' – 199'11" | >8'6" to 16'0" | Any | Two (2) private vehicles. Region may require law enforcement vehicle. |
| Up to 350K | 200' to 250' | 8.6 to 16'0" | Any | Two (2) private vehicles one (1) law enforcement vehicle. |
| Up to 350K | 160' - 224'11" | < or = to 8.6 | Any | Two private escort vehicles. Region may require one law enforcement vehicle depending on route complexity. |
| Up to 350K | >225' | Any | Any | Minimum of Two (2) State Patrol escort vehicles. |
| >350K | Any | Any | Any | At least one State Patrol Escort (see Heavy Slow Loads below) |
| Key: | < Less Than | | > Greater Than | |

Note: When multiple conditions for weight and dimension are met reviewer should use the requirement that provides the most coverage for the load in question.

2. Nighttime or Round-The-Clock Movement. Any company requesting nighttime or round-the-clock movement shall have a minimum of one (1) law enforcement officer and one (1) private escort, at the direction of the Region.
3. The WisDOT always retains the right to be more restrictive when it is deemed necessary.

CONVOYS

1. Review. Each Region shall review all convoy requests and efficiencies should also be considered.
2. Size. Convoys shall not exceed two oversize vehicles per convoy.
3. Conditions. Multiple convoys of a single carrier or project shall have a staged departure with a minimum of ½ hour travel time between convoys, and maintain said travel time separation for the full duration of the trip.

LAW ENFORCEMENT

1. Escort Type
 - a. State Patrol escorts may be used when moving through multiple counties.
 - b. State Patrol, county, or local law enforcement may be used when moving within a local area.
2. Responsibility - Law enforcement responsibility shall be limited to traffic control and load escort. Carriers shall not rely on the law enforcement officers for route navigation and guidance through turning movements.

HEAVY AND SLOW LOADS

1. All vehicles over 270,000 pounds shall be reviewed by the Bureau of Technical Services Pavements Section.
2. The Bureau of Structures reviews overweight loads for adequacy of any structure to safely accommodate such a load at certain speeds prior to BHM and Regional review. BTS review shall be included if applicable.
3. The Region(s) shall review gross vehicle weights exceeding 350,000 pounds and traveling at less than posted speeds for the facility on route.
4. The Region(s) shall review all loads operating at a maximum speed of 45 mph or less on a limited access facility.
5. Recommendations for building moves will be based on the discretion of the Region's evaluation of safety and best practices.
6. Loads in excess of 350,000 pounds escorts based on overall dimension, weight, anticipated speed, and complexity of route. Use the table above for a preliminary reference point. Loads with six or more slow to 5 miles per hour bridge crossing requirements shall have 1 State Patrol and One Private escort.

INSPECTIONS

1. See [TEOpS 13-2-12](#)

WORK ZONES

1. Travel through work zones otherwise limited by posted signs or other constraints (i.e. lane width restrictions) cannot proceed without prior authorization of DMV, BHM, and BTO on the permit. Permit vehicles without prior authorization should interdict and call DMV to either approve travel through the work zone or find an alternate route.

COORDINATION

1. Responsibility
 - a. It is the responsibility of the carrier to contact local community and county public works departments or law enforcement agencies to apply for additional permits on connecting highways, and if required by the municipality, for travel on the local roadways.
 - b. Carriers shall coordinate with railroad officials as to the times of move for railroad tracks with short storage distances and humped crossings.

Documentation - All carriers shall be required to carry a log documenting all local community, law enforcement, and agency coordination, during operation.

13-2-11 Oversize/Overweight Wind Industry Permits

January 2014

If not stated in this policy, follow [TEOpS 13-2-10](#).

DEFINITIONS

Wind Tower Multi-trip Permit – specific permits relating to a process implemented to plan for multiple trips of oversize/overweight loads to wind projects.

Wind Multi-Trip Permit – A permit that is valid for unlimited, specified route trips during a range of 3 to 6 months. This is applied to each vehicle identification number (VIN) from a company seeking this permit type

Oversize/Overweight Load – A load that requires a permit due to exceeding certain dimensions and weights.

Pole Car – A pole car is an escort vehicle equipped with a height sensor. A pole car must precede the load and move sufficiently ahead of the oversize vehicle when approaching structures to ascertain clearance prior to the load arriving. The height sensor pole shall be made of a non-conductive, non-destructive, flexible material.

Single Trip Permit – A permit that is valid for 14 days and for one trip only. The carrier specifies the route, and the return trip is allowed at no charge if requested with the original permit application.

Urbanized Area – A populated area that normally experiences peak hour traffic volumes in the morning, afternoon and evening travel periods. It is at the discretion of the Region to determine if an area is considered urbanized and if an oversize/overweight vehicle will significantly impede on traffic during peak periods.

Freeway/Expressway – Four-lane divided highway facilities with no or minimal at grade intersections and sharp curves. Expressways are divided arterial highway facilities that have partial control of access, generally with grade separations at major intersections.

GUIDELINES

1. WisDOT permitted hours of operation for movement of wind tower components are:
 - 6PM Sunday through Noon on Friday, except during the peak traffic hours of 6AM-9AM and 3:30PM-6PM, Monday through Friday, in below specified urban areas
 - 12:01AM Saturday through 10AM Saturday
 - 12:01AM Sunday through 10AM Sunday
2. Oversize/overweight permits will restrict travel during peak traffic hours only in the counties of Brown, Outagamie, Winnebago, Dane, Milwaukee, Ozaukee, Washington, Waukesha, Racine, Kenosha, and LaCrosse. The maps for the wind tower restricted urban areas can be found in:

[\\Mad00fph\n4public\BHO\osow\Time Restrictions\](#) (internal DOT access only)

Wind Tower Allowable Times of Travel

| Day\Hour | 12:01 AM Midnight | 1:00 AM | 2:00 AM | 3:00 AM | 4:00 AM | 5:00 AM | 6:01 AM | 7:00 AM | 8:00 AM | 9:01 AM | 10:00 AM | 11:00 AM |
|-----------|----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|
| Monday | X | X | X | X | X | X | e/u | e/u | e/u | X | X | X |
| Tuesday | X | X | X | X | X | X | e/u | e/u | e/u | X | X | X |
| Wednesday | X | X | X | X | X | X | e/u | e/u | e/u | X | X | X |
| Thursday | X | X | X | X | X | X | e/u | e/u | e/u | X | X | X |
| Friday | X | X | X | X | X | X | e/u | e/u | e/u | X | X | X |
| Saturday | X | X | X | X | X | X | X | X | X | X | n/p | n/p |
| Sunday | X | X | X | X | X | X | X | X | X | X | n/p | n/p |

| Day\Hour | 12:01 PM Noon | 1:00 PM | 2:00 PM | 3:00 PM | 3:30 PM | 4:00 PM | 5:00 PM | 6:01 PM | 7:00 PM | 8:00 PM | 9:00 PM | 10:00 PM | 11:00 PM |
|-----------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|
| Monday | X | X | X | X | e/u | e/u | e/u | X | X | X | X | X | X |
| Tuesday | X | X | X | X | e/u | e/u | e/u | X | X | X | X | X | X |
| Wednesday | X | X | X | X | e/u | e/u | e/u | X | X | X | X | X | X |
| Thursday | X | X | X | X | e/u | e/u | e/u | X | X | X | X | X | X |
| Friday | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p |
| Saturday | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p | n/p |
| Sunday | n/p | n/p | n/p | n/p | n/p | n/p | n/p | X | X | X | X | X | X |

X = Travel Permitted
 e/u = Exception for Urban Areas noted below
 n/p = Travel Not Permitted

*Urban Areas

Green Bay
 Kenosha
 La Crosse
 Appleton including Neenah/Menasha and STH 15

*Counties

Dane County
 Milwaukee County
 Ozaukee County
 Racine County
 Washington County
 Winnebago County

*Urban Areas and or Counties may change due to further LOS Analysis

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5/6/2009

- 30 minute "pulsing" will be allowed. This permit restriction will be replaced with this language: "It is the carrier's responsibility to plan for staging and managing of the departures of permitted loads to avoid congestion on the route due to massing of the permitted loads.
- Permits may include a condition for convoying of two loads in order to more efficiently use escorts. This condition is available on a very limited case-by-case basis and the consecutive convoys cannot move less than 30 minutes apart.
- Escorts (Wind Only)

| WEIGHT | LENGTH | WIDTH | HEIGHT | ESCORT |
|------------------------------------|-------------------------------|---------------|----------------|--|
| < 170K | 100' to 120' | < 13' | <14'6" | One private escort. Pole car requirement subject to Region review. |
| < 171K – 270K | 121- 189'11" | 13'01" -16'0" | 14'7" – 15'11" | Two (2) private escort vehicles. Pole car requirement subject to Region review. |
| Up to 350K 1 to 5 slow to 5mphs | 190'6"- 200'0" | 16'0" to 20' | 16' to 20' | One (1) private vehicle and one (1) state patrol escort vehicles. One (1) private shall be a properly equipped pole car and lead the load by 0.5 miles at all times. |
| Up to 350K 6 or more slow to 5mphs | 200'1" | >20' | >20' | Two (2) state patrol escort vehicles and one (1) private vehicle to provide a properly equipped pole car and lead the load by 0.5 miles at all times. |
| Key: | < Less Than > Greater Than | | | |

- The WisDOT always retains the right to be more restrictive when it is deemed necessary.
- Subject to inspection results or other concerns base loads regardless of weight and dimension maybe required to have one State Patrol Escort until such time as the concern triggering this requirement or concern is removed.

6. Work Zones

Travel through work zones otherwise limited by posted signs or other constraints (i.e. lane width restrictions) cannot proceed without prior authorization of DMV, BHM, and BTO on the permit. Permit vehicles without prior authorization should interdict and call DMV to either approve travel through the work zone or find an alternate route.

7. Ramp Off/Ramp On Method

Ramp off/Ramp on movements for wind industry truck shipments may be utilized and approved by the regions in order to keep the load on the OSOW Freight Network. This method *should* only be used to avoid construction, low bridge clearance, or weight restricted facility. The interchange must be a diamond interchange with a clear path between the exit and entrance ramp. The presence of fixed barriers or medians eliminates this method as an option. Ramp off/Ramp on *should not* be used consecutively on a route or for the overall permit. This method *should* be limited to 1 or 2 exceptions on a route. Additional ramp off/ramp on exceptions are at the discretion of DMV permitting office and BHM staff and only when alternative routes cannot be reasonably identified.

GENERAL NOTES

It is recognized that physical roadway conditions *may* change at the time of the move and the carrier must be aware that they are ultimately responsible for maintaining safe operating conditions and reviewing roadway and vehicle characteristics (i.e., horizontal and vertical clearances, intersection geometrics, load height, tire pressure, etc.)

Contact DMV if there are any loads that do not conform to these load requirement guidelines.

13-2-12 OSOW Inspection Requests and Waiver Procedure

December 2011

PURPOSE

To provide a process for annual vehicle and driver inspections or waivers for specialized transport vehicles that require a permit to travel in Wisconsin and are reviewed under [TEOpS 13-2-10](#) and [TEOpS 13-2-11](#) of this chapter.

DEFINITIONS

OOS – Out of Service violations for the purposes of this section are violations that are significant including but not limited to Brakes, Frame, Suspension, Tires, couplings or any other significant physical feature necessary for safe mobility of the vehicle. OOS for lighting that can be fixed and signed off on would not be considered in the review of a carrier for the purposes of this guidance.

FMCSA – Federal Motor Carrier Safety Administration

PROCEDURE

| Process | Carrier in Regulatory Compliance | Carrier not in Compliance |
|------------------------------|----------------------------------|-----------------------------------|
| ISS | Below 65 | Above 65 |
| NAS 7 - Out of Service (OOS) | No OOS w/in 24 months | OOS in last 24 – Order Inspection |
| 396 for Truck and Trailer* | Submit for file | Do not request |

1. All house/building movers (other than mobile homes and modular home carriers) shall be ordered for inspection as part of every permit application.
2. BHM OSOW Freight Unit to check ISS on the first of every month for all carriers that have NAS 7 inspections that will be over 12 months old in OSOW Freight Unit Database within 30 days from the 1st of the month:
 - a. If a carrier is new to Wisconsin, record is significantly out of date, or not in the OSOW Freight Unit Database than that carrier shall be ordered for inspection.
 - b. All carriers who have an ISS score of 65 or greater BHM to request inspection at next permit request if load originates in Wisconsin.
 - c. For loads originating outside Wisconsin and where inspections are required by any other states in route to Wisconsin DMV shall request a signed copy of that inspection. The out of state inspection shall have no Out of Service (OOS) violations and is only good for permit the carrier is applying for at the time of application. If subsequent permit requests originate outside Wisconsin carrier shall supply an inspection with no OOS violations from the other state. BHM will repeat the process at the time of the carrier's permit request for a load originating in Wisconsin and order an inspection if necessary.
 - d. If a carrier is inspected and found to have OOS violations for lights or other items that can be fixed and signed off on by DSP carrier shall be able to proceed with their load at that time.
3. BHM to submit list of carriers identified under item 2 above and ask DSP to check these carriers for OOS violations in Wisconsin within the last 24 months from the date of the request.
 - a. If no OOS violations are found for last 24 months - proceed to 3 b if there are OOS proceed to 3c.

- b. DMV to request STANDARD OPERATING PROCEDURE (SOP's) and 396 (carrier's annual self-inspection) submittal from carrier.
 - c. If there are OOS violations found for the last 24 months from date of request BHM shall order inspection at next permit request (skip task 4 and 5 below). BHM to continue to repeat item 3c on an annual basis until carrier is free of OOS violations for a period of 24 consecutive months from the date of a permit request.
4. DMV to request most recent copy of FMCSA annual inspection (aka 396) performed by company or other authorized agency for the tractor and trailer units supplied as part of permit request. DMV to provide copy to BHM. This should be repeated annually even if the carrier is in compliance.
 5. For item 4, Carrier has 30 calendar days from the date of request to comply.

NON-COMPLIANCE

1. If carrier is not waived for inspection in accordance with this procedure and fails to comply with a request for inspection twice – subsequent permits shall be held until compliant per DMV discretion. DMV to provide BHM OSOW Freight Unit with any waivers of inspection requirement and reason (i.e. not originating Wisconsin). BHM to provide list of non-compliant carriers who have not responded to inspection requests to DMV to monitor carrier applications in the event the carriers:
 - Next permit dimensions and or weight do not meet requirement for review by BHM – OSOW Freight Unit*
 - Next permit would be on a previously approved route that does not require BHM – OSOW Freight Unit review
2. If a carrier who is initially granted a waiver fails to provide to DMV a FMCSA 396 self-inspection form in accordance with items 4 & 5 above of this procedure the carrier shall be consider non-compliant and their annual inspection waiver is revoked until they either submit to and pass an inspection or provide the requested documentation.
3. BHM OSOW Freight Unit will provide DMV with a monthly list of carriers if any that fall subject to Non Compliance item 2 above.

*OSOW Inspections requested by OSOW Freight Unit are for loads in excess of 16 wide, 140 feet long, or 270,000 pounds, or any combination thereof or wind industry components.

13-2-15 Oversize/Overweight Permit Suspension

May 2009

BACKGROUND

State Patrol and other law enforcement officials currently have the authority to restrict or suspend travel on Wisconsin roadways when unsafe driving conditions occur. According to Trans 254.06 (4) Validity for Single Trip Permits for Oversize or Overweight Vehicles or Loads, and Trans 255.06(4) Validity for Multiple Trip Permits for Oversize or Overweight Vehicles or Loads, *“A permit is not valid during periods when adverse weather or road conditions, such as fog, smoke, heavy rain, snow or ice or wind velocity, impair the safety of a movement under the permit.”*

GUIDELINES

The following conditions are considered when defining a travel restriction:

- Impassable or unsafe roadway conditions on the traveled way – extremely slippery, reduced visibility, significant snow cover, flooding over the road, high winds and blowing snow causing whiteout conditions or drifting, and severe wind chill.
- Recovery activities incomplete – vehicle & debris removal operations, transportation of recovery resources, snow removal

Winter Weather, Flooding, and Other Events

WISDOT will incorporate provisions within oversize-overweight (OSOW) shipment permits to reinforce the accountability of carriers to comply with Trans 255.06(4). The carrier's responsibility to remain aware of current roadway restriction, closure, and alternate route information **shall** also be emphasized.

DTSD will maintain web-based travel warning and information sources for travelers, such as

- 511 Traveler Information Services
- Lane and Ramp Closures (Lane Closure System)

- Work Zones & Detour Information

DTSD will not maintain web pages or otherwise support customized or specialized traffic and incident information services or resources specifically for truck routing or oversize-overweight permitted shipments.

DTSD will not be involved in motor carrier notifications or related further action, including internet posting of maps. DMV *may* notify the motor carriers of events or *may* alternately rely upon the provisions in the OSOW permit stating it is the motor carrier's responsibility to refrain from travel when unsafe driving conditions occur.

COMMUNICATION

Internal WISDOT communication with DTSD by other Divisions (including DMV and DSP) **shall** be directed through the State Traffic Engineer of Operations. This **shall** include deliberations involving emergency suspensions of OSOW permits. The State Traffic Engineer of Operations or their designee **shall** be responsible for timely coordination with DTSD Regional OSOW Coordinators and other DTSD representatives.



Traffic Engineering, Operations & Safety Manual

Chapter 13 Traffic Regulations

Section 3 Low Speed Vehicles

13-3-1 Policy

December 2011

A Low-Speed Vehicle (LSV) is defined in Wis. Stat. S.340.01(27h). Formerly known as “Neighborhood Electric Vehicles (NEVs),” LSVs are four-wheeled, motorized vehicles that comply with federal safety standards stated in 49 CFR ss. 571.3(b) and 571.500. LSVs are manufactured with a maximum speed of 25 MPH. Golf carts are not LSVs.

Wisconsin law (ss. 349.26) provides town, village and city governments’ broad discretion to permit LSVs to operate on highways within their territorial boundaries. Municipal ordinances take priority over county ordinances, as well as the default rules explained below. The default rules apply where there are no municipal or county ordinances.

Under new legislation effective October 2010, WisDOT no longer has authority to permit or prohibit LSV use on highways. The law, however, prohibits LSV use on any highway with a speed limit greater than 35MPH, which effectively prohibits LSV use on most of the state highway system.

DEFAULT RULES – NO LOCAL ORDINANCE

Per the Default Rules, LSVs may be used as follows:

- Connect Highways – A person may operate an LSV on a connecting highway only if the speed limit of the connecting highway is 25 MPH or less
- Local Roads – A person may operate an LSV on any highway, other than a connecting highway, that has a speed limit of 35 MPH or less and that is under the maintenance jurisdiction of a municipality or county. Exception apply at intersections:
 - At an intersection of a local (municipal or county) road with a state trunk highway or connecting highway, LSVs may be used only if:
 - 1) The state trunk highway or connecting highway has a speed limit at the intersection of 35 MPH or less; and
 - 2) Traffic at the intersection is controlled by traffic control signals.
 - At intersections of a local (municipal or county) road with expressways, freeways, or controlled-access highways, LSVs may not be used. This means that an expressway, freeway or controlled access highway effectively creates an impassable barrier to LSV travel in the absence of an ordinance. LSVs cannot cross these highways at grade or at grade-separated interchanges.



BACKGROUND

Why do we have speed limits? Speed limits are an important tool for promoting safety on streets and highways. Limits tell drivers the reasonable speed for a road section under ideal conditions. They also help traffic enforcement by setting standards for what is an unsafe speed.

The concept of establishing speed limits is based upon the nationally accepted principle that the majority of drivers are cautious, prudent and drive at speeds that are reasonable and proper, regardless of the posted speed limit. This “reasonable and proper” theme is part of the Wisconsin Statutes in s.346.57 (4) and s.349.11 (7) and as set forth in the Uniform Vehicle Code (UVC). In part, it reads:

“A person driving a vehicle on a highway shall drive at a careful and prudent speed not greater than nor less than is reasonable and proper, having due regard to the traffic, surface, and width of the highway and of any other condition then existing. A person shall not drive a vehicle upon a highway at a speed greater than that which will permit a stop within the assured, clear distance ahead.”

In other words, motorists are required to drive at a speed that allows them to stop safely. This statute governs the speed of all drivers regardless of any posted speed limits. Differences in speeds at which drivers proceed are a common cause of crashes, often making the roadway less safe. This is an important point because there are several types of speed limits in the State of Wisconsin as indicated below:

Advisory speeds are recommended safe driving speeds to inform drivers of the maximum recommended speed through a curve or for other special roadway conditions. They are posted only in combination with an appropriate warning sign. *Advisory* speeds are not enforceable in Wisconsin courts except as driving too fast for conditions.

Regulatory speed limits are enforceable and are categorized as either statutory or modified.

Statutory speed limits are set as maximum/minimum speeds. These limits are established legislatively and apply throughout the State. The MUTCD defines statutory speed as a speed limit established by legislative action that typically is applicable for highways with specified design, functional, jurisdictional and/or location characteristic and is not necessarily shown on speed limit signs. The determining factor for speed limits on freeways and expressways is most often statutory. Engineering speed studies are not required for applying statutory speed limits.

Modified speed limits are utilized in areas requiring speed limits between the statutory maximum speed limits on state, county or local roadways and the 25 MPH *prima facie* speed limits in business and residential areas. These *modified* speed limits are established by administrative action based on a traffic engineering study. They *may* only be set by agencies having legal authority and jurisdiction over the respective roadway in accordance with s. 349.11 Statute. These modified speed limits are often referred to as absolute speed limits and are not to be exceeded regardless of condition. For State Trunk Highways, the authority and jurisdiction to set modified speed limits lies with the Wisconsin Department of Transportation. Connecting highways, although marked as state highway routes, are not State Trunk Highways. The authority and jurisdiction for speed limits on those routes is held by the municipality responsible for maintaining the underlying street or highway, subject to the review and approval of WisDOT. Local agencies are responsible for setting speed limits on all other roads under their jurisdiction in accordance with the provisions of state law. WisDOT approval to change speed limits on local roads and connecting highways is required based on s. 349.11 and s.86.32(1), Statutes. Local units of government have authority to change the speed limit on routes under their jurisdiction (excluding connecting highways) without WisDOT approval for certain circumstances spelled out in s.349.11, Statutes.

TERMS – DEFINITIONS

Speed Zone – A section of street or highway where speed limit different than the statutory speed limit has been established.

Speed Limit – The maximum (or minimum) speed permitted on a section of street or highway. *May* be statutory or it *may* be established within a speed zone on the basis of an engineering study.

Basic Speed Law – No person **shall** operate a motor vehicle at a speed greater than is reasonable and proper for the prevailing conditions.

85th Percentile Speed – The speed at or below which 85 percent of the sample of free flowing vehicles are traveling. This speed *should* be determined by conducting a spot speed study.

Pace – The 10 MPH band of travel speeds containing the largest number of observed vehicles.

Engineering Study/Engineering and Traffic Investigation – The comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, standards, guidance and practices as contained in the MUTCD and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. An engineering study **shall** be documented. (Language from MUTCD).

HIGHWAY DEFINITIONS

Freeways are divided highways with fully controlled access at interchanges only. Interstate Highways are freeways with the Interstate route designation.

Expressways are divided highways with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional Highways are streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

A Bypass is a route intended to divert traffic around a community and re-connects to routes through a community on the outskirts of the community

PHILOSOPHY

It has been found that motorists are generally capable of determining the driving speed that is reasonable for prevailing road and traffic conditions unless there are some roadway conditions that they are unaware of or which are not readily apparent and that the majority will subsequently adjust their speed accordingly. The 85th percentile speed, the speed at or below which 85% of the vehicles travel a particular roadway, has been found to best represent this perceived "reasonable" speed. The MUTCD Section [2B.13](#) states "when a speed limit is to be posted, it *should* be within ... 5 MPH of the 85th percentile speed of free-flowing traffic." This practice promotes safety as research shows the lowest risk of being involved in a crash occurs at approximately the 85th percentile speed (see "Setting the Speed Limit" in the Wisconsin Statewide Speed Management Guidelines, June 2009). The practice also promotes voluntary speed limit compliance as the majority of drivers would be anticipated to observe the limit. A third benefit of posting speed limits close to the 85th percentile speed is the ability to target law enforcement efforts toward the limited number of motorists that speed.

Unreasonably low speed limits, also called irrational speed limits, are not effective in changing driver behavior and have several negative effects. Research shows that drivers do not reduce their speed to the posted limit on the basis of signage alone (ITE Journal, 2004, "The Effectiveness of Transitional Speed Zones."). While irrational speed limits do not result in desired driver behavior, resulting negative effects include higher financial cost due to need for increased enforcement, higher potential for crashes due to larger variability in vehicle speeds, and encouragement of motorist disregard of other, rational posted speed limits. Irrationally low speed limits also promote a false sense of security among residents and pedestrians who *may* expect that posting lower limits will change drivers' speed behavior.

Driving environment is the main influence on motorists' speeds. A number of factors contribute to the driving environment including design, location within urban or rural areas, and characteristics of traffic, surrounding land use, and access along the roadway. Other factors contribute as well including pavement condition, on-street parking, bicycle and pedestrian activity levels, and level of snow and ice removal. The MUTCD in Section [2B.13](#) recommends conducting a study every 5 years when there are significant changes in roadway characteristics or surrounding land use. Changes to the regulatory speed limit **shall not** be used as a means to correct spot safety or operational problems when an advisory speed plaque with a warning sign would be more appropriate. Regulatory speed limit changes also *should not* be used to address concerns with noise or specialty vehicles.

PURPOSE OF SPEED ZONES

Speed zones are typically established on roadways where the statutory speed limit or an existing speed zone is no longer appropriate due to changes in land use, access, traffic volumes, levels of congestion, and crashes or crash potential along the highway. Speed zoning is a means of establishing uniform regulatory speed for similar driving conditions throughout the state. It is a means of informing motorists who *may* be unfamiliar with the road of "reasonable" driving speeds under ideal operating conditions. Speed limits within speed zones *should* correlate

closely (usually within 5 MPH) with 85th percentile speeds determined by field speed studies to promote safety and voluntary compliance.

AUTHORITY

Regulatory speed limits in Wisconsin are absolute limits, above which it is unlawful to drive regardless of roadway conditions, traffic volumes, or other factors. The statutory authority for establishment of regulatory speed limits is provided in Sections 346.57 and 349.11, Wis. Stats. These statutes vest the Department with the authority to establish regulatory speed limits on the State Trunk Highway System. Furthermore, they provide the Department with approval authority (refer to Section 349.11(3)(c), Wis. Stats.) over some regulatory speed limits that local units of government would establish on facilities under their respective maintenance jurisdictions. Figure 1 summarizes the speed limits under s.346.57, Stats. and authority under s.349.11, Stats.

On November 13, 1962, the Highway Commission delegated its statutory authority to the Chief Traffic Engineer, and established the Chief Traffic Engineer as being responsible for maintaining the official records. Later the title of Chief Traffic Engineer was changed to State Traffic Engineer for Highways.

By memorandum of June 5, 1992, from the State Traffic Engineer, the regional offices were authorized to approve speed limit changes on local roads and streets, including county trunk highways, where those changes fall outside the authorized limits that the local authorities *may* exercise as specified in the statutes. In the same memo, the regional offices were authorized to establish reductions in speed limits in construction zones on a temporary basis while the need for the reduction exists. A Traffic Engineer with a PE License is required to sign for any speed study on state maintained highways.

As of October 16, 1995, authority for approval of speed limits which fall within 5 MPH of the measured 85th percentile and no more than 2 MPH below the measured average speed, or which are increased to the statutory speed limit was delegated to a designated approval authority in each region. Speed limits not meeting those criteria **shall** be sent to the State Traffic Safety Engineer in Bureau of Traffic Operations.

Figure 1. Speed Zone Summary

| Fixed Limits per Statute 346.57(4)* | What Local Governments** Can do Per 349.11(3) and (7)* |
|---|---|
| (gm) 65 MPH – Freeway/Expressway | WisDOT ONLY |
| (h) 55 MPH – STH | WisDOT ONLY |
| (h) 55 MPH – CTH, Town Roads | Lower the speed limit by 10 MPH or less. |
| (k) 45 MPH – Rustic Roads | Lower the speed limit by 15 MPH or less. |
| (j) 35 MPH – Town Road (1,000' min) with 150' driveway spacing | Lower the speed limit by 10 MPH or less. |
| (e) 25 MPH – Inside corp. limits of a city or village (other than outlying districts) | Raise the speed limit to 55 mph or less. Lower the speed limit by 10 mph or less. |
| (f) 35 MPH – Outlying district within city or village limits | Raise the speed limit to 55 mph or less. Lower the speed limit by 10 mph or less. |
| (g) 35 MPH – Semi urban district outside corp. limits of a city or village | Raise the speed limit to 55 mph or less. Lower the speed limit by 10 mph or less. |
| (a) 15 MPH – School Zone, when conditions are met. | Raise the speed limit to that of the roadway. Lower the speed limit by 10 MPH or less. |
| (b) 15 MPH – School Crossing, when conditions are met. | Raise the speed limit to that of the adjacent street. Lower the speed limit by 10 MPH or less. |
| (c) 15 MPH – Pedestrian Safety Zone, with Public Transit Vehicle Stopped. | No changes permitted. |
| (d) 15 MPH – Alley | Lower by 10 MPH or less. |
| (i) 15 MPH – Street or town road adjacent to a Public Park | Lower by 10 MPH or less. |
| (10) Construction or maintenance zones – as appropriate | State and Local have authority to establish lower limit. |
| *From Updated 2007-2008 Wis. Stats Database. | |
| **All speed limit changes shall be based on a traffic engineering study, including modifications allowed under State Statute. Local governments can implement speed limit changes on the local road system without WisDOT approval when proposals are within the constraints identified above. | |

NOTE: s.346.57 (4)(g) is a highway and s.346.57(4)(j) is a town road.

SPEED STUDIES

Speed zone reviews are typically initiated as a result of concerns expressed by interested citizens who live nearby or drive along the roads in question, or *may* be triggered by a severe crash that has occurred. These concerns are referred to the traffic section in the region for review. Occasionally citizens or public officials under citizen pressure, request that a particular speed limit be imposed or that some other type of corrective action be taken. Requests for speed zone reviews originating outside the Wisconsin Department of Transportation for STHs *should* come through a mayor or other elected executive, appointed official, government body, or Traffic Safety Commission and be submitted in writing. WisDOT regions contacted directly by state or national legislators *should* notify and coordinate with the Bureau of Traffic Operations, Traffic Engineering Section. Any

decisions regarding speed limits must be based on facts and an objective analysis of the characteristics of the roadway. Once a study begins, the person requesting the survey *may* be contacted for further input or clarification of the problem.

Engineering studies **shall** include the following:

1. Measure prevailing speed characteristics and determine the 85th percentile speed;
2. Evaluate reported crash experience for the past three to five years;
3. Check the road's geometrics including lane widths, curves, roadside hazards and sight distances;
4. Determination of the 10 mile per hour pace;
5. Determine average speed;
6. Evaluate density and roadside development in terms of the number of driveways and access points where vehicles can enter the traffic flow.

Engineering studies *should* include the following:

7. Consider conflicts with parking practices, and pedestrian and bicycle activity.
8. Evaluate shoulder widths as well as roadway and shoulder conditions.
9. Determine the current level of enforcement.

Additional guidance on assessing need for a speed zone or for modification of a speed zone is available in the Wisconsin Statewide Speed Management Guidelines, June 2009.

OBJECTIVES OF A MODIFIED SPEED LIMIT

For a speed limit to be effective, it *should* accomplish the following:

- Reduce the speed differential of vehicles using the highway.
- Be a reasonable speed so the majority of drivers will comply voluntarily.
- Reflect consistent application of traffic engineering principals and guidelines in common circumstances.

Numerous studies have shown that setting a speed limit within 5 MPH of the 85th percentile speed is advisable, to achieve safer operation.

Increments: Speed limit recommendations between adjacent sections of highway outside incorporated cities/villages *should* generally be made in increments of ten MPH, but increments of five MPH are permissible when justified. Inside the incorporated cities/villages these speed limits *should* be in increments of five MPH. The number of such changes *should* be held to a minimum when speed limits are being applied to several adjacent sections of highway.

Length/Transitions: A speed limit *should* generally not be recommended when the length of the total zone would be less than 0.3 miles of a mile in length. A shorter distance *may* be considered or even necessary in urban settings where transitional speed limits are enacted as a buffer between high and low speed limits. The 85th percentile *should* support these transitional zones. Avoid unwarranted step down speed limits; rather base it on the character of the roadway.

In many rural areas where urban sprawl is not present, an abrupt change occurs in the driving environment when entering or leaving an urban area and a transitional speed will not be supported by the 85th percentile speed. Unless the driver perceives a reason to slow down, transitional zones are almost completely ineffective. In these cases, advance signing advising the driver of a drop in the speed limit is the preferred method.

TRANSITIONAL SPEED ZONES

Generally, it is not recommended to have transitional/step down speed zones. Transitional speed zones are typically less than 0.3 miles in length and provide a means to allow drivers to step down their speed when approaching zones that are reduced due to constraints such as urban areas or construction. Research suggests that drivers *may not* reduce their speed to the posted speed limit on the basis of signage alone. Speed is more dependent on other factors, such as the physical characteristics of a highway. Speed data was analyzed in transitional zones, which resulted in increased dispersion or variance of individual speed. The probability of collisions increased with speed variance. Transitional speed zones had very little effect on the speeds of vehicles downstream as they entered lower speed zones. There needs to be changes in highway characteristics to impact driver behavior. (ITE Journal, 2004, "The effectiveness of Transitional Speed Zones".)

A transitional zone *should* be considered, if the physical characteristics of the roadway change, such as a rural section that transitions to a curb and gutter section with minimal driveways, and then to a curb and gutter section with a significant number of driveways. Consider no more than 2 step-downs and only if within the 85th percentile speeds. Where there is development in an outlying area, a step down/transitional zone *may* be appropriate. However, where the highway is rural and transitions directly into a community without an outlying business area, the step down/transition zone is probably not appropriate.

SPEED STUDY

The Speed Study includes and is conducted as follows: (see Appendix A for example):

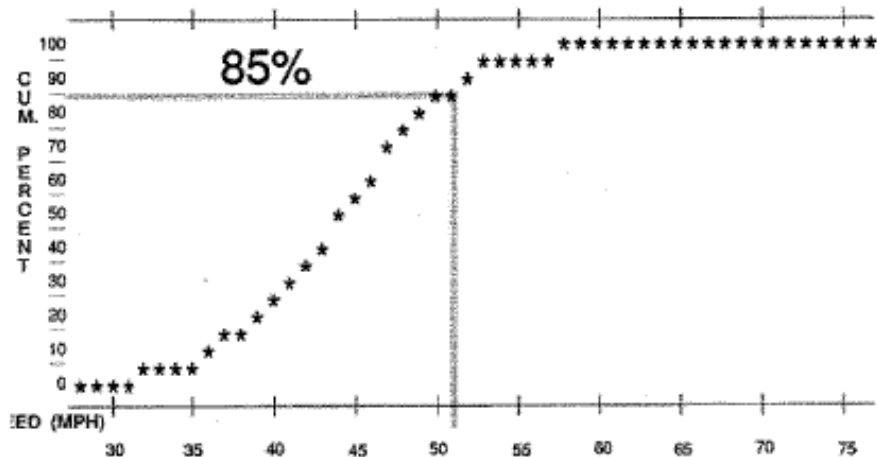
- Taken during light to medium traffic conditions on a weekday. Rush hours and adverse weather conditions are typically avoided because they do not represent normal, free-flow traffic.
- Areas such as intersections, railroad tracks, or other factors that will influence speed are avoided. Since modified speed limits are the maximum allowable speeds, the conditions under which speed studies are taken must be close to ideal.
- The speed data are collected by recording the speeds of free flowing motor vehicles using radar, laser or other speed-measuring devices. A representative sample of vehicular speeds is recorded and these speeds would include local residents who drive through the zone. To assist in obtaining representative data, the data collection process *should* be low key so as to limit any affect on driver behavior.
- As a general rule, the minimum sample size *should* never be less than 30 measured spot speeds (for example, 15 vehicles per direction). On higher volume roads the study *should* include about 100 vehicles per lane per direction (e.g., a total of 200 vehicles for a roadway with one lane in each direction, or 400 vehicles total for a roadway with two lanes in each direction). Accurate spot speed measurements are important for setting limits. Spot speed is the instantaneous speed at one location. Data can be collected over multiple weekdays.
- Utilize a minimum 6-second headway, i.e the gap between vehicles *should* be 6 seconds in order to provide for good free flow.
- A one hour time period is the minimum time period used to conduct a study.

Note: Traffic data collection systems using Laser technology are available.

Use of the 85th percentile speed acknowledges that 15% of the drivers are traveling above a speed that is reasonable and proper. This is the 15% of motorists at which enforcement action is directed. Studies have shown that this is the group of motorists that cause many of the crashes and are the most aggressive drivers. There are other parameters used to evaluate speed data, such as the average, median and pace speeds. However, the 85th percentile speed is the most critical criterion in establishing realistic speed limits.

Figure 2 provides a typical sample 85th percentile study, 10 MPH pace and synopsis of speed distribution.

Figure 2a. Speed Distribution Graph



DIRECTION(S) E-W
 DATE 01/10/91
 TIME 1:30 PM
 POSTED SPEED LIMIT 45

50TH PERCENTILE SPEED 45
 85TH PERCENTILE SPEED 51
 10 MPH PACE SPEED 40 through 49
 PERCENT IN PACE SPEED 63.3
 PERCENT OVER PACE SPEED 18.6
 PERCENT UNDER PACE SPEED 17.9
 RANGE OF SPEEDS 28 to 61
 VEHICLES OBSERVED 218
 AVERAGE SPEED 44.6

| SPEED | NO. | PCT. | CUM. PCT. |
|-------|-----|------|-----------|
| 30 | 2 | 0.9 | 1.4 |
| 31 | 1 | 0.5 | 1.8 |
| 32 | 2 | 0.9 | 2.8 |
| 33 | 4 | 1.8 | 4.6 |
| 34 | 3 | 1.4 | 6.0 |
| 35 | 2 | 0.9 | 6.9 |
| 36 | 6 | 2.8 | 9.6 |
| 37 | 7 | 3.2 | 12.8 |
| 38 | 4 | 1.8 | 14.7 |
| 39 | 7 | 3.2 | 17.9 |
| 40 | 12 | 5.5 | 23.4 |
| 41 | 12 | 5.5 | 28.9 |
| 42 | 10 | 4.6 | 33.5 |
| 43 | 17 | 7.8 | 41.3 |
| 44 | 15 | 6.9 | 48.2 |
| 45 | 15 | 6.9 | 55.0 |
| 46 | 14 | 6.4 | 61.5 |
| 47 | 18 | 8.3 | 69.7 |
| 48 | 16 | 7.3 | 77.1 |
| 49 | 9 | 4.1 | 81.2 |
| 50 | 8 | 3.7 | 84.9 |
| 51 | 5 | 2.3 | 87.2 |
| 52 | 9 | 4.1 | 91.3 |
| 53 | 4 | 1.8 | 93.1 |
| 54 | 3 | 1.4 | 94.5 |
| 55 | 3 | 1.4 | 95.9 |
| 56 | 2 | 0.9 | 96.5 |
| 57 | 1 | 0.5 | 97.2 |
| 58 | 2 | 0.9 | 98.2 |
| 59 | 0 | 0.0 | 98.2 |
| 60 | 2 | 0.9 | 99.1 |
| 61 | 2 | 0.9 | 100.0 |

Figure 2b

U.S. Highway 18 Speed Study – City & Town of Brookfield - Waukesha County

| Direction of Travel | ----- Eastbound ----- | ----- Westbound ----- |
|-----------------------------------|------------------------------|------------------------------|
| Location | -0.1 mi w of Brookfield Rd - | -0.25 mi w of Brookfield Rd- |
| Date | 12/14/06 | 12/14/06 |
| Military Time | 12:32-13:24 | 11:37-12:10 |
| Posted Speed Limit | 45 MPH | 45 MPH |
| Lowest Recorded Speed | 37 MPH | 35 MPH |
| Highest Recorded Speed | 57 MPH | 57 MPH |
| Average Speed | 44.2 MPH | 45.2 MPH |
| 85 th Percentile Speed | 48 MPH | 49 MPH |
| 10 MPH Pace | 38 - 47 MPH | 40 - 49 MPH |
| % > 35 MPH | 100 % | 98 % |
| % > 40 MPH (Req. Lim.) | 83 % | 87 % |
| % > 45 MPH (Speed Limit) | 32 % | 44 % |
| % > 50 MPH | 5 % | 11 % |
| % > 55 MPH | 1 % | 1 % |

| Direction of Travel | ----- Eastbound ----- | ----- Westbound ----- |
|-----------------------------------|-----------------------------|-----------------------------|
| Location | - 0.15 mi w of Calhoun Rd - | ----- at Woelfel Road ----- |
| Date | 12/14/06 | 12/14/06 |
| Military Time | 10:01-10:37 | 10:54-11:30 |
| Posted Speed Limit | 45 MPH | 45 MPH |
| Lowest Recorded Speed | 34 MPH | 37 MPH |
| Highest Recorded Speed | 55 MPH | 51 MPH |
| Average Speed | 43.5 MPH | 43.4 MPH |
| 85 th Percentile Speed | 47 MPH | 47 MPH |
| 10 MPH Pace | 38 - 47 MPH | 38 - 47 MPH |
| % > 35 MPH | 98 % | 100 % |
| % > 40 MPH (Req. Lim.) | 80 % | 73 % |
| % > 45 MPH (Speed limit) | 31 % | 34 % |
| % > 50 MPH | 5 % | 2 % |
| % > 55 MPH | 0 % | 0 % |

| Direction of Travel | ----- Eastbound ----- | ----- Westbound ----- |
|-----------------------------------|----------------------------|----------------------------|
| Location | -0.20 mi w of Moorland Rd- | ----- at Thomas Lane ----- |
| Date | 01/23/07 | 01/23/07 |
| Military Time | 09:11 - 09:55 | 10:01 - 10:43 |
| Posted Speed Limit | 45 MPH | 45 MPH |
| Lowest Recorded Speed | 36 MPH | 35 MPH |
| Highest Recorded Speed | 52 MPH | 51 MPH |
| Average Speed | 44.3 MPH | 42.2 MPH |
| 85 th Percentile Speed | 48 MPH | 46 MPH |
| 10 MPH Pace | 39 - 48 MPH | 38 - 47 MPH |
| % > 35 MPH | 100 % | 98 % |
| % > 40 MPH (Req. Lim.) | 89 % | 62 % |
| % > 45 MPH (Speed Limit) | 37 % | 16 % |
| % > 50 MPH | 5 % | 1 % |
| % > 55 MPH | 0 % | 0 % |

Red – Greater than posted speed limit

Blue – Greater than proposed speed limit

Figure 2c

Project ID : EB STH 18
 Street : Blue Mound Rd
 Capture Zone : 0.20 mile west of Moorland Road
 Community : City of Brookfield
 County : Waukesha
 Posted Speed Limit: 45
 Weather Conditions: Cl damp

Date Range : 1/23/07
 Time Range : 9:11 AM Through 9:55 AM
 Direction(s) : Approaching
 Types of Vehicles : All Vehicles

| | | | |
|------------------------|--------|-----------------|------|
| Lowest Recorded Speed | : 36 | 15th Percentile | : 41 |
| Highest Recorded Speed | : 52 | 50th Percentile | : 45 |
| Average Speed | : 44.3 | 85th Percentile | : 48 |
| Vehicles Observed | : 100 | 95th Percentile | : 50 |

10 MPH Pace Speed : 39 Through 48
 Percent In Pace Speed : 85.0
 Percent Under Pace Speed : 4.0
 Percent Over Pace Speed : 11.0

| SPEED | COUNT | PERCENT | CUM. % | SPEED | COUNT | PERCENT | CUM. % |
|-------|-------|---------|--------|-------|-------|---------|--------|
| 36 | 2 | 2.0 | 2.0 | 45 | 15 | 15.0 | 63.0 |
| 37 | 0 | 0.0 | 2.0 | 46 | 12 | 12.0 | 75.0 |
| 38 | 2 | 2.0 | 4.0 | 47 | 6 | 6.0 | 81.0 |
| 39 | 5 | 5.0 | 9.0 | 48 | 8 | 8.0 | 89.0 |
| 40 | 2 | 2.0 | 11.0 | 49 | 5 | 5.0 | 94.0 |
| 41 | 10 | 10.0 | 21.0 | 50 | 1 | 1.0 | 95.0 |
| 42 | 13 | 13.0 | 34.0 | 51 | 4 | 4.0 | 99.0 |
| 43 | 6 | 6.0 | 40.0 | 52 | 1 | 1.0 | 100.0 |
| 44 | 8 | 8.0 | 48.0 | | | | |

Figure 2d

WISCONSIN DEPARTMENT OF TRANSPORTATION
SPOT-SPEED FIELD STUDY

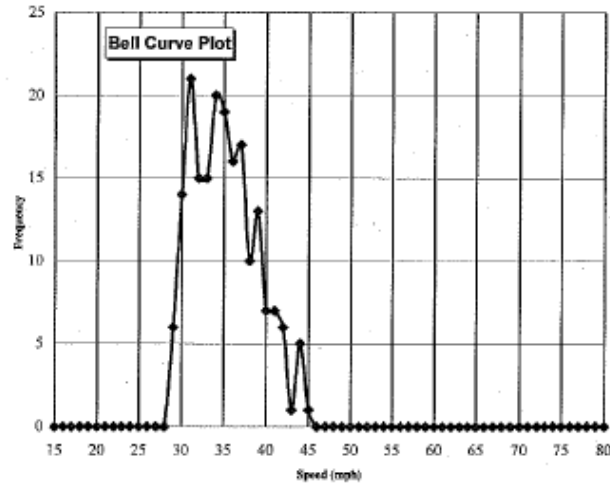
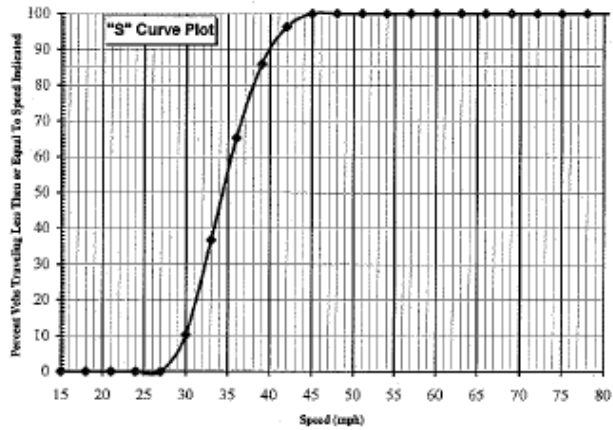
| | | | |
|--------------------------|----------------------------|------------------|---|
| Date: 04/05/07 | Hwy: USH 18 | Direction: Both | SUMMARY OF VEHICLES BY TYPE: |
| Time: 9:30 AM | Location: Fennimore - East | Posted Speed: 30 | |
| Observer(s): Kory Keppel | Location 2 | Weather: Sunny | |
| | Btw Marsden & Bronson | Pav't Condition: | |
| | County: Grant | | Passenger = 100.0% |
| | | | Trucks = 0.0% |
| | | | Buses = 0.0% |

| SPEED RANGE | No. VEHICLES (f) | Speed * # | CUMM No. VEHICLES | CUMM % |
|-------------|------------------|-----------|-------------------|--------|
| 15 | 0 | 0 | 0 | 0.0 |
| 16 | 0 | 0 | 0 | 0.0 |
| 17 | 0 | 0 | 0 | 0.0 |
| 18 | 0 | 0 | 0 | 0.0 |
| 19 | 0 | 0 | 0 | 0.0 |
| 20 | 0 | 0 | 0 | 0.0 |
| 21 | 0 | 0 | 0 | 0.0 |
| 22 | 0 | 0 | 0 | 0.0 |
| 23 | 0 | 0 | 0 | 0.0 |
| 24 | 0 | 0 | 0 | 0.0 |
| 25 | 0 | 0 | 0 | 0.0 |
| 26 | 0 | 0 | 0 | 0.0 |
| 27 | 0 | 0 | 0 | 0.0 |
| 28 | 0 | 0 | 0 | 0.0 |
| 29 | 6 | 174 | 6 | 3.1 |
| 30 | 14 | 420 | 20 | 10.4 |
| 31 | 21 | 651 | 41 | 21.2 |
| 32 | 15 | 480 | 56 | 29.0 |
| 33 | 15 | 495 | 71 | 36.8 |
| 34 | 20 | 680 | 91 | 47.2 |
| 35 | 19 | 685 | 110 | 57.0 |
| 36 | 16 | 576 | 126 | 65.3 |
| 37 | 17 | 629 | 143 | 74.1 |
| 38 | 10 | 380 | 153 | 79.3 |
| 39 | 13 | 507 | 166 | 86.0 |
| 40 | 7 | 280 | 173 | 89.6 |
| 41 | 7 | 287 | 180 | 93.3 |
| 42 | 6 | 252 | 186 | 96.4 |
| 43 | 1 | 43 | 187 | 96.9 |
| 44 | 5 | 220 | 192 | 99.5 |
| 45 | 1 | 45 | 193 | 100.0 |
| 46 | 0 | 0 | 193 | 100.0 |
| 47 | 0 | 0 | 193 | 100.0 |
| 48 | 0 | 0 | 193 | 100.0 |
| 49 | 0 | 0 | 193 | 100.0 |
| 50 | 0 | 0 | 193 | 100.0 |
| 51 | 0 | 0 | 193 | 100.0 |
| 52 | 0 | 0 | 193 | 100.0 |
| 53 | 0 | 0 | 193 | 100.0 |
| 54 | 0 | 0 | 193 | 100.0 |
| 55 | 0 | 0 | 193 | 100.0 |
| 56 | 0 | 0 | 193 | 100.0 |
| 57 | 0 | 0 | 193 | 100.0 |
| 58 | 0 | 0 | 193 | 100.0 |
| 59 | 0 | 0 | 193 | 100.0 |
| 60 | 0 | 0 | 193 | 100.0 |
| 61 | 0 | 0 | 193 | 100.0 |
| 62 | 0 | 0 | 193 | 100.0 |
| 63 | 0 | 0 | 193 | 100.0 |
| 64 | 0 | 0 | 193 | 100.0 |
| 65 | 0 | 0 | 193 | 100.0 |
| 66 | 0 | 0 | 193 | 100.0 |
| 67 | 0 | 0 | 193 | 100.0 |
| 68 | 0 | 0 | 193 | 100.0 |
| 69 | 0 | 0 | 193 | 100.0 |
| 70 | 0 | 0 | 193 | 100.0 |
| 71 | 0 | 0 | 193 | 100.0 |
| 72 | 0 | 0 | 193 | 100.0 |
| 73 | 0 | 0 | 193 | 100.0 |
| 74 | 0 | 0 | 193 | 100.0 |
| 75 | 0 | 0 | 193 | 100.0 |
| 76 | 0 | 0 | 193 | 100.0 |
| 77 | 0 | 0 | 193 | 100.0 |
| 78 | 0 | 0 | 193 | 100.0 |
| 79 | 0 | 0 | 193 | 100.0 |
| 80 | 0 | 0 | 193 | 100.0 |
| 193 | | | | |

STUDY RESULTS

| AVERAGE SPEED | 50th PERCENTILE | 85th PERCENTILE | PACE SPEED RANGE |
|---------------|-----------------|-----------------|------------------|
| 35.2 | 34.3 | 38.9 | 30.0 to 39.0 |

% In Pace = 82.9%
% Over Pace = 14.0%
% Under Pace = 3.1%

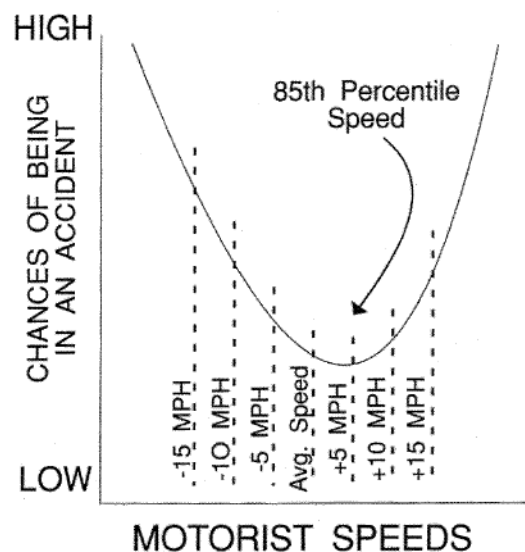


W:\2007\04\05\07\SpotSpeed\13-5 Grant\Fennimore USH 18 East\Fennimore 2 - 2007.d\SPOT2D DATA SHEET

TRAFFIC CRASH DATA

Contrary to popular belief, lower speed limits do not necessarily improve safety. It is inappropriate to compare crashes on a fairly short segment of road to the statewide crash average, because a speed study is taken at the one section of highway you are dealing with. Crashes typically indicate another problem, which is generally not speed. The more uniform the speeds of vehicles in a traffic stream, the less chance there is for conflict and crashes. Posting speed limits lower or higher than what the majority of drivers are traveling produces two distinct groups of drivers: those attempting to observe the speed limit and those driving at a speed they feel is reasonable and prudent. These differences in speeds can result in increased crashes due to tailgating, improper passing, reckless driving, and weaving from lane to lane. However, the number of traffic crashes along any highway is related to numerous factors. Regardless of the roadway involved, there are a statistical number of crashes that can be expected to occur no matter how safe a roadway is made. Investigations of crashes reveal that in the majority of cases there was a clear violation of a traffic law or rule of good driving. Proper analysis and evaluation of these factors require the experience and expertise of a traffic engineer. Based on these studies and as illustrated in the graph, the lowest risk of being involved in a crash occurs at approximately the 85th percentile speed. Figure 3 represents this fact that crashes are lowest at the 85th percentile speed.

Figure 3. Accident Involvement vs. Motorists Speeds



Source: "Speed Zoning on Texas Highways" State Department of Highways and Public Transportation, Austin, Texas, October 1990.

DRIVING ENVIRONMENT

The design, physical condition, and classifications of a roadway have an effect on vehicle speeds because motorists vary their speeds depending on the driving environment. The traffic engineer considers significant items in the driving environment. These items *may* include:

- Traffic volumes
- Roadside development (type, density and lateral offset)
- Roadway and shoulder widths
- Condition of the roadway
- The number of lanes
- Intersections
- Driveways
- Hills, curves
- Urban Roadway cross-section (presence of curb and gutter rather than ditches)
- Parking
- Pedestrians and bicyclists – frequent presence 10% of time.
- Any other factors recorded by the study team.

The number of changes in the speed limit along a given route *should* be minimized. With this in mind, the length of the speed zone *should* be at least 0.3 miles. Speed limits are not a spot issue. The traffic engineer bases the recommendation on the conditions that exist at the time of their evaluation and *should not* attempt to consider such things as future growth, anticipated enforcement, or concerns for something that has not happened.

Realistic speed limits provide for a uniform and orderly movement of traffic. There is a need for uniformity on all

roadways especially where they carry large volumes of traffic through various roadside conditions or numerous adjoining communities.

SPEED STUDY DATA EVALUATION

The 85th percentile speed is the primary indicator of the speed limit that *should* be established. The pace speed is another excellent tool. A normal distribution contains approximately 70 percent of the vehicles within the pace with approximately 15% of the vehicles below and 15% of the vehicles above the limits of the pace speed.

THE APPROVAL PROCESS - DOCUMENTATION

In accordance with state statutes, an engineering and traffic investigation must precede the establishment of a modified speed zone on the state trunk highway system. The following elements are expected to be prepared by the region as part of every speed zone engineering and traffic investigation. An engineering and traffic investigation is not required for rural 55 and 65 MPH limits that are established by statute.

1. Speed checks taken at appropriate intervals to determine the 85th percentile and mean of the speed distribution at each of the monitored locations. Exceptions are minor adjustments of existing speed zone termini due to changes in highway features, and development or signage that requires the speed limit sign locations to be adjusted. In addition, for all recommendations sent to the Bureau of Traffic Operations:
2. A picture or photo of each location where speed readings were taken. Document the capture zone.
3. Crash history when it bears on the recommendation.
4. A map depicting the limits of both the existing and proposed speed zoning.
5. Documentation of any concurrences or protests by local units of government, particularly where existing speeds are to be altered, and discussion of the reason for a recommended change.

Note: An example of a speed study is shown in Figure 5.

The region *should* prepare the submittal in the prescribed submittal/approval shell. The region will number the declaration in the following manner: SZ-*ww-xxx-yyyy-zz*, where *ww* is the county number where the roadway resides (e.g., Dane County would be entered 13, Milwaukee County would be entered 40), *xxx* is the numeric designation of the highway involved in the declaration, *yyyy* is the four digit year the request was submitted, (e.g. 2009), and *zz* is a number in sequence denoting chronological declarations for the roadway throughout the year, beginning with 01. Figure 4 is the submittal/approval document available electronically on the WisDOT Website.

When the criteria enumerated in the last paragraph of the Authority Section are met, the region *may* fill out the approval portion of the submittal letter, and fill in the information on speed check verification.

When the criteria for region approval are not met, the region **shall** fill out the recommendation information portion of the letter, indicating the material that is being transmitted with the recommendation. The region **shall** include a memo as a cover page to the recommendation explaining background, summary of the analysis and any additional information that would be helpful for the reviewer.

The region's submittal is reviewed by the State Highway Traffic Safety Engineer at the Bureau of Traffic Operations Traffic Engineering Section who identifies, based on region input and other factors, recommendations that *may* be expected to generate special attention or controversy and will review those recommendations with the State Traffic Engineer. The State Highway Traffic Safety Engineer will make routine approvals. Upon approval, the official records are updated and the region is notified. The Bureau of Traffic Operations will respond to region recommendations in writing, including an explanation of the reasons for any denials.

LOCAL SPEED LIMITS

Local governments can implement speed limit changes on the local road system without department approval when proposals are within the constraints shown in Figure 1 contained herein. The traffic study must be per SS 349.11 and MUTCD Section [2B.13](#). Changes proposed outside the constraints require department approval.

Authority is delegated to the region office. It is recommended that the declaration number for this have the format: SZC-*ww-xxxx-yyyy-zz*, where *ww* is the county number where the roadway resides (e.g., Dane County would be entered 13, Milwaukee County would be entered 40), *xxxx* is the letter designation or abbreviated name of the highway/street involved in the declaration, *yyyy* is the four digit year the request was submitted (e.g., 2009), and *zz* is a number in sequence denoting chronological declarations for the roadway throughout the year, beginning with 01.

Figure 4. Speed Declaration Form

| | | |
|--|--|---|
| Date | <hr/> | PAGE 1 OF 3 SPEED STUDY COVER LETTER |
| From | <hr/> | |
| To | <hr/> State Traffic Safety Engineer | |
| Subject | SPEED ZONE DECLARATION SZ-- <hr/> -- <hr/> -- <hr/> -- <hr/> | |
| STUDY LOCATION | | |
| Highway/Street Name: <hr/> | | |
| From: <hr/> | | To: <hr/> |
| Municipality: <hr/> | | |
| Segment Length (mi): <hr/> | | County: <hr/> |
| Reason(s) for Speed Limit Change: <hr/> | | |
| | | |
| | | |
| REQUEST FOR APPROVAL OF DECLARATION | | |
| For Declaration Requiring Approval by the Bureau of Highway Operations, per TGM 13-5-1 | | |
| The Region submits the attached declaration, numbered as above, and recommends approval. | | |
| The following information supporting the recommendation is enclosed with this request (please circle): | | |
| Map showing limits | Speed study data | Crash history data |
| Aerial / site location photo(s) | Documents of public interest | Highway log files |
| Other (please specify): <hr/> | | |
| RECOMMENDED BY: <hr/> Region | | Date: <hr/> |
| REVIEWED BY: <hr/> Bureau of Highway Operations | | Date: <hr/> |
| SPEED ZONE REQUEST APPROVED NOT APPROVED | | |
| Reviewer shall provide comments, in writing, when a request is not approved. | | |

Figure 4. Continued

| | | | |
|--|---|------------------------------|-------|
| Date: _____ | | PAGE 2 OF 3 | |
| Speed Zone Declaration: _____ | | SPEED STUDY WORKSHEET | |
| ROADWAY CHARACTERISTICS | | | |
| Posted Speed Limit: _____ mph | Is Segment a Transition Zone (circle): | Yes | No |
| | <small>(If 'Yes', please explain on Page 3)</small> | | |
| Design Speed Limit: _____ mph | Significant On-Street Parking (circle): | Yes | No |
| | <small>(If 'Yes', please explain on Page 3)</small> | | |
| Number of Lanes: _____ | Significant Ped/bike activity (circle): | Yes | No |
| | <small>(If 'Yes', please explain on Page 3)</small> | | |
| Lane Width (feet): _____ | Horizontal curves present (circle): | Yes | No |
| | <small>(If 'Yes', please explain on Page 3)</small> | | |
| AADT (vehicle / day): _____ | Vertical curves present (circle): | Yes | No |
| | <small>(If 'Yes', please explain on Page 3)</small> | | |
| Year AADT Performed: _____ | Number of access points in segment: _____ | | |
| Land Use (circle): Urban Suburban Rural | | CRASH HISTORY | |
| Roadway Type (circle): Freeway Non-freeway | Years: _____ | to | _____ |
| Functional Class: _____ | Number of Years: _____ | | |
| Shoulder Type (circle): Paved Gravel C&G | Speed-related crashes: _____ | | |
| Shoulder Width (feet): _____ | Crash Rate: _____ | | |
| Median Type (circle): Divided Undivided TWLTL | Severity Rate: _____ | | |
| SPEED STUDY RESULTS | | | |
| Posted Speed Limit (mph): _____ | Number of observed vehicles: _____ | | |
| 50th Percentile Speed (mph): _____ | 10 mph Pace Range: _____ | | |
| 85th Percentile Speed (mph): _____ | Percent vehicles in pace: _____ | | |
| Range of Speeds (mph): _____ | Percent vehicles over pace: _____ | | |
| Percent observed vehicles non-compliant to speed limit: _____ | Percent vehicles under pace: _____ | | |

Figure 4. Continued

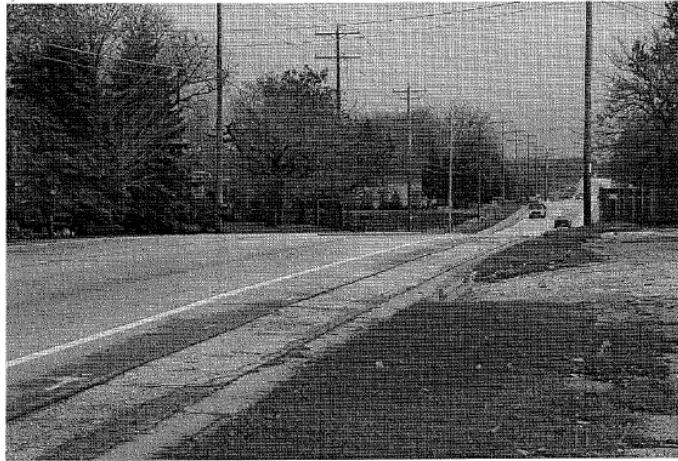
Date: _____

Speed Zone Declaration: _____

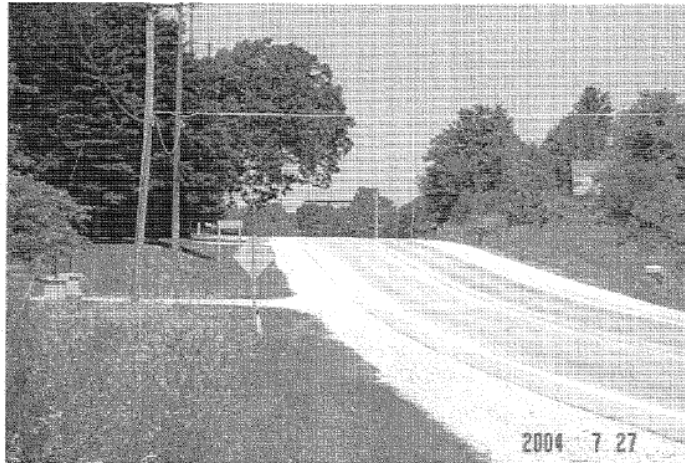
Provide additional comments that may be significant or noteworthy about the request

Provide reasoning for omission of any information requested

Figure 5. Typical Speed study documentation



Capture Zone - STH 38 @ 0.1 mile east of Nicholson Rd - Husher



Capture Zone - SB 38 @ 0.20 mile north of Brook Rd



Capture Zone - NB 38 @ 0.35 mile south of 4 Mile Rd

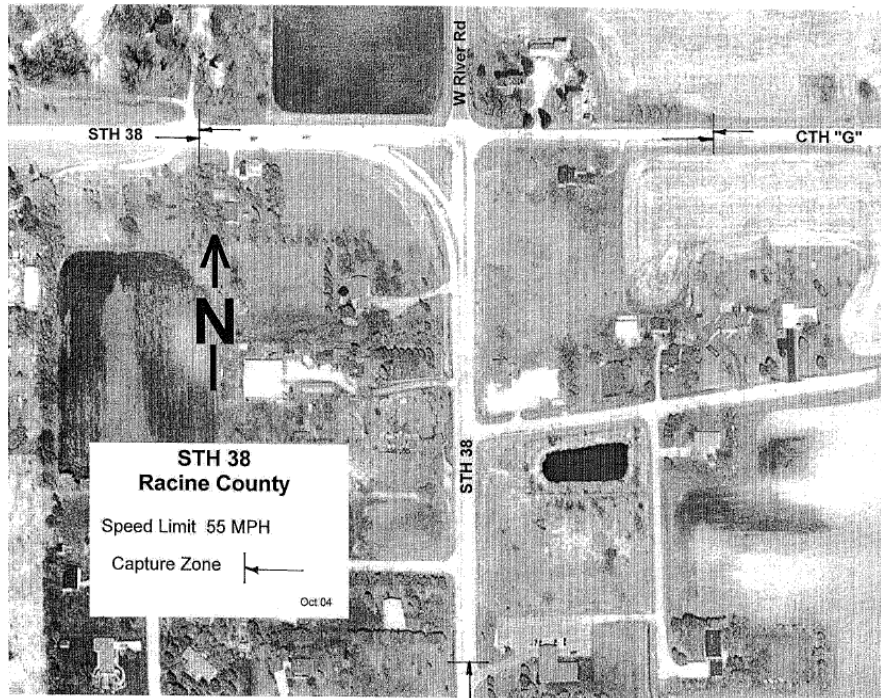
Project ID : NB STH 38
 Street :
 Capture Zone : 0.1 mile east of Nicholson Rd
 Community : Town of Caledonia
 County : Racine
 Posted Speed Limit: 40
 Weather Conditions: dry

Date Range : 11/2/04
 Time Range : 11:10 AM Through 12:11 PM
 Direction(s) : Approaching
 Types of Vehicles : All Vehicles

Lowest Recorded Speed : 34 15th Percentile : 41
 Highest Recorded Speed : 59 50th Percentile : 45
 Average Speed : 46.1 85th Percentile : 51
 Vehicles Observed : 130 95th Percentile : 54

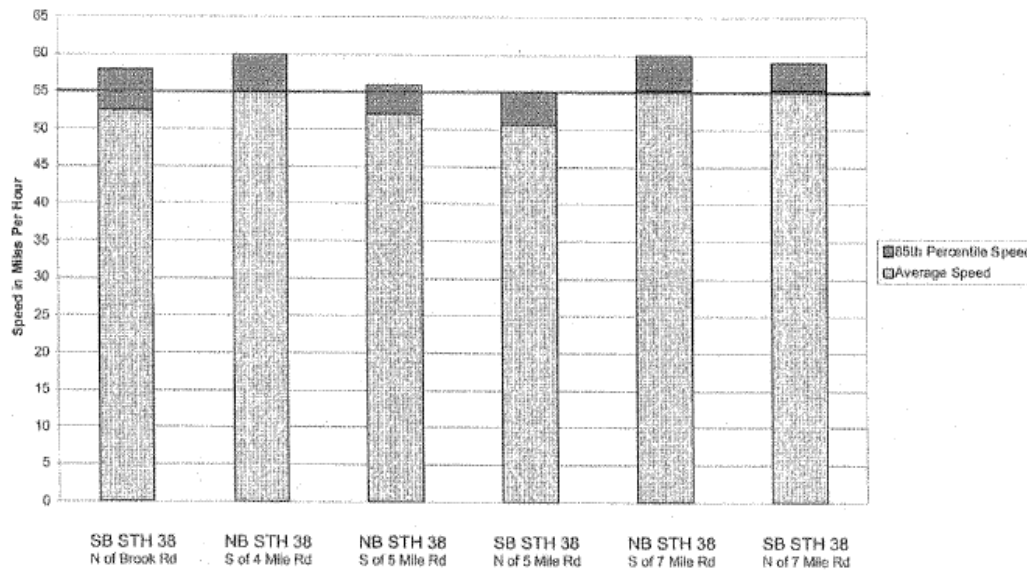
10 MPH Pace Speed : 41 Through 50
 Percent In Pace Speed : 66.9
 Percent Under Pace Speed : 12.3
 Percent Over Pace Speed : 20.8

| SPEED | COUNT | PERCENT | CUM.% | SPEED | COUNT | PERCENT | CUM.% |
|-------|-------|---------|-------|-------|-------|---------|-------|
| 34 | 1 | 0.8 | 0.8 | 47 | 8 | 6.2 | 59.2 |
| 35 | 0 | 0.0 | 0.8 | 48 | 4 | 3.1 | 62.3 |
| 36 | 3 | 2.3 | 3.1 | 49 | 10 | 7.7 | 70.0 |
| 37 | 1 | 0.8 | 3.8 | 50 | 12 | 9.2 | 79.2 |
| 38 | 3 | 2.3 | 6.2 | 51 | 9 | 6.9 | 86.2 |
| 39 | 4 | 3.1 | 9.2 | 52 | 7 | 5.4 | 91.5 |
| 40 | 4 | 3.1 | 12.3 | 53 | 4 | 3.1 | 94.6 |
| 41 | 11 | 8.5 | 20.8 | 54 | 1 | 0.8 | 95.4 |
| 42 | 7 | 5.4 | 26.2 | 55 | 2 | 1.5 | 96.9 |
| 43 | 12 | 9.2 | 35.4 | 56 | 2 | 1.5 | 98.5 |
| 44 | 7 | 5.4 | 40.8 | 57 | 0 | 0.0 | 98.5 |
| 45 | 12 | 9.2 | 50.0 | 58 | 0 | 0.0 | 98.5 |
| 46 | 4 | 3.1 | 53.1 | 59 | 2 | 1.5 | 100.0 |



GRAPHICAL SPEED ZONE SUMMARY

STH 38 In Racine - from CTH "K" to Milwaukee County Line



Posted Speed Limit - 55 MPH

July 2004

13-5-5 School Zones

April 2008

BACKGROUND

Wisconsin Statutes require that School Advance warning signs (S1-1) be installed and maintained on every highway where a school grounds is contiguous to the highway. There is no requirement that a school speed limit be posted except where it differs from the 15 mph provision in s.346-57 (4)(a) and (b). These two provisions place the requirement on the motorist to reduce speed to 15 mph when children are present, even in the absence of speed limit signs.

MOTORIST OBSERVANCE

It is commonly known that motorists in Wisconsin, as well as in many, if not most other states, do not respond consistently or dependably to school speed limit signs, unless there is active enforcement. Where enforcement is exercised, it is often sporadic or symbolic, such as on the opening day of school. It takes intensive, continuous enforcement to cause a reduction of speed toward 15 mph or thereabouts. As a result, this effort is rarely undertaken. In regard to public safety, it would be better to address the issue as to what actual hazards exist and make efforts to correct them.

THE NEED FOR SIGNS

There are of course many variations on the physical arrangements at school locations on the State Trunk Highway System. The following two very typical situations, however, are offered to illustrate guidelines for handling most of the rest:

1. In a built-up section of a city or village, where the arterial speed limit is low, probably 25 mph or 30 mph and sidewalk are present. Many or most of the children walk to school. Many are transported by personal auto, thereby causing some congestion, etc. The posting of the school speed limit is virtually inevitable and would be in agreement with general statewide practice. A motorist's unexpected or sudden reaction to the combination of the speed limit and/or presence of children or crossing guard would likely not cause an accident potential. Sudden stoppages and slow downs are common in developed areas. It would be desirable to study the location to see if an increase to 20 mph would be appropriate and acceptable; as per authority is s. 349.11(7). School speed limits can be posted (S4-51 sign). **If used, it should be posted at 10 MPH less than the speed limit of the highway.** Reason: If

speed limits more than a 10 MPH drop are used, the compliance will be marginal and differential speeds will occur.

2. On a rural section of highway, where the school is the only feature, and the speed limit is 55 mph or approaching it. Virtually, all students are transported. There *may* be a few nearby who walk or cycle. It is the Department's policy to refrain from posting school speed limits under these conditions and to resist requests to have them posted. Whereas motorists are skilled at anticipating slowing traffic where there are recognizable features, such as intersections or driveways, there would be a very serious situation generated if occasional motorists respond to extremely low posted speed limits in an unpredictable manner. Since children are unlikely to be present, speed limit signs would also be basically a purposeless use of signing. School speed limits can be posted (S4-51 sign). **If used, it *should* be posted at 10 MPH less than the speed limit.** If there are no children present, do not post a school speed limit sign; rather place an advisory speed plaque under the S1-1 advance sign or the school entrance warning sign school.

On the other hand, School Advance signs, which are required, *should* be useful in warning of motorists frequenting the school driveway.

The two examples given *may* represent the two extremes of situations. Other locations *may* have semi-urban characteristics and will have to be studied carefully to see what problems *may* exist.

Do not post signs unless asked by local unit of government. Evaluate appropriateness prior to posting. Appropriateness includes such items as:

- Are there children present near the roadway?
- Will there be proper and consistent enforcement?
- Are children bused to school rather than crossing the roadway or near the roadway?

ARTERIAL SPEED LIMIT

There has been occasional local sentiment to have an arterial speed limit lowered because of the existence of a school, often times on the outskirts of the municipality. If the school is isolated and detached, the request *should* be resisted. The school hours, particularly those where children are present at street side, are such a low percentage of the day that this *should* be unjustifiable. Enhanced warning signs or flashers on time clock would be better solutions.

CONFLICT OF SIGNS

Where school speed limits are posted, it is considered good practice to omit the full time arterial speed limit signs in the school zone, in order to prevent confusion or avoid giving motorists grounds for disobeying the school speed limit.

MUTCD

See Figure 7B-3 in the MUTCD for proper sign locations.

MUTCD Section 7B.11 provides standards, options and support for School Speed Limit assemblies.

SPEED LIMITS WITH FLASHERS

It *should* be emphasized the Wisconsin Statutes provide for school zone speed limits to be in effect "When Children Are Present". Therefore, it is improper for local municipalities to use the S4-4 "When Flashing" panel with the school speed limit sign that is supplemented with a flashing beacon.

FLASHING BEACON

A permit can be issued to the local jurisdiction to place a beacon above the S4-51 sign in accordance with [TEOpS 4-5-1](#) permit application.

PERMANENT MOUNTED SPEED BOARDS

See [TEOpS 2-1-7](#) regarding policy for speed boards.

BACKGROUND

Speed limit reduction for temporary traffic control zones is discussed in Part 6 of the MUTCD. Excerpts from Section [6C.01](#) of the MUTCD state:

“Reduced speed limits *should* be used only in the specific portion of the temporary traffic control zone where conditions or restrictive features are present.”

“A temporary traffic control plan *should* be designed so that vehicles can travel through the temporary traffic control zone with a speed limit reduction of no more than 10 mph.”

“Reduced speed zoning (lowering the regulatory speed limit) *should* be avoided as much as practical because drivers will reduce their speeds only if they clearly perceive a need to do so.”

“Research has demonstrated that large reductions in the speed limit increase speed variance and the potential for crashes. Smaller reductions in the speed limit of up to 10 mph cause smaller changes in speed variance and lessen the potential for increased crashes. A reduction in the regulatory speed limit of only up to 10 mph from the normal speed limit has been shown to be more effective.”

The MUTCD guidance corresponds with conclusions of research titled, “Work Zone Speed Limit Procedure,” documented in Transportation Research Record Volume 1657 and National Cooperative Highway Research Program Digest 192. Conclusions of the report include:

1. Motorists reduce their speed in temporary traffic control zones even with no speed limit reduction.
2. Where temporary traffic control zone speed limits are posted, motorists reduce their speed but not to the posted limit.
3. If a reduced speed limit is posted, compliance and crash prevention benefit are best if the speed limit is reduced no more than 10 mph.
4. There is commonly more variance in speed in temporary traffic control zones than in non-zones.
5. Where all work activity is on or beyond the shoulder, there are no benefits from reducing speed limits.
6. Interviews with motorists show that they resent arbitrary, inappropriate speed limits.
7. If a reduced speed limit is posted, the reduced limit must be removed where no activity is present.

To be consistent with the MUTCD and documented research, reductions in speed limits for temporary traffic control zones *should* be evaluated according to the criteria in this procedure.

There is often less need for reduced speed limits in temporary traffic control zones on rural conventional highways. The main reason is that on rural conventional highways, drivers do not have the same expectation for free-flowing traffic as they do on rural freeways. With driveway access and crossing movements on conventional highways, drivers tend to be alert to such movements and other similar conflicts even without reduced speed limits.

Changes in alignment such as crossovers and transitions, or work activities that occupy a short work area, *should not* be posted with short sections of regulatory speed limit signs. If a lower operating speed is necessary, warning signs with advisory speed plaques are more appropriate.

AUTHORITY

Authority to approve and establish temporary traffic control zone speed limits has been delegated to the Regional Work Zone Engineer. This conditional delegation effectively retained BTO Work Zone Operations Engineer approval authority for 65-mph and 70-mph highways.

POLICY CRITERIA

Engineering judgment must be used when determining appropriate speed zones. This procedure is intended to assist with the development of an appropriate work zone speed limit. Contact the region work zone engineer or the Bureau of Traffic Operations for assistance with applying this policy.

The majority of drivers operate their vehicles at a speed they deem appropriate for conditions. A posted speed that is close to what most drivers consider appropriate is more likely to yield uniform speeds. Consistent speeds improve safety for the travelling public and highway construction workers.

Speed zones provide drivers an indication of what is considered a reasonable speed for that section of roadway. Proximity to construction activities, drop offs, lane closures, narrow lanes/shoulders and pavement condition all influence the driver’s determination of a reasonable speed. The type of construction work, project length, area type (i.e. urban vs. rural), facility type, occurrence of night work and traffic mix (e.g. commuter, recreational, truck percentages) all impact driver expectations and the determination of what is a reasonable speed. The policy criteria described below *should* only be used for freeways and expressways during intermediate-term and long-term work activities as defined in Part 6 of the MUTCD.

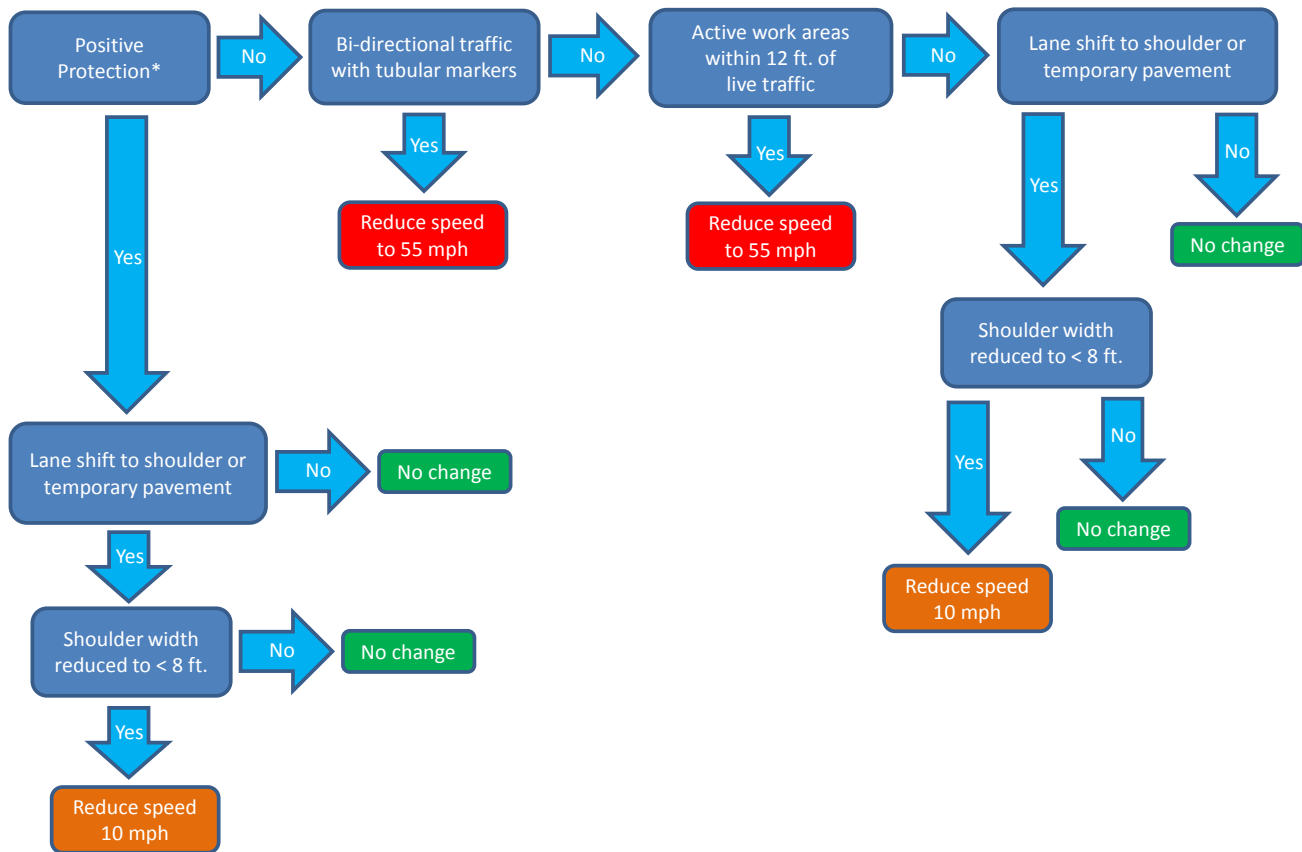
Speed reductions in segments without active work lead to disregard of the posted speed. When there is no work activity or traffic control devices are pulled back and lanes re-opened, the temporary speed limit *should* be removed. Work with your project manager to incorporate special provisions for removing temporary speed zones when there is no work activity.

Tables 1 and 2 and Figure 1 *should* be used, along with engineering judgment, to develop an appropriate work zone speed limit. The most restrictive work zone impact *should* be used as the determining condition.

Table 1. Temporary Traffic Control Zone Speed Limit Conditions




| Work Zone Condition | Original Posted Speed Limit (mph) | Speed Limit Reduction (mph) |
|--|-----------------------------------|-----------------------------|
| Lane width less than 12 ft. | 65 - 70 | Up to 10 |
| | ≤ 55 | 0 |
| Lane shift to shoulder or temporary pavement | 65 - 70 | Up to 10 |
| | ≤ 55 | 0 |
| Lane closure without positive protection | 65 - 70 | Up to 15 |
| | ≤ 55 | 0 |
| Shoulder width less than 8 ft. | 65 - 70 | Up to 10 |
| | ≤ 55 | 0 |

Figure 1. Temporary Traffic Control Zone Speed Limit Chart



*Positive protection is defined by FHWA as a temporary precast concrete barrier that contains or redirects vehicles and separates workers from the active travel lanes.

Table 2. Example Temporary Traffic Control Zone Scenarios

| | |
|---|--|
|  | <p>Bi-directional traffic separated by flexible tubular markers</p> |
|  | <p>Active work areas within 12-ft. of live traffic without positive protection</p> |
|  | <p>Lane shift to shoulder or temporary pavement</p> |
|  | <p>Lane closure without positive protection</p> |
|  | <p>Shoulder width less than 8 ft.</p> |

SPEED ZONE DECLARATIONS

Reduced speed limits in temporary traffic control zones are subject to documented approval by the State Traffic Engineer or their delegate’s approval identified as “Reviewer” on the Speed Zone Declaration. A Speed Zone Declaration **shall** be submitted through the Department’s Speed Zone Application (Figure 2) found at the following link:

<https://webapp.dot.state.wi.us/speedzones/>

Requests for access to the Speed Zone Application should be sent to the State Traffic Safety Engineer in the Bureau of Traffic Operations.

The temporary speed zone requestor **shall** include justification for the speed zone request, supporting documentation including, but not limited to, temporary traffic control plans, construction project ID associated with the speed zone and an explanation of any exceptions to the policy criteria described above.

Where speed limit reductions in temporary traffic control zones are determined to be appropriate, the declaration *should* be written to indicate its association with the appropriate project so that a follow-up declaration to rescind is not necessary. A suggested format is:

Interstate Highway 94

*(). Fifty-five miles per hour from a point one mile west of County Trunk Highway "X" in Jefferson County, to a point 0.5 miles east of the roadway structures of State Trunk Highway 26 for the duration of construction of Project 1234-56-78. This speed limit declaration **shall** be effective only when workers are unprotected, there is active work within 12-ft. of live traffic, and the speed limit is posted by regulatory signing.*

For long-term work zones that overlap construction years, the Region **shall** denote the time period of the speed limit reduction during the appropriate construction year(s). Example:

This declaration is valid from the commencement of the active construction operations to the final conclusion of active construction operations during calendar year (CY) 2016 within WisDOT construction project ID XXXX-XX-XX.

Figure 2

Adding Speed Zone Declaration

CORRESPONDENCE/MEMORANDUM

Declaration Type: Permanent Speed Zone Declaration Temporary Speed Zone Declaration

Region: SW-Southwest County:** Select County Municipality: Select CMTY

Declaration ID: SZ - - - 2015** - 35 (SZ - County Code - Highway No - Year - Two Digit Sequence No)

Submitter: SILVERSON, EMILY S Status: In Process Update User:

STUDY LOCATION

Rescind Speed Zone Declaration:

Highway/Street Name:*

Total Segment Length (mi):

School Zone:

Reason(s) for Speed Limit Change:

REQUEST FOR APPROVAL OF DECLARATION

BTO Approval Required:* Yes No

Permanent Declaration:

The following information supporting the recommendation is enclosed with this request:

Map showing limits Speed Study data

Crash history data Aerial/site location photo(s)

Documents of public interest Highway log files

Other (please specify):

Additional comments that may be significant or noteworthy:

Reasoning for omission of any information requested:

** fields required for saving the declaration;
* fields required for submitting the declaration.

13-5-7 Maintenance Work Zones**January 1993**

Wisconsin Statute [349.11\(10\)](#) provides that a county *may* establish a speed limit through a maintenance work zone on a state trunk highway less than the authorized speed limit. This, of course, includes all freeways and Interstate highways. The State Patrol will enforce the speed limit, but would need to be informed of its inauguration and the ordinance, resolution, or action enacting it.

The County Highway Committee *may* specify a speed limit for a specific work zone location, or specify a speed limit or limits for future locations on a blanket basis. These locations would be maintenance projects performed by county forces on state trunk highways, and not let contract construction projects.

Approval of a declaration by the department is required for any construction zone speed limit on the state trunk highway system.

13-5-8 Speed Limits on Approach to Controlled Intersections**April 2008****GENERAL**

Reference is made to [TEOpS 13-5-1](#). At times, questions surface regarding the need to reduce the regulatory speed limit on a STH in the vicinity of isolated intersections controlled by STOP conditions, traffic control signals, or roundabouts. In these situations, the section of highway within approximately one-half mile of the intersection is generally considered.

POLICY

By this policy, sections of the STH system in the immediate vicinity of a controlled intersection *should not* be considered for a speed zone reduction due strictly to the presence (or planned presence) of an intersection control condition. Intersection control conditions include: STOP conditions (two-way or all-way), traffic control signals, roundabouts, or access restrictions (controlled either by regulatory signs or channelizing islands).

Rather than promoting artificial restrictions in advance of a condition, proper design of the intersection control will be required to address the safety & operational needs of the subject location. Design features typically include:

- STOP Conditions – Proper placement of advance warning signs (per MUTCD),
- Traffic Control Signals – Intersection lighting (per [TEOpS 11-12-1](#)) and Dilemma zone detection on high-speed approaches (per [TSDM 8-1-6](#)),
- Roundabouts – Proper geometric design of splitter islands, roadway curvature (per [FDM 11-26-5](#)) and lighting (per [TEOpS 11-11-1](#)),
- Access Restrictions – Proper geometric design principles (per [FDM 7-35-1](#)).
- Yield Conditions – For roundabouts per [FDM 11-26-15](#)

SUPPORT

As indicated by [TEOpS 13-5-1](#) to be appropriate, speed limits need to be reasonable and enforceable. Just as speed-zoning criteria used on all other portions of the STH system are considered, any section of highway on approach to a controlled intersection *should* be treated in similar regard.

If requests for a reduced speed in advance of a controlled intersection stem from safety concerns, improvements *should* be considered that pertain to the installation/location itself (e.g. channelized turning movements, extended turn bays, modification to signal phasing or timing, rumble strips, advance warning signs, warning beacons, signing/markings enhancements, etc.).

Speed limit reductions in advance of the installation will likely not influence safety at the condition and *may* even promote poor engineering decisions in the future since certain functions, such as signal timing or sign placement, can be based on posted speeds.

Note: Existing locations that do not comply **shall** be allowed to remain until such time as the intersection is resurfaced or reconstructed.

13-5-10 Declarations Format**FORMAT OF DECLARATIONS**

The speed zone declarations are recorded as individual actions for each individual highway, and are numbered consecutively. Each speed zone declaration is prepared in paragraph form and will either establish a new speed zone or rescind an earlier numbered action and usually recreate it.

The region will number the declaration using the next chronological number in the speed zone declarations database.

Following are typical examples of speed zone declarations, depicting some of the more common situations encountered and portraying the general written format and style. Note: All distances *should* be in decimals of a mile, to the nearest 0.01-mile.

Example of an action to establish a new speed zone:

- State Trunk Highway 57, Town of Liberty Grove, Door County

Forty-five miles per hour from a point 0.16 of a mile south of its north intersection with County Trunk Highway "Q", northerly for a distance of 0.37 of a mile.

Example of an action taken to simply remove a speed zone:

- U.S. Highway 51, Town of Dunn, Dane County

Rescind Speed Zone Declaration No. 3119, approved by the Commission on February 11, 1976.

Example of an action taken to change a speed zone:

####- State Trunk Highway 31, Town of Caledonia and Mt. Pleasant, Racine County

Rescind Speed Zone Declaration No. 3905, approved by the Department on November 11, 1982, and substitute the following:

- a) Forty-five miles per hour from its intersection with State Trunk Highway 32, southerly to its intersection with County Trunk Highway "MM".
- b) Thirty-five miles per hour from its intersection with County Trunk Highway "MM", southerly to its intersection with State Trunk Highway 11.
- c) Forty-five miles per hour from its intersection with State Trunk Highway 11, southerly to its intersection with Lincolnshire Drive.

The preceding example is a typical speed zone declaration. It begins with a title line that included the Speed Zone Declaration number, followed by the identification of the highway, the local governmental unit(s) in whose jurisdiction the zone is located and the county/counties involved.

The title line is followed by a line describing the action to be taken as it relates to any previous action(s) by either the former Wisconsin Highway Commission (all actions before July 1, 1977), or the Department. This line is omitted if a new speed zone is being established.

This is followed by the declaration itself. All distances are referenced to readily recognizable landmarks (in this instance, CTH "MM"), which are itemized in the "STH Roadway Log". Landmarks that are not of sufficient importance to be recognized in the STH Roadway Log *should not* be used in describing a speed zone. Landmarks that change (construction limits, city limits, railroad names, etc.,) *should* also not be used.

If in the preceding example, STH 31 intersected STH 32, in both the Town of Caledonia and the Town of Mt. Pleasant, paragraph (a) would need to be revised to specify which intersection was involved as follows:

- (a) Forty-five miles per hour from its intersection with State Trunk Highway 32, in the town of Caledonia, southerly to its intersection with County Trunk Highway "MM".

As long as all local governmental units are specified in the title line, and there could be no misinterpretation of specific intersection(s) involved, there is no need to repeat the "city of _____", "village of _____", "town of _____", appellation in the Declaration itself.

Note that use of capitalization is in accord with general usage: State Trunk Highway 32, County Trunk Highway "MM" (and the letter designation is in quotes), Lincolnshire Drive, etc. In addition, had there only been one descriptive subparagraph, the (a), (b) and (c) identifiers would have been eliminated.

To ensure that there are no misunderstandings concerning the speed limit on those "rural" or unzoned segments of STH within a local unit's corporate limits, a subparagraph is included to define the limits of all 55 mph zones within limits of incorporation:

(b) The speed limit on all other portions of U.S. Highway 12 within the corporate limits of the village of Elk Mound **shall** be 55 miles per hour.

School speed zones other than 15 mph **shall** have individual declarations:

(c) Twenty-five miles per hour "When Children are Present", from a point 150 feet east of its intersection with Range Line Road, westerly to a point 350 feet west of said intersection, pursuant to Section 349.11(7), Wisconsin Statutes.

This example depicts the use of seasonal speed limits:

(d) Thirty-five miles per hour from its intersection from Sunset Drive, northerly to its intersection with Beach Road, except that from the Friday before Memorial Day through the Sunday after Labor Day each year, the speed limit **shall** be twenty-five miles per hour.

The Regions are responsible for keeping electronic records in the statewide speed zone declaration database. For more information, contact the Bureau of Traffic Operations Traffic Section.

13-5-11 County Ordinance

October 1992

The following is a suggested format for a county ordinance for speed limits on county highways. It pertains to those limits requiring approval by the department. It *may* be modified for use by other local governments.

SAMPLE ORDINANCE

Establishment of Speed Zones on County Trunk Highway,
Doe County, State of Wisconsin

The Board of Supervisors of the County of Doe do ordain as follows:

Section I. A traffic and engineering investigation having been made on the following described highways, the maximum permissible speed at which vehicles *may* be operated on said highways, which speed is herewith established as reasonable and safe pursuant to Section 349.11, Wisconsin Statutes, **shall** be as set forth herein subject to approval by the Wisconsin Department of Transportation, and upon the erection of standard signs giving notice thereof:

No. 1. County Trunk Highway "A", Town of Doe, Doe County.

Forty-five miles per hour from its intersection with County Trunk Highway "B", northerly to its intersection with State Trunk Highway 201.

No. 2. County Trunk Highway "B", Town of Blank, Doe County.

Thirty miles per hour from the north corporate limits of the Village of Blank, northerly for a distance of 0.35 of a mile.

I, John Doe, Clerk of Doe County, hereby certify that the above is a true and correct copy of an ordinance which was adopted on _____, by the Board of Supervisors of Doe County.

Dated this _____ day of _____, _____.

County Clerk

PURPOSE

To clarify the relationship between the posted speed and design speed and to clarify the roles between Traffic Section and Projects Group related to the design and posted speeds.

BACKGROUND

A 2006 article in the Transportation Research Record had this to say about reasonable speeds for multi lane highways.

REASONABLE SPEED LIMITS ON SUBURBAN MULTILANE HIGHWAYS WITH CURBS

By Jongdae Baek, Joseph E. Hummer, Billy M. Williams and Christopher M. Cunningham

When some two-lane roads with 55 mph speed limits are widened to four through lanes, curb and gutter are installed to address issues such as access control, difficult terrain and limited right-of-way. Posted speed limits along such highway segments are typically decreased to 45 mph in North Carolina because of guidance in the AASHTO Green Book and elsewhere that vertical curbs *should not* be placed next to high-speed lanes. Shoulders are required in accordance with FDM standards in Wisconsin.

Although much money is spent to improve such roadways, the results *may* be viewed negatively by the public, design professionals and law enforcement. Drivers *may* be unhappy about getting tickets or driving more slowly; designers are unhappy about being blamed by the public; and police are unhappy about the increased enforcement burden. To help resolve such a dilemma, in this research, the team collected relevant data such as speeds and collisions on four-lane road sections with curbs that have 45 or 55 mph speed limits and non-traversable medians or two-way left-turn lanes. The team found that the speed limit does not seem to make an important difference in collision rates or severities for the roads the team examined. The higher speed limit also made relatively small differences in the mean speeds and speed variances observed. Considering all results, the researchers recommended that the North Carolina Department of Transportation continue its current policy of allowing 55 mph speed limits on four-lane roads with curbs on a selective, case-by-case basis.

The research was published in 2006 in the *Transportation Research Record: Journal of the Transportation Research Board*, Issue Number: 1969.

GUIDANCE

When designing curb for a new roadway, the expected posted speed is used. The posted speed limit is not required to correspond to the design speed or to an individual design element within a project. **Consult with the Region traffic engineer to determine the appropriate posted speed that will be implemented following completion of an improvement project. (See [TEOpS 13-5-1](#) for guidance relating to posted speed limits).** In the case of a local roadway or connecting highway, also consult with the local municipality having jurisdiction over the roadway when determining the appropriate posted speed limit".

The 85th percentile is used as the primary bases of establishing posted speed limits and, by extension, design speeds. Geometric and cross-section elements are based on design speed. Exceptions to Design Standards *may* be necessary for some individual geometric or cross-section elements. Although the posted speed is not reduced because of these exceptions, some mitigation is usually desirable - for example:

Cross-sectional features *should not* dictate posted speed limits, rather:

- **Free flow ramps** - At system and service interchanges the design speed **shall not** dictate the speed limit. Rather, ramps are signed with advisory speed warning sign plaques (W13-1) mounted under a horizontal alignment sign and ramp speed warning sign, because raising and lowering the speed limit for each ramp results in differential speeds.
- **Curves and turns with a speed rating less than design speed on a section of highway** - are not signed with a change in speed limit; rather, they are signed with horizontal alignment signs and an advisory speed plaque with the safe operating speed of the curve or turn. For example: A 55 MPH rural section of highway often has turns and curves where it is necessary for the driver to lower their speed in order to safely negotiate the curve or turn. The speed limit is not changed for each one of these turns or curves.
- **At transition sections from 4 to 2 lanes** - the speed limit is not reduced because of the transition area merely because of the divided highway to undivided highway change.

- **Individual design features** - do not determine speed limit; such as the presence of curb, wider or narrower shoulders, or other design features. Rather, it is determined based on the 85th percentile speed as the primary indicator.
- **Curb offsets** also are not a determining factor in establishing speed limits.
- **Sloped curb** without offset *should not* dictate speed limit

The 85th percentile is used as the primary basis of establishing speed limits. Motorist's behavior will account for road characteristics such as shoulder condition, grade, development and sight distance.

Where local roads are converted to State Highways or built on relocation; such as bypasses, the speed limit *should* be based on the new geometrics of the roadway and the function of the highway as either an expressway or conventional highway. The function of the highway includes adjacent land use, spacing of access points and proximity to the roadway. The speed limit *may not* necessarily be retained that existed prior to the conversion to a State Highway. Evaluate the proper speed limit based on the characteristics of the highway and how it will function.

POLICY

- Posted speeds *may* be higher than the design speed for a section of highway.
 1. Individual design features such as isolated horizontal and vertical curves and shoulder width narrowing *should not* dictate posted speed; rather, overall design features *should* determine the appropriate posted speed.
 2. Drivers perceive the overall design features to determine a safe operating speed.
- The Projects Development Group engineers need to obtain approval from the Regional Traffic Unit at the scoping meeting to establish the proper speed limit for the improvement plan.
- Additionally, the Regional Traffic Unit will need to create a speed limit declaration for any speed zone that is an exception to state statute. Traffic Section *should* issue the speed zone declaration at the PS&E.
- The traffic engineer **shall** establish the speed limit of a roadway in consultation with projects group.

The DSR **shall** be routed through the Regional Traffic Unit for establishing the posted speed, where posted speed is suggested to be changed.

Conversion of a 2-lane roadway to a 4-lane roadway **shall not** automatically constitute changing the speed limit from 55 MPH to 45 MPH.



Traffic Engineering, Operations & Safety Manual

Chapter 13 Traffic Regulations

Section 10 Detour Permit

13-10-1 Authority and Policy

July 2012

PURPOSE

This policy covers the process that a municipality **shall** follow when requesting permission to close a state highway and provide a temporary detour route. The municipality may need to close a state highway for maintenance work or the moving of large objects or machinery. **Closing and detouring a state highway route for special events is covered under TEOps 2-10-1.**

AUTHORITY

Section 84.07(4) establishes the conditions under which a city or village *may* detour State Trunk Highway traffic:

"Except in the case of emergency, no city, village or town **shall** obstruct any street over which any State Trunk Highway is marked, unless it first makes arrangements with the Department for marking a detour."

This provides the statutory basis for the issuance of detour permits. The arrangements with the Department must be documented in a detour permit.

APPROVAL

The Region Traffic Engineer or designee has the authority to make decisions with regard to requests for permits to temporarily close or obstruct a street carrying the marked route of a state highway, or to detour the marked route of a state highway. Those decisions are subject to the conditions established in this policy. Permits may be issued only to a municipality upon formal request from its governing body and **shall not** be issued to individuals or non-governmental organizations. All closures and restrictions on Corridors 2030 roadways require approval by the Regional Traffic Engineer (RTE) via the Lane Closure Planning System.

GENERAL PROVISIONS

Applications for permits and the approval thereof **shall** be made in writing on the standard form provided for the purpose (DT1479, copy appended), with such attachments as are necessary, such as a map. When a permit application is denied, the denial *should* be in writing with a letter of explanation to the applicant.

Circumstances that *may* result in a decision to grant a permit include:

1. Construction, maintenance and repair of streets, structures and utilities.
2. The movement of large single objects such as buildings and machinery.

In all instances, the Region must be satisfied that traffic on the state highway route will not be unduly inconvenienced and that an adequate detour will be provided.

The municipality **shall** agree to accept the terms and conditions of the permit as specified by the Department. Refer to Figure 1 for the Permit Application by Municipality for Permission to Detour State Trunk Highway Traffic (DT1479 form).

The Region should consider the following requirements for the approval process of the roadway closure and detour permit. The Region *may* modify or impose additional reasonable requirements or restrictions to the permit as are necessary for the particular circumstances of that permit.

1. A plan for traffic control and detour, and documentation of the means to implement it, *should* be submitted to the WisDOT Region Traffic Engineer for review at least 90 calendar days in advance of the event.
2. A detour **shall** be required. Motorists **shall** be guided through the detour by signs and/or law enforcement personnel.
3. A detour permit application (Form DT1479) **shall** be completed.
4. All traffic control and detour signs **shall** be in conformance with the standards established in the MUTCD.

5. The municipality **shall** notify appropriate media, emergency services and affected schools five (5) days prior to the detour.
6. All road closures and detours **shall** be coordinated with the State Patrol and/or the local law enforcement agency. The coordination **shall** be documented by the municipality.
7. The WisDOT Region Traffic Engineer *should* notify the Region Communications Manager of the Special Event once the DT1479 form has been completed and signed.
8. The municipality **shall** be responsible for providing adequate traffic control for the duration of the closure and effective coordination with law enforcement.
9. The municipality **shall** be responsible for all costs associated with providing the traffic control, law enforcement, and coordination of other services to accomplish the closure consistent with the permit requirements.

Figure 1. Forum DT1479

| | | |
|---|--|--|
| APPLICATION BY MUNICIPALITY FOR PERMISSION TO DETOUR STATE TRUNK HIGHWAY TRAFFIC DT1479 6/2007 (Replaces ET604) s.84.07(4) Wis. Stats. | | Wisconsin Department of Transportation |
| TO: REGIONAL TRAFFIC SECTION | | |
| Municipality | County | |
| Area Code – Telephone Number | E-Mail Address | |
| Name of Street(s) to be Closed <input type="checkbox"/> STH <input type="checkbox"/> USH PROPOSED TEMPORARY ROUTE | Streets Closed Between (Street Name) FROM: TO: | |
| <input type="checkbox"/> MAP ATTACHED | Date and Duration of Detour Date: | Time: a.m. to a.m. |
| Reason | | |
| Name and Address to Whom Permit will be Returned | | |
| The above municipality requests permission to close the marked route as described, during which time the municipality will provide temporary route as designated. | | |
| The municipality agrees to accept the following terms and conditions: | | |
| <ol style="list-style-type: none"> 1. The municipality shall provide a detour having structural, geometric and traffic control characteristics, which are acceptable to the Region. A detour map which provides street names shall be submitted. 2. The municipality shall furnish, erect and remove signs and markers at the sole expense of the municipality, unless provided for in (3), or unless directed by officers for short routes and short timeframe (less than 3 days). 3. A Detour and Traffic Control Plan shall be submitted to the Region for approval. An example is Standard Detail Drawing 15C2-4C. 4. The municipality shall agree to minimize, as much as practicable, the duration of closure, including providing for assembly and dispersal of parades in areas removed from the state highway route. 5. The municipality shall accept full responsibility for any damage to local roads and streets resulting from closure and detour. 6. The requester shall arrange for adequate traffic control from either WisDOT or the appropriate county, and provide documentation of enforcement coordination. 7. The requester shall notify all media, emergency services and schools, five (5) days prior to the detour. 8. Additional conditions: . Attachments: <input type="checkbox"/> Yes <input type="checkbox"/> No | | |
| _____ (Authorized Official Signature) | _____ (Title) | _____ (Date) |
| Permission is granted to temporarily close the designated segment of state trunk highway and to provide a detour, subject to the stated conditions. | | |
| _____ (Permit Number) | _____ (Approved By) | _____ (Date) |

13-10-2 Use of Highway Right-of-Way for Special Events**December 2008****PURPOSE**

The Department receives frequent requests to use the highway right-of-way for various activities. These activities are typically short-term, readily definable activities that fall in two categories:

- roadway or roadside modifications, repairs, or maintenance operations by a local unit of government, or permitted railroad or utility work,
- and certain types of special events, such as parades, marathons, bicycle races, charity walks/runs, filming, etc.

Roadway or roadside operations, including utility work, are regulated under Chapters 90 and 96 of the Maintenance Manual and DOT Permit Form DT1812. The purpose of this policy is to establish criteria on the use of the highway right-of-way for the special events that can be conducted with the road open to traffic under certain restrictions.

Road closures and detours for special events shall be governed by the guidance in [TEOpS 13-10-1](#) and DOT Permit Form DT1479. Signing for Special Events off of the State Highway system shall be governed by the guidance in [TEOpS 2-15-25](#).

The basis for allowing the use of the highway for these special events is Wisconsin State Statute 349.185, which allows governments in charge of maintaining the highway the authority to regulate community events or celebrations, processions or assemblages on the highways. The word “assemblage” is interpreted to mean that the Department *may* consider activities such as street fairs, bike racing and marathons as legitimate reasons for traffic restrictions, up to and including closing the street and arranging for a detour if the municipality so chooses.

In general, use of the state highway right-of-way for special events will not be allowed unless a legitimate public interest (supported by the Local Government) is served and the activity does not cause safety or capacity problems. Requests for closing and detouring the highway **shall** come from the municipal government. Special event requests that only require temporary traffic restrictions *may* come from the municipality, individuals, private enterprises or a neighborhood community. Authorization for usage of the highway right-of-way for special events *may* be granted by the WisDOT Region office in the form of a permit, provided all pertinent criteria covered in these guidelines are satisfied. All closures and restrictions on Corridors 2030 roadways require approval by the Regional Traffic Engineer (RTE) via the Lane Closure Planning System.

DEFINITIONS

Freeways are defined as divided arterial highway facilities that have fully controlled access at interchanges only. Interstate Highways are freeways with the interstate route designation.

Expressways are defined as divided arterial highway facilities with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional Highways are defined as streets or roads other than freeways, expressways, or low-volume roads. They may be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

GENERAL POLICY CRITERIA

1. Special events on the highway right-of-way **shall not** be allowed on freeways, expressways or any roadway with a posted speed above 55 mph.
2. The permit **shall** identify that the special event sponsor agrees to assume the entire responsibility and liability for all damages or injury to all persons, whether employees or otherwise and to all property, arising out of, resulting from or in any manner connected with the operation of the special event. The sponsor **shall** provide proof of General Liability Insurance Coverage and **shall** agree to defend and indemnify WisDOT, its agents and employees from all such claims including, without limiting the generality of the foregoing, claims for which WisDOT may be paid or incurred to enforce the provisions of this paragraph, and the sponsor shall further agree and pay for such general liability coverage which protects the state as an additional named insured.
3. The requestor **shall** submit the permit application to the WisDOT Region Traffic Section at least 90 calendar days in advance of the event.

4. The sponsor **shall** be responsible for any damage done to the highway property as a result of the special event.
5. The special event minimum attendance is typically 100 participants. This attendance number does not include spectators.
6. A special event **shall not** occur more than once annually by the same sponsor in the same location. Special events **shall not** occur more than twice a year in the same location.
7. WisDOT is responsible for determining whether the event qualifies for special event signs, providing guidance on acceptable signs and placement, reviewing the permit application, and assuring compliance with the permit.
8. The Region Traffic Section will evaluate the safety of any nighttime special event requests.

DETAILED POLICY CRITERIA

1. Special Events **shall** not be allowed during peak traffic periods, as determined by the WisDOT Region Traffic Engineer.
2. The time duration of the Special Event should not exceed four hours or when the last event participant has cleared the roadway.
3. The use of the right-of-way **shall not** interfere with motorists' safe operation of their vehicles.
4. The use of the right-of-way shall not obstruct sight distance and shall not detract from motorists' view of traffic control devices.
5. A plan for traffic control and documentation of the means to implement it **shall** be submitted to the WisDOT Region Traffic Engineer for review and approval at least 90 calendar days in advance of the event.
6. All traffic control signs shall be in conformance with the MUTCD.
7. Advance notices to the media **shall** be coordinated by the Requestor.
8. All special events **shall** be coordinated with the State Patrol and/or the local law enforcement agency as appropriate, by the requestor. Documentation of this coordination is required.
9. Parking shall not be allowed on the state highway right-of-way, which includes the shoulders.
10. If the event will take place on highways maintained by other agencies, the Requestor **shall** coordinate the event and provide proof by letter to the WisDOT Region Traffic Engineer.
11. The usage of police powers for special events **shall not** substitute for appropriate signing.

SIGNING LIMITATIONS

1. No commercial advertising is allowed on the signs. The inclusion of a brand name within the name of an event, such as "Brand X Racing Event" is permissible. The sign message *may* include the word "Event" or "Parking". Event names on signs should be as clear and concise as possible. Pictographs **shall not** be allowed on the signs, per interpretation of the MUTCD and guidance from FHWA.
2. The signing layout detail and installation locations **shall** be approved by the Regional Traffic Section and Bureau of Traffic Operations.
3. Guidance signs with red, orange, yellow, or fluorescent yellow-green background **shall** not be used. Temporary work zone warning signs **shall** be fluorescent orange. Sign base material **shall** consist of plywood or sheet aluminum. If banners are used, they must meet the requirements of the policy on banners ([TEOpS 13-12-1](#)). Posts **shall** be of an approved type for highway signs per WISDOT standards. Signs **shall** be manufactured by a fabricator who has been in the traffic signing business for a minimum of three years.
4. Letter size, font, and spacing **shall** meet MUTCD guidelines. Minimum of 6" upper case letters and 4 ½" lower case letters **shall** be used.
5. If the event takes place at night, the signs **shall** be high intensity, retroreflective.
6. Changeable message signs *may* be used, subject to WisDOT policy requirements for use of changeable message signs. The Regional Traffic Section **shall** approve the message content, letter height, and sign location by completing the PCMS Usage Request Form for special events in [TEOpS 17-2-1](#). Larger letter

heights are needed on changeable message signs for readability. Refer to the [TEOpS 17-2-1](#) for additional provisions regarding PCMS usage.

7. Pre-event signing *may* be required up to 10 days in advance of the special event. The signing layout and installation details for pre-event signing **shall** be approved by the Regional Traffic Section and the Bureau of Traffic Operations.

IMPLEMENTATION/COST

1. The event organization or requesting group **shall** pay for all costs associated with the special event signing including costs to obtain the permit, which *may* include WisDOT review costs, any costs to acquire, install, and remove the special event signs, including changeable message signs, and any additional costs incurred by the Department. The event organizer will be responsible for obtaining signs that conform to Department standards and arranging to have those signs placed, operated, and removed consistent with the terms of the permit. All work on the highway right of way must be performed by a contractor or local government agency approved by WisDOT.
2. Installation by county forces *may* be an option in some situations. When that occurs, all costs are charged back to the requesting organization.

**APPLICATION BY MUNICIPALITY FOR PERMISSION
TO DETOUR STATE TRUNK HIGHWAY TRAFFIC**
DT1479 7/2011 (Replaces ET604) s.84.07(4) Wis. Stats.

Wisconsin Department of Transportation

TO: REGIONAL TRAFFIC SECTION

| | | | |
|--|--------------------------------------|--|--|
| Municipality | | County | |
| (Area Code) Telephone Number | | Email Address | |
| Name of Street(s) to be Closed <input type="checkbox"/> STH <input type="checkbox"/> USH | | Streets Closed Between (Street Name) FROM: TO: | |
| Proposed Temporary Route | | | |
| <input type="checkbox"/> MAP ATTACHED | Date and Duration of Detour Date: | Time: a.m. to a.m. | |
| Reason | | | |
| Name and Address to Whom Permit will be Returned | | | |

The above municipality requests permission to close the marked route as described, during which time the municipality will provide temporary route as designated.

The municipality agrees to accept the following terms and conditions:

1. The municipality shall provide a detour having structural, geometric and traffic control characteristics, which are acceptable to the Region. A detour map which provides street names shall be submitted.
2. The municipality shall furnish, erect and remove signs and markers at the sole expense of the municipality, unless provided for in (3), or unless directed by officers for short routes and short timeframe (less than 3 days).
3. A Detour and Traffic Control Plan shall be submitted to the Region for approval. An example is Standard Detail Drawing 15C2-4C.
4. The municipality shall agree to minimize, as much as practicable, the duration of closure, including providing for assembly and dispersal of parades in areas removed from the state highway route.
5. The municipality shall accept full responsibility for any damage to local roads and streets resulting from closure and detour.
6. The requester shall arrange for adequate traffic control from either WisDOT, traffic control contractor, or the appropriate county, and provide documentation of enforcement coordination.
7. The requester shall notify all media, emergency services and schools, five (5) days prior to the detour.
8. Additional conditions: . Attachments: Yes No

(Authorized Official Signature)_____
(Title)_____
(Date)

Permission is granted to temporarily close the designated segment of state trunk highway and to provide a detour, subject to the stated conditions.

(Permit Number)_____
(Approved By)_____
(Date)



Traffic Engineering, Operations & Safety Manual

Chapter 13 Traffic Regulations

Section 11 Survey Permits

13-11-1 Policy

May 1990

(The following was contained in a memorandum of April 4, 1974, instituting the issuance of permits for surveying and related activities.)

From time to time private land surveyors, utility company surveyors, and others doing similar work are on highway right-of-ways for the purpose of making land surveys, locating landmarks or monuments, surveying for utility lines, etc. The work may take place wholly on or above the highway surface as is the case in measuring distances and courses or establishing elevations, or it may include excavation, for example to locate monuments. For the safety of both highway traffic and persons making these surveys, it appears desirable to re-emphasize the requirements for such operations.

It is recognized that such private survey work on or along a highway is accomplished in a short time and does not involve any significant interference with traffic or hazard to either traffic or the survey crew. In such cases, the survey personnel have the same status as any pedestrian upon the highway, although unlike persons engaged in highway construction or maintenance they are not exempt from the provisions of the Rules of the Road. Such survey personnel *should* be strongly encouraged to wear high-visibility clothing. Whether or not they *should* place advance warning signing will depend somewhat upon whether the work is near or across the roadway, or if it is done well away from traffic.

A permit is required whenever the survey activity will necessitate actual closure of a portion of the roadway for more than a very brief period such as when an isolated measurement is made across the road. The attached permit format *should* be used. The Region *should* add special conditions necessitated by the specific situation. When the highway is heavily traveled it may be desirable to require that a uniformed police officer be provided to direct traffic.

Permits for surveys and other similar operations not requiring an excavation on highway right-of-ways will normally be issued by the Regional Traffic Section and a copy **shall** be sent to the Central Office Traffic Section.

Whenever it is necessary to cut into the roadway surface, to use mechanized equipment or to make any substantial excavation elsewhere in the highway right-of-way to locate a monument or for any reason, a permit is required from the Maintenance Section.

E.T-613-74

State of Wisconsin / Department of Transportation

**APPLICATION FOR PERMIT TO CONDUCT
PRIVATE LAND SURVEY ON STATE HIGHWAY RIGHT OF WAY**

To the District Engineer - Wisconsin Dept. of Transportation - Division of Highways

Address

City _____ State _____ Zip Code _____

The undersigned hereby requests permission to temporarily close a portion of the roadway of the state trunk highway indicated below for the purpose of making a land survey which cannot be safely and expeditiously conducted without such closure. The undersigned applicant certifies that he has read and will comply with the conditions of this application including any conditions which may be imposed by the Division of Highways prior to issuance of a permit.

| | | |
|---|-----------------|----------------------|
| Date of Application | APPLICANT | By |
| Address | Date of Closure | Hours |
| Highway to be closed USH _____ STH _____ | County | Location Description |
| Description of closure (lane, width, etc.) | | |

CONDITIONS FOR A PERMIT

1. The permittee shall minimize as much as practicable the duration of work on the highway right of way.
2. Adequate standard warning signs (SURVEY CREW AHEAD; FLAGMAN AHEAD; ONE LANE ROAD; RIGHT or LEFT LANE CLOSED AHEAD; etc. as appropriate) shall be used at and in advance of the work. Traffic cones or barricades shall be provided and used as needed or as required by the district engineer.
3. Survey crew members, including flagmen, shall wear high visibility vests.
4. Flagmen, when required by this permit (see below), shall use either a red flag at least 18" x 18" in size in good condition on a 3' staff or alternatively a sign paddle with the words STOP, SLOW or GO as appropriate.
5. This permit does not authorize disturbance of highway surfacing or excavation elsewhere in the highway right of way.
6. Survey crew vehicles shall be parked in a safe location where they will not interfere with visibility or operations for traffic on the highway.
7. In applying for and accepting this permit, the permittee agrees to hold the Division of Highways and its employees harmless from any claim which may arise as a result of operations under the permit.
8. No trees, brush or shrubs shall be cut in the course of work under this permit.
9. Additional conditions:

PERMIT

Permission is hereby granted to the above applicant and his employees to temporarily close the indicated part of the state trunk highway roadway for the requested period of time as set forth in the application, subject to the conditions stated above.

PERMIT NO. _____ DATE ISSUED _____ EXPIRATION DATE _____ APPROVED BY _____



Traffic Engineering, Operations & Safety Manual

Chapter 13 Traffic Regulations

Section 12 Permits for Temporary Banners and Civic Displays

13-12-1 Policy

January 2014

GENERAL

Communities *may* request permits to install banners and/or civic displays to promote special events or to display civic pride. These banners/displays can provide a very effective and efficient means to convey a message to the motorist, and when used correctly can provide a positive effect for the flow of traffic, and ultimately traffic safety.

The MUTCD, Section [1A.01](#) and Wisconsin State Statute 86.19 clearly state that advertising messages **shall not** appear on traffic control devices. Even though banners and civic displays are not considered traffic control devices and are not used to control traffic, they can compete with essential traffic control signs. Therefore, careful consideration must be taken to provide signs and messages which do not conflict with these rules or have a negative impact on traffic safety.

Regional Transportation directors, or their designees, *may* approve or deny applications for permission to install temporary banners or civic displays. Applicants *may* be municipalities, or private entities who must receive endorsement from the respective municipality. Approval **shall** be by means of the standard form. Denial *should* be by letter, giving reasons for rejection.

DEFINITIONS

Banners are defined as flexible, horizontal signs that are either overhead or ground mounted displays that *may* promote public activities such as parades, celebrations, speeches, concerts, plays, musicals, contests, athletic events and charitable events. Banners are considered short-term and are removed once the event has completed.

Civic Displays are considered a permanent decorative feature installed by the community to promote civic pride and are not associated with a special event. Examples of civic displays include:

- Decorations on light poles, including wrapping
- Community achievements
- Holiday decorations
- Civic mottos or emblems
- Seasonal messages
- Extra enforcement locations, such as EZ Wrap

Freeways are defined as divided highways with fully controlled access at interchanges only. Interstate Highways are freeways with the interstate route designation.

Expressways are defined as divided highways with partially controlled access by a combination of interchanges, at-grade intersections, and driveways.

Conventional Highways are defined as streets or roads other than freeways or expressways. They *may* be divided or undivided, two-lane or multi-lane, and access is available at intersections and driveways.

POLICY

1. Banners and civic displays **shall not** display commercial advertising or advertise specific commercial products, services or businesses. The inclusion of a brand name within the name of an event, such as "Brand X Bike Race" is permissible.
2. Lettering on banners **shall** be a minimum of 4" in height and overhead banners **shall** have a minimum clearance of 17 feet (bottom of banner to top of roadway).
3. All banners **shall** be made out of a flexible material, and have no horizontal stiffeners, except banners supported on overpasses. Civic displays *may* be made out of a rigid material.
4. Banners and civic displays **shall not** be permitted on freeways or expressways.
5. Banners and civic displays **shall** be removed or replaced when legibility is impaired due to wear or fading.
6. Any new posts installed for banners or civic displays **shall** be NCHRP 350 crash compliant.

7. Maximum length of time for banners promoting community events is 30 days and 90 days for community promotion. Civic displays *may* be installed indefinitely, provided they remain in good shape.
8. Banners and civic displays **shall not** be installed on existing traffic control devices or supports.
9. The applicant **shall** accept full responsibility for any damage claims from any permitted banner or civic display.
10. Banners located in the highway right-of-way *should* be located as close to the right-of-way line as possible.



TEMPORARY BANNER / CIVIC DISPLAY INSTALLATION APPLICATION / PERMIT

Wisconsin Department of Transportation
 DT1876 1/2014 (Replaces ET717) s.86.19(2) Wis. Stats.

Submit application in duplicate to the Division of Transportation System Development Regional Office, Wisconsin Department of Transportation (WisDOT). A single application may be made for each associated pair of temporary banners or group of civic displays.

| | |
|--|------------------------------|
| Applicant – <i>If applicant is not a municipality, indicate endorsement below by responsible municipal official.</i> | |
| Contact Person Name | (Area Code) Telephone Number |
| Mailing Address, City, State and ZIP Code | Email Address |
| Wording on Banner | |
| Location(s) Highway Number | At |
| | And At |
| Date To Be Erected | Date To Be Removed |

The undersigned applicant requests permission to install temporary banner(s) and/or civic displays at the above location(s). It is understood and agreed that the applicant shall comply with the general and specific conditions stated below and/or attached. The undersigned certifies that he/she is authorized to sign this application on behalf of the named applicant.

| | |
|--|---|
| <p>X _____ (Applicant or Authorized Representative Signature) (Date – m/d/yyyy)</p> | <p>X _____ (Municipal Endorsement Signature)</p> |
| Representative Title | Municipal Title |

CONDITIONS

1. A banner is defined as a flexible, horizontal sign extending with its rope or cable supports across an entire roadway.
2. The lettering on banners shall be at least 4 inches in height and the minimum clearance to ground on overhead banners shall be 17 feet.
3. The banner shall not be made of rigid material, and shall have no horizontal stiffeners, except that it may be supported on an overpass. Civic displays may be made of ridged material.
4. Banners and civic displays shall not be permitted over Interstate highways, freeways or expressways.
5. Banners and civic displays shall be removed or replaced when legibility is impaired due to wear or fading.
6. Permitted maximum length of time for banner displays is 30 days for events, and 90 days for community promotion.
7. No banner or civic displays shall be installed using state-owned supports.
8. If new supports are installed to support an overhead banner or any civic display, the applicant shall review the proposed installation with the Regional Traffic Engineer.
9. The applicant shall accept full responsibility for any damage claims resulting from any permitted banner or civic displays.
10. Owners of banners or civic displays which do not conform to the stated conditions are subject to penalty as provided in s.86.19(3) Wis. Stats.
11. Notwithstanding the preceding, no banner or civic display shall display commercial advertising or advertise specific commercial products, services or businesses. The inclusion of a brand name within the name of an event, such as "Brand X Bike Race" is permissible on banners.
12. The applicant shall provide certification, by a Professional Engineer, that any banners or civic displays installed on lighting supports shall meet wind loading requirements.
13. Other conditions: No Yes On Reverse Attached

PERMIT Approved for the Wisconsin Department of Transportation

| |
|---------------|
| Permit Number |
|---------------|

X

(WisDOT Representative Signature) (Date – m/d/yyyy)

| |
|----------------------|
| Print Name and Title |
|----------------------|



Traffic Engineering, Operations & Safety Manual

Chapter 13 Traffic Regulations

Section 13 Snowmobiles Crossing Freeways

13-13-1 Authority and Policy

January 1993

POLICY

Regional Transportation Directors *may* approve or disapprove crossings for snowmobiles over or under freeways which are on the State Trunk Highway system. The crossings *may* be via State Trunk Highways, other public highways, and non-highway crossings.

CROSS-REFERENCE

Operation of snowmobiles on or in the vicinity of highways, s. 350.02, Wis. Stats., (1) freeways, and (2) highways.

REQUEST AND APPLICATIONS

Requests for approval for snowmobiles to cross freeways *should* be made in writing, and approvals or disapprovals will be transmitted in writing. Requests will be accepted only from governmental authorities who are responsible for the designation and maintenance of snowmobile trails within their jurisdiction. A copy of each request, together with the approval or denial **shall** be sent to the State Traffic Engineer for Highways and to the State Maintenance Engineer for Highways.

GENERAL PROVISIONS

An official snowmobile trail or an approved snowmobile route (defined in s. 350.01, Wis. Stats.) must be designated on both sides of the freeway at the point of the proposed crossing.

The Regional Transportation Director **shall** be satisfied that snowmobiles *may* cross the freeway ramps with reasonable safety if using the proposed crossing, assuming that the snowmobile operator uses ordinary safety precautions and obeys the law relating to snowmobile operation.

AT CROSSROADS WITH INTERCHANGES

Snowmobiles *may* cross freeways at crossroads with interchanges, whether the crossroad is over or under the freeway provided that the ramp crossings are visible to the motorist did not obscured by snow piles, curvature or other features, and provided that, if the crossroad is under the freeway' the crossing can be made without violating ss. 350.02(2)(b)1, 2 and 4, Wis. Stats. (In some cases, the design of the bridge *may* prevent this).

OTHER CROSSINGS

Snowmobiles *may* cross freeways at bridges other than at crossroads providing that it *may* be done without violating the access control and there is adequate horizontal and vertical clearance.

CONDITIONS OF APPROVAL TO BE ACCEPTED BY MUNICIPALITY

1. The county or municipality **shall** sign the trail with approved snowmobile signs in compliance with the standards of the DNR.
2. The Regional Transportation Director *may* impose such additional reasonable requirements as a prerequisite to approval as are necessitated by the particular circumstances of the request.

13-13-2 Model Ordinance

April 1996

POLICY

Wisconsin Act 61 of 1995 provided for the operation of snowmobiles on roadways of streets and highways in municipalities for trips from residences or lodges to the nearest trail out of town. This includes permission to travel on state and county highways. The law requires that the municipality pass an ordinance to this effect. The ordinance *may* specify all roadways, all roadways with certain omissions, or specific roadways and segments.

The ordinance and guidelines were prepared by the DNR and the Snowmobile Council. They were reviewed by the State Traffic Engineer. The municipalities who are interested in this are likely to obtain these documents

from the other agencies, but a copy is included herein for the Regions' information and for making copies if asked.

SNOWMOBILE ACCESS
MODEL ORDINANCE

**AN ORDINANCE TO ALLOW SNOWMOBILE ACCESS FROM A RESIDENCE OR RESIDENCE AND
LODGING ESTABLISHMENT TO A SNOWMOBILE ROUTE OR TRAIL,
IN THE (TOWN/CITY/VILLAGE) OF _____,
COUNTY, WISCONSIN AND PRESCRIBING PENALTIES FOR VIOLATION THEREOF.**

The (Town/City/Village) Board of the (Town/City/Village) of _____,
_____ County, Wisconsin do ordain as follows:

Section I. Intent

1a. The intent of this ordinance is to provide a means for persons to travel from a residence within the limits of (Town/City/Village) _____, _____ County, Wisconsin for the shorten distance that is necessary for a person to operate a snowmobile to the snowmobile route or trail that is closed to that residence.

OR

1b. The intent of this ordinance is to provide a means for persons to travel from a residence and lodging establishment within die limits of (Town/City/Village) _____, _____ County, Wisconsin for the shortest distance that is necessary for a person to operate a snowmobile to the snowmobile route or trail that is closest to that residence and lodging establishment

Section II. Statutory Authority

This ordinance is adopted as authorized under s.350. 18 (3) (a).

Section III. Designated Roadways and/or Highways

No person **shall** operate a snowmobile on a roadway or shoulder of a highway not designated as a snowmobile route other than the following:

- (a) all roadways or shoulders or,
- (b) the following listed roadways or shoulders

Section IV. Conditions

This ordinance designates the roadways and/or shoulders of specific highways for snowmobile travel by persons residing in or staying at a lodging establishment within the limits of (Town/City/Village) _____, _____ County, Wisconsin to travel for the shortest distance that is necessary to reach the snowmobile trail or route that is closest to that residence or lodging establishment subject to the following conditions:

Section V. Speed

A snowmobile operated on a portion of the roadway or shoulder of a highway pursuant to this ordinance **shall** observe roadway speed limits.

Section VI. Enforcement

This ordinance **shall** be enforced by any law enforcement officer of the (Town/City/Village) of _____, _____ County, Wisconsin.

Section VII. Penalties

Wisconsin state snowmobile penalties as found in s. 350.11(1)(a), Wis. Stats., are adopted by reference.

Section VIII. Severability

The provisions of this ordinance **shall** be deemed severable and it is expressly declared that the (Town/City/Village) Board would have Wised the other provisions of this ordinance irrespective of whether or not one or more provisions *may* be declared invalid. If any provision of this ordinance or the application to any person or circumstances is held invalid, the remainder of the ordinance and the application of such provisions to other persons or circumstances **shall** not be affected.

Section VIII. Effective Date

This ordinance will become effective upon passage and publication.

Passed this _____ day of _____, _____ (year).

(Town/City/Village) Chairman

GUIDELINES FOR WRITING LOCAL SNOWMOBILE ACCESS ORDINANCES

This guideline and attached model ordinance is provided to assist you in developing your local ordinance. You *may* be more restrictive, you do not have to include lodging establishments and additional snowmobile regulations such as snowmobile routes can be included. Please feel free to utilize all or portions of this model.

State law allows Towns, Cities and Villages to enact local regulations allowing snowmobilers to travel between a residence or a lodging to travel along roadways and/or shoulders of highways to the closest snowmobile route or trail. The authority to enact local snowmobile residential access regulations is found in Chapter 350.18(1)(a) of the Wisconsin Statutes.

Section I. Intent

State the specific name of the (Town/City/Village) covered by the ordinance. The law gives you the option to allow residential access and lodging access (only if residential access is also allowed) within your jurisdiction to operate their snowmobiles on a roadway or shoulder of a highway. Specify which activities you are allowing.

Section II. Statutory Authority

Your authorizing statute is s.350.18 (3)(a).

Section III. Designating Roadways and/or Highways

You have authority to open all the roadways and shoulders of highways within your jurisdiction for residential/lodging establishment access. This includes state and county trunk highways within your jurisdiction. Even though this authority exists, you also have the right to omit these major roadways from your ordinance. You are encouraged to open up only those roadways that will suit the needs of the snowmobilers in your community. Once determined, list the specific roadways to be open to snowmobilers.

The authorizing law gives you two options on where snowmobiles *may* be operated. One is the roadway which is the traveled portion of a highway or on the shoulder. Specify in this section where you are authorizing snowmobile operation.

Section IV. Conditions

Except for speed limits, the authorizing law does not grant additional authority to regulate snowmobile operation. (Municipal snowmobile ordinances are subject to the limitations of s.350.18, Wis. Stats.) However, you have the right to establish conditions on the right to use the roadways. The following is a list of conditions for your consideration:

1. Snowmobiles **shall** be operated on the extreme right side of the roadway and travel with the flow of traffic.
2. Snowmobiles are to be operated in single file.
3. Headlights *should* be on at all times.
4. Snowmobile operators **shall** yield the right-of-way to other vehicular traffic and pedestrians.

Snowmobiles violating any of the above conditions would be subject to the underlying violation of operating on the roadway.

Section V. Speed

Section 350.18 Wis. Stats., allows municipalities to adopt certain ordinances in strict conformity with state law. This language mirrors that found in founding s. 350.02(2)(a) 6, Wis. Stats.

Section VI. Enforcement

The law enforcement officer/s within your jurisdiction *should* be listed as the enforcement authority. State Conservation Wardens do not have authority to enforce local ordinances.

Section VII. Penalties

The appropriate penalty section to be adopted would be s.350.1 1(1)(a), Wis. Stats.

Consideration *should* be given to include in your ordinance a seasonal effective date to eliminate problems that might occur because of early/late snowfalls. This would also eliminate any prospects of snowmobile use during non-winter seasons.

Snowmobile activity is constantly growing and local regulation can be responsive to the public need. Through regulation, a safe, enjoyable snowmobiling environment can be provided while at the same time controlling undesirable conflict. Understanding is needed by everyone involved in the process.

Once, your ordinance is adopted, you are required to submit a copy to the Department of Natural Resources, Attn. Snowmobile Section, P.O. Box 7921, Madison, Wisconsin 53707 and to the office of the law enforcement agency of the municipality and county having jurisdiction over such street or highway.



Traffic Engineering, Operations & Safety Manual

Chapter 13 Traffic Regulations

Section 25 Turn Prohibitions

13-25-1 No Turn on Red

May 1990

Guidelines for prohibiting turning movements on red indication at specific intersections are as follows:

A. Turning on red *should* be prohibited where:

1. Sight distance of vehicles approaching is less than the following minimums:

| <u>Cross Street Speed Limit (MPH)</u> | <u>Minimum Sight Distance (Feet)</u> |
|---------------------------------------|--------------------------------------|
| 20 | 120 |
| 25 | 150 |
| 30 | 190 |
| 35 | 220 |
| 40 | 270 |
| 45 | 320 |
| 50 | 360 |

2. The intersection has more than four approaches or has unusual geometrics which cause unexpected conflicts. The restriction *should* apply to only those approaches affected.

3. The intersection is within 200 feet of a railroad grade crossing, and the sequence is pre-empted during train crossings. The restriction *should* apply to the right turn toward the crossing.

B. Turning on red *may* be prohibited where:

1. Large volumes of pedestrians exist such as on downtown streets.

2. There has been more than one accident directly resulting from turning on red signal per year.

3. There are two lanes turning right, or two opposing lanes turning left.

C. Turns on red *may* be prohibited at school crossings, but allowed at other times. Refer to [2B-37](#) of MUTCD.

D. All restrictions must be authorized by an approved declaration before posting.



BACKGROUND

Passing on the right at intersections can present enforcement problems if the marking and signing are not clear as to whether a motorist can pass on the right where there is a standing left turner at an intersection. The intersection *may* have a paved shoulder, a paved right turn lane or a gravel shoulder.

The State Statutes "Rules of Road" indicate the following:

ss 346.08 When overtaking and passing on the right permitted. The operator of a vehicle *may* overtake and pass another vehicle upon the right only under conditions permitting such the movement in safety and only if the operator can do so while remaining on either the roadway or a paved shoulder, and then only under the following conditions:

1. When the vehicle overtaken is making or about to make a left turn or U-turn; or
2. Upon a street or highway with unobstructed pavement of sufficient width to enable 2 or more lines of vehicles lawfully to proceed, at the same time, in the direction in which the passing vehicle is proceeding; or
3. Upon a one-way street or divided highway with unobstructed pavement of sufficient width to enable 2 or more lines of vehicles lawfully to proceed in the same direction at the same time.

This language can be misunderstood. Therefore, it is important to provide the proper signing and pavement marking for intersection lane control. Refer to [TEOpS 2-2-20](#) for additional lane control signage.

POLICY

1. Provide pavement marking in accordance with Figure 1 if the intersection is to operate with a bypass option lane where the right lane functions as a right turn lane or bypass lane. If the intersection is to operate with a bypass option lane where the right lane functions as a bypass lane, provide pavement marking in accordance with Standard Detail Drawing 15C8-10b (Intersections).
2. Provide signing and pavement marking in accordance with Figure 2 if the intersection is to operate with an exclusive right turn lane.
3. Provide signing as optional in accordance with Figure 3 or Figure 4 if you desire to restrict drivers from making the maneuver to bypass a standing left turner. Typically this sign is used only if you have a history of crash issues. The sign is intended for use at intersections.

Note: Figure 1 is used except in unusual cases, Figure 2 is used for higher crash locations. Evaluate the number of right turns versus left turns to determine the proper marking and signing for right turn only lane versus allowing the right hand lane as a bypass lane.

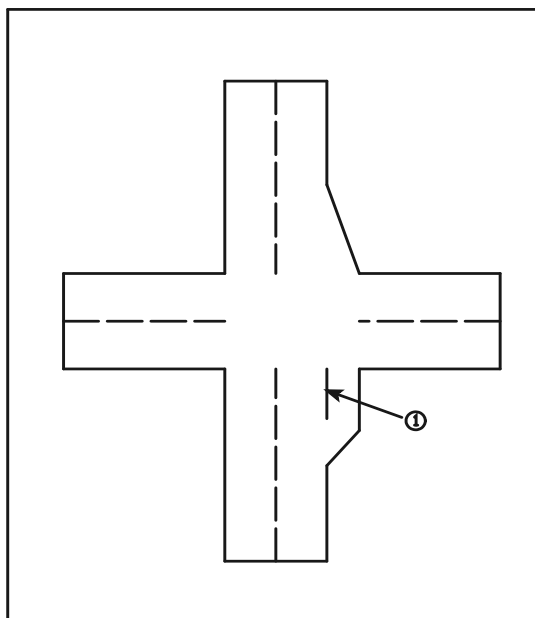


FIG. 1 PAVED BYPASS/RIGHT TURN LANE

① 8" CHANNELIZING PAVEMENT MARKING

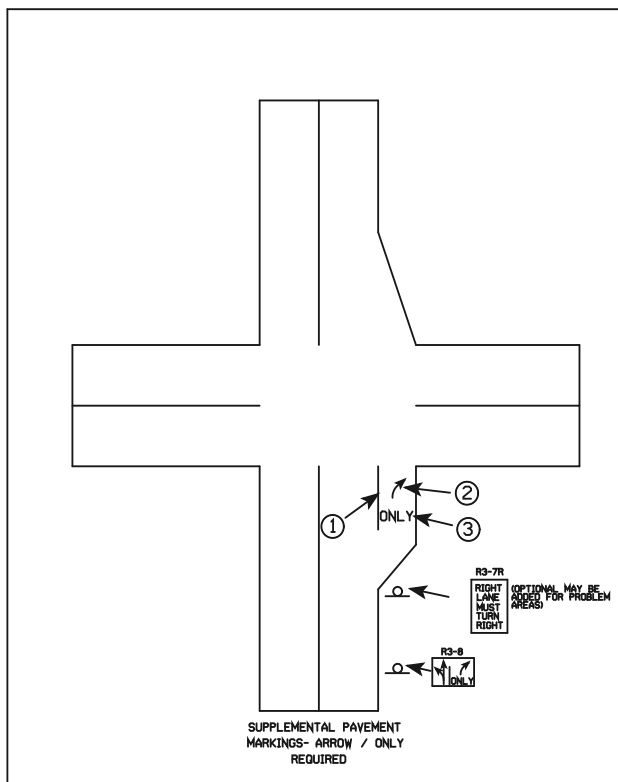


FIG. 2 EXCLUSIVE PAVED RIGHT TURN LANE

- ① 8" CHANNELIZING PAVEMENT MARKING
- ② TYPE 2 ARROW PAVEMENT MARKING
- ③ WORD PAVEMENT MARKING

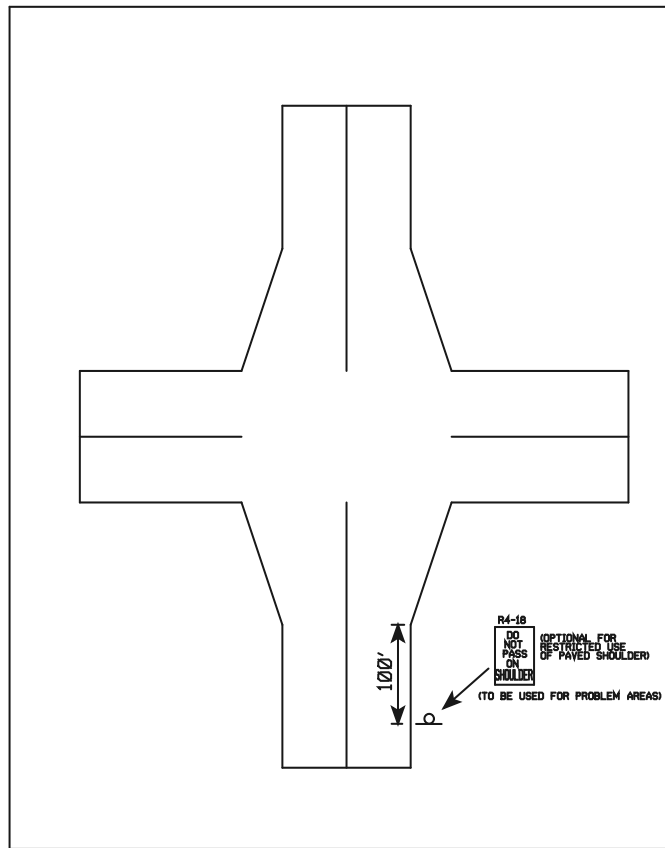


FIG. 3 PAVED RIGHT TURN LANE

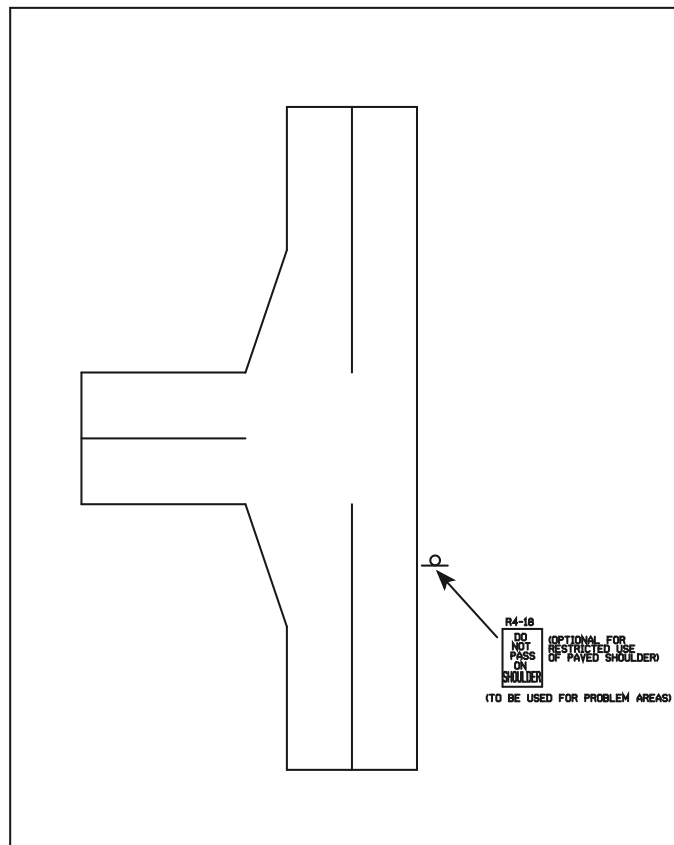


FIG. 4 T-INTERSECTION

13-26-5 All-Way Stop**PURPOSE**

This policy describes WisDOT's philosophy regarding the use of all-way stop control (AWSC) as a permanent method of traffic control at State Trunk Highway (STH) intersections that are under WisDOT jurisdiction or State Trunk Highway intersections under local jurisdiction as a Connecting STH. (WisDOT maintains statutory approval authority for any stop controls implemented on Connecting STHs).

GUIDANCE

Refer to MUTCD [2B.07](#), Multiway Stop Applications, for further detail.

WisDOT has maintained a philosophy that emphasizes minimal use All Way Stop Control (AWSC) as a permanent traffic control method. This philosophy is based on the concept of maintaining mobility by allowing traffic to "free-flow" as much as possible. Also, all STHs in Wisconsin are statutorily designated as "through" highways, and typically *should not* be stopped without strong justification. AWSC *should* be considered only after other less restrictive options have been evaluated and determined not to be feasible.

EVALUATION CRITERIA

MUTCD [2B.07](#) describes several criteria that *should* be considered in an engineering study for a multi-way stop sign installation. These guidance criteria include the need for interim traffic control, crash history, and traffic volume. MUTCD [2B.07](#) also describes additional criteria that *may* be considered in an engineering study. These optional criteria include the need to control left turn conflicts, pedestrian conflicts, sight restriction, and the intersection of two residential neighborhood collector streets.

An AWSC Warrant Criteria worksheet *may* be found at the following link:

<http://wisconsin.gov/dtsdManuals/traffic-ops/manuals-and-standards/teops/awsc-warrant.xlsx>

All the criteria in MUTCD [2B.07](#), both guidance and optional, **shall** be considered when evaluating whether AWSC is an appropriate method control for intersections on the STH system. In addition, the following supplemental criteria **shall** also be considered:

1. Functional Highway Classification - There are five levels of functional highway classes used by WisDOT: principal arterial, minor arterial, major collector, minor collector, and local roads. For desirable AWSC, the intersecting roadways *should* have the same or similar functional class on at least three approaches. Similar functional class would be only one level of difference between intersecting highways. For example, a minor arterial and major collector would be considered similar functional class, but a principal arterial and major collector would not be considered similar.
2. Average Daily Traffic (ADT) - For AWSC, it is highly desirable for the intersecting roadways to have closely balanced ADTs on at least 3 approaches. Closely balanced ADTs would be considered as the volume of at least one of the minor roadway approaches (stop controlled on a 2-way stop) being not less than 70% of the higher volume of the two approaches on the major roadway (through STH).
3. Crash History - AWSC *should* be considered if it is expected to correct a significant number of intersection crashes that have occurred in the last 5 years (that are susceptible to correction by a multi-way stop installation), and/or expected to significantly reduce the overall severity of future crashes from what previously occurred. AWSC, while typically reducing severe right angle crashes, *may* increase less severe rear-end crashes.
4. Alternatives - Improvement alternatives that are less restrictive than AWSC **shall** be considered and evaluated. See section D below.
5. Mobility Impact - Evaluate the ramifications of stopping the existing "through" STH, including the average vehicle delay and queue length. Perform an AWSC capacity analysis and compare it to the existing two-way stop control capacity analysis. Will the high-volume of existing "through" STH traffic experience significant delays for the benefit of reducing delays for a low-volume side street?
6. Right turn inclusion - Similar to signal warrant evaluation, the inclusion of right turns from the minor approach(es) in the AWSC warrant analysis *should* be evaluated. See the WisDOT Traffic Signal Design Manual (TSDM) [2-3-2](#).

ALTERNATIVES TO AWSC

Similar to MUTCD Section [4B.04](#), Alternatives to Traffic Control Signals, consideration **shall** be given to providing less restrictive alternatives to AWSC even if one or more of the warranting factors in the MUTCD is satisfied.

These alternatives *may* include, but are not limited to, the following:

1. Adding a dedicated right turn lane (with optional “pork-chop” channelizing island) on the stop-controlled minor roadway approach(es) to separate the minor roadway right turns from minor roadway left turn / through movements and reduce the delay for a high-volume right turn.
2. Remove or relocate vision corner obstructions such as utilities, vegetation, parking, or other sight restrictions that are impeding the side street traffic from finding reasonable gaps in the “through” highway. Utilize local government setback ordinances as enforcement when these impediments are located outside the highway right-of-way.
3. Restrict, relocate, or consolidate driveway access that *may* be interfering with intersection operation.
4. Installing a roundabout intersection.
5. Relocating the stop line on the minor approach to improve the sight distance.
6. Installing warning signs and / or supplemental flashing beacons advance of the intersection. (See [TEOpS 4-5-1](#) Beacons Policy).
7. Improve pedestrian crossing ability by providing a mid-crossing refuge island or decreasing the crossing distance by using curb bumpouts.
8. Improve sight distance for the minor roadway to see vehicles approaching on the through roadway by modifying a vertical crest in the through profile or modification of the horizontal curve.
9. Restricting turning movements if alternate access points are nearby.



Traffic Engineering, Operations & Safety Manual

Chapter 16 Traffic Analysis and Modeling

Section 1 Traffic Modeling Process

16-1-1 Overview

January 2018

1.1 Originator

The Traffic Analysis and Safety Unit (TASU) within the Bureau of Traffic Operations (BTO) is the originator of this chapter. Submit all questions and comments concerning this chapter to the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox.

1.2 General

This chapter addresses the methodologies and tools for conducting traffic operations analyses for the evaluation and design of WisDOT facilities. Traffic operations analyses provide an assessment of how traffic demands for all modes of travel and the capacity of the facility affect the overall performance of the transportation system. The results of traffic operations analyses assist WisDOT in determining the best way to meet the department's goal of providing a safe, reliable and efficient multimodal transportation system.

There are multiple tools and methodologies for completing traffic operations analysis, each having their own set of capabilities and limitations. Selecting the appropriate analysis procedure and tool is not always intuitive and can prove challenging. The primary goal of this chapter is to address this challenge by providing guidance on the uniform and consistent application of the various traffic operations analysis tools, methodologies and procedures. The policy within this chapter does not cover the travel demand models (TDMs) used to generate traffic forecasts. Refer to the [Transportation Planning Manual \(TPM\), Chapter 9](#) for additional details regarding traffic forecasting protocols.

1.3 Content

[Attachment 1.1](#) provides an illustration (flow chart) outlining the process for the development and review of traffic models used to conduct traffic operations analyses. For cost-effective traffic analyses, project managers *should* refer to [Attachment 1.1](#) as they develop the project schedules, budgets and management plans.

This chapter defines WisDOT's policy pertaining to traffic analysis tools and methodologies. Use the policy within this chapter in conjunction with WisDOT's Facilities Development Manual (FDM), specifically [FDM 11-5-3.7](#). In the event the two documents provide conflicting information, contact BTO-TASU via the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox to confirm the controlling methodology.

1.4 Acronyms/Terminology

The key terms and acronyms used within this chapter include:

AADT – Average Annual Daily Traffic

BPED – Bureau of Planning and Economic Development

BSHP – Bureau of State Highway Programs

BTO – Bureau of Traffic Operations

CDR – Concept Definition Report

Department – Wisconsin Department of Transportation

DOT – Department of Transportation

DHV – Design Hour Volume

DTIM – Division of Transportation Investment Management

DTSD – Division of Transportation System Development

FDM – Facilities Development Manual

FHWA – Federal Highway Administration

GoF – Goodness of Fit

HCM – Highway Capacity Manual

HCM6 – Highway Capacity Manual, 6th Edition: A Guide for Multimodal Mobility Analysis

LOS – Level of Service

Microsimulation – Microscopic traffic simulation. Tools using this methodology analyze the movement of individual vehicles as they travel through a simulated network on a second-by-second or sub-second basis.

MOEs – Measures of Effectiveness

O-D Matrix – Origin-Destination Matrix

PDAS – Program Development and Analysis Section (part of BSHP)

PMP – Project Management Plan

RFP – Request for Proposal

RTOR – Right-Turn on Red

TASU – Traffic Analysis and Safety Unit (part of BTO)

TAT III – Traffic Analysis Tool Box Volume III, published by FHWA

TAT IV - Traffic Analysis Tool Box Volume IV, published by FHWA

TDM – Travel demand models used to generate traffic forecasts

TEOpS – Traffic Engineering, Operations and Safety Manual

TFS – Traffic Forecasting Section (part of BPED)

TOPS Lab – University of Wisconsin, Madison Traffic Operations and Safety Laboratory

Traffic Models – the computer models used to carry out traffic operations analysis. These include both the HCM-based traffic analyses and microsimulation analyses. This does not include TDMs.

TSDM – Traffic Signal Design Manual

V-SPOC – WisTransPortal Volume, Speed and Occupancy Application Suite

WisDOT – Wisconsin Department of Transportation

LIST OF ATTACHMENTS

[Attachment 1.1](#) Traffic Model Development & Review Process

16-1-2 Basic Principles

January 2018

2.1 Establish Project Purpose and Needs and Goals

The traffic analysis requirements for a project are highly dependent on the project goals. If the project goal is to provide a preliminary or planning level assessment of the traffic operations, then a higher-level analysis may suffice. If the goal of the project is to define project-specific design requirements, then a detailed analysis is often necessary.

Every project is unique, with its own set of assumptions and applicable methodologies. A clear understanding of the purpose, needs and goals of the project is critical in determining the necessary level of traffic analysis. When developing the project schedule and budget, consider the traffic analysis and modeling needs, including the associated peer review requirements. Ideally, the traffic analysis and modeling needs *should* dictate the schedule as opposed to having the project schedule dictate the level of traffic analysis conducted for the project. This ensures the appropriate level of traffic analysis is conducted at the most appropriate stage of the project life cycle, reducing the need for any rework. Defining the project schedule without consideration of the traffic analysis needs may compromise the integrity of the traffic models, which in turn may affect the selection of the project alternative.

The process defined within this chapter will be used to clarify the intent and intended outcome of the project and the associated traffic analysis needs while preparing the concept definition report (CDR), project management plan (PMP), request for proposal (RFP) and other project scoping documents. The key internal stakeholders, including the project team, regional traffic engineers and other pertinent staff, *should* hold a project kick-off meeting to reach internal agreement on key project goals and to define the traffic analysis needs early in the

process.

2.2 Defining the Traffic Analysis Scope/Level of Effort

To provide clear guidance for the project and to ensure that the project goals and objectives are satisfied, the project team *should* address the following questions during the initial project kick-off meeting:

- What agencies/divisions/bureaus need to be involved in the project as it pertains to the traffic analysis (i.e., who are the intended stakeholders)? What will be their intended level of involvement (project resource, project review, traffic analysis, etc.)?
- In general, what is the purpose of the project, specifically as it pertains to the traffic analysis (i.e., what questions does the traffic analysis need to answer)?
- What type of process will the project address (planning, design, construction, etc.)?
- What type of study area will the project consider (corridor, intersection/interchange, highway segment, etc.)?
- What transportation components will the project address (travel modes, traffic control, facility type, etc.)?
- What types of outputs are important for the decision-making process? What are the intended deliverables? Is the purpose of the evaluation detailed technical assessment, visual animation or both?
- What transportation alternatives does the project need to consider? What evaluation criteria will the project apply?
- Are there any known/key issues about the study area? If so, how will the project address them?
- What are the schedule and budget constraints (including agency review needs) associated with this effort?
- What is the critical path for the project? Does the traffic analysis fall within the critical path? When will changes in the project scope/ purpose significantly affect the project schedule?

The facilitator of the kick-off meeting *should* use DT2290 to guide the discussion of the key aspects of the project, specifically as they pertain to the traffic analysis needs. Circulate the completed DT2290 form to the internal stakeholders immediately after the completion of the kick-off meeting and update the form as necessary as the project progresses. Although the DT2290 form *should* remain a fluid document, be cautious of unnecessary changes to the scope of the project and/or traffic model (i.e., watch out for scope creep).

2.3 Identify Need for Consultant Team

After defining the project goals, objectives and traffic analysis needs, the internal WisDOT project team *should* coordinate closely with the regional traffic operations staff to assess whether the region has the knowledge, time and resources available to conduct the anticipated level of traffic analysis required for the project. Oftentimes, the regional traffic operations staff can perform the simpler traffic analyses (such as the deterministic-HCM analyses) in-house while the more complex and/or demanding traffic analyses (such as the microscopic traffic simulation analyses) typically requires that the work be outsourced to one or more consultant firms.

If in need of consultant services, the internal WisDOT project team *should* follow the process outlined in [FDM 8-5](#) to select and procure the consultant team(s) to perform the necessary traffic analyses for the project. Historically, BTO has maintained master contracts for general traffic engineering services (BTO01) and traffic modeling and analysis services (BTO03). Coordinate with BTO regarding the potential use of either of these master contracts.

After procuring the consultant team(s), the internal WisDOT stakeholders *should* meet with the selected consultant firm(s) to define/clarify their roles, tasks and tentative schedule. WisDOT *should* procure the consultant team(s) and host the traffic analysis kick-off meeting early on during the project process to allow the consultant(s) to provide input on the traffic analysis methodologies, including the identification of the appropriate traffic analysis tool(s). Refer to [FDM 11-5-3.7](#) for details on defining the most appropriate traffic analysis tool(s).

2.4 Initiate Traffic Analyses

Follow the process illustrated in Attachment 1.1 to conduct the necessary traffic analyses. Refer to [FDM 11-5-3.7](#) for details on defining the most appropriate traffic analysis tool(s) and analysis methodologies, [TEOpS 16-20](#) for guidance on conducting microsimulation analyses and [TEOpS 16-25](#) for details pertaining to conducting peer

reviews. Details on other aspects of the traffic-model development process shown in [Attachment 1.1](#) are forthcoming.

Coordinate with WisDOT regional traffic staff and/or BTO-TASU as necessary to address any questions/concerns regarding the traffic analyses tool(s), methodologies and/or results.

Attachment 1.1 Traffic Model Development & Review Process

Last Updated: January 2018

List of Abbreviations

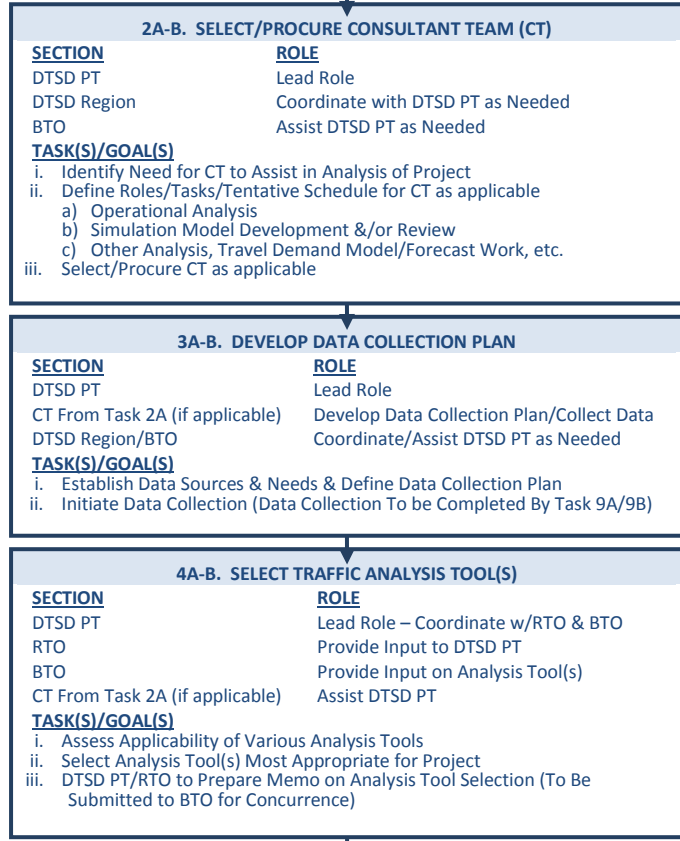
FHWA = Federal Highway Administration
 BTO = Bureau of Traffic Operations – Traffic Analysis & Safety Unit
 BSHP = Bureau of State Highway Programs (Program Development & Analysis)
 Forecasting = WisDOT Traffic Forecasting Section
 DTSD PT = DTSD Project Team
 RTO = Region Traffic Operations
 RTM = Region Traffic Modeler
 PRT = Peer Review Team
 CT = Consultant Team
 Indep. Consult. = Independent Consultant
 CDR = Concept Definition Report
 PMP = Project Management Plan
 Sim. = Microscopic Simulation

NOTE

The timeline for each task will vary from one project to another depending on the project scope, project limits, & number of alternatives being analyzed. The Project Manager should establish project specific timelines for each task during the project definition/scoping stage.

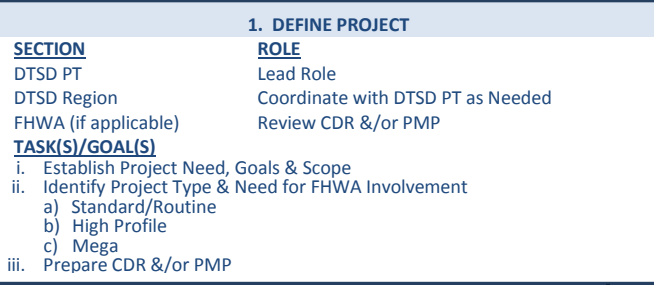
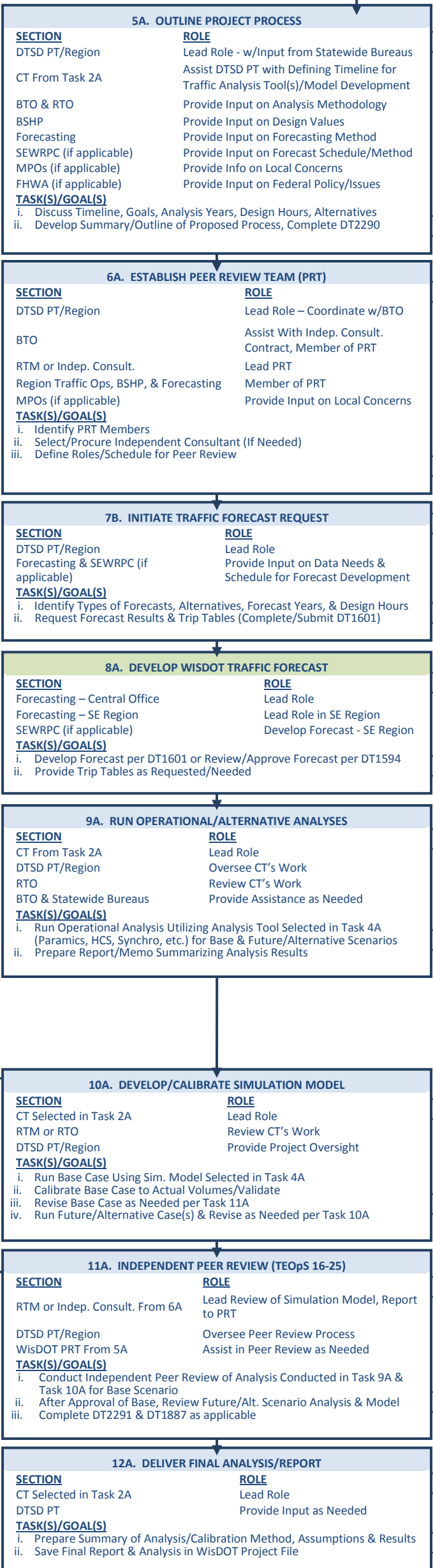
TRACKS A&B

Statewide Level Review
 (Requires Early Involvement of Statewide Bureaus)



Is a Microscopic Simulation Model Proposed for Use?

TRACK A

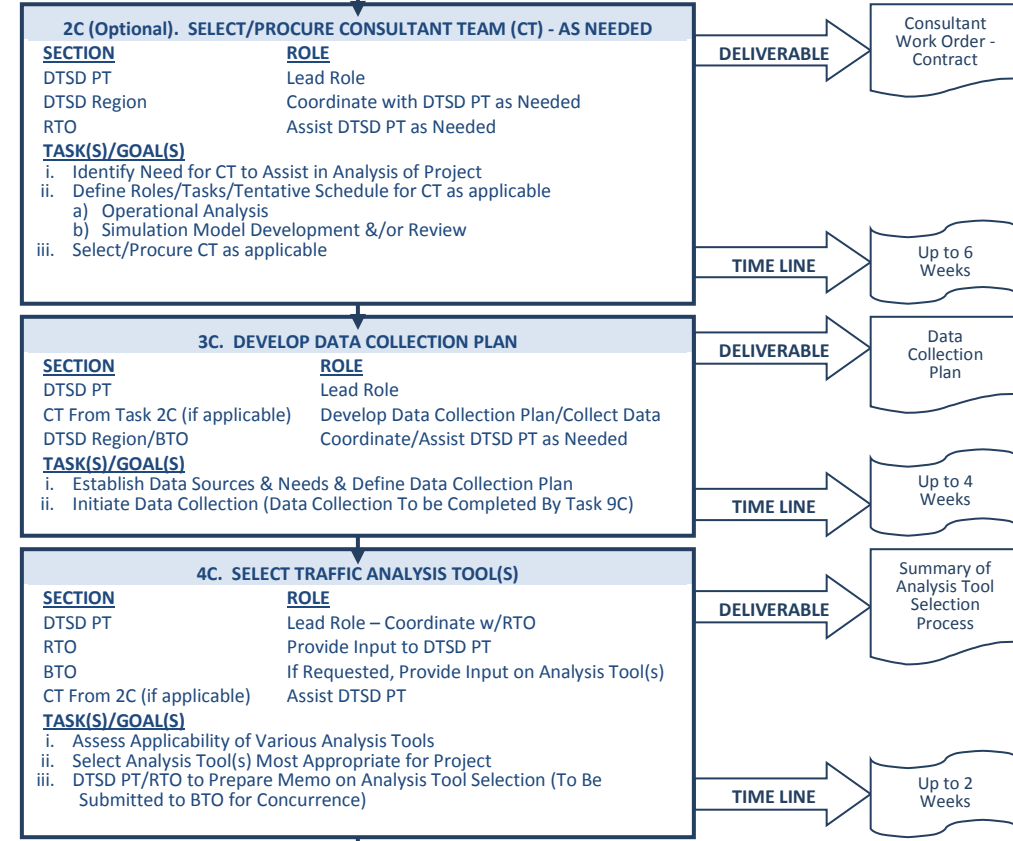


LEGEND

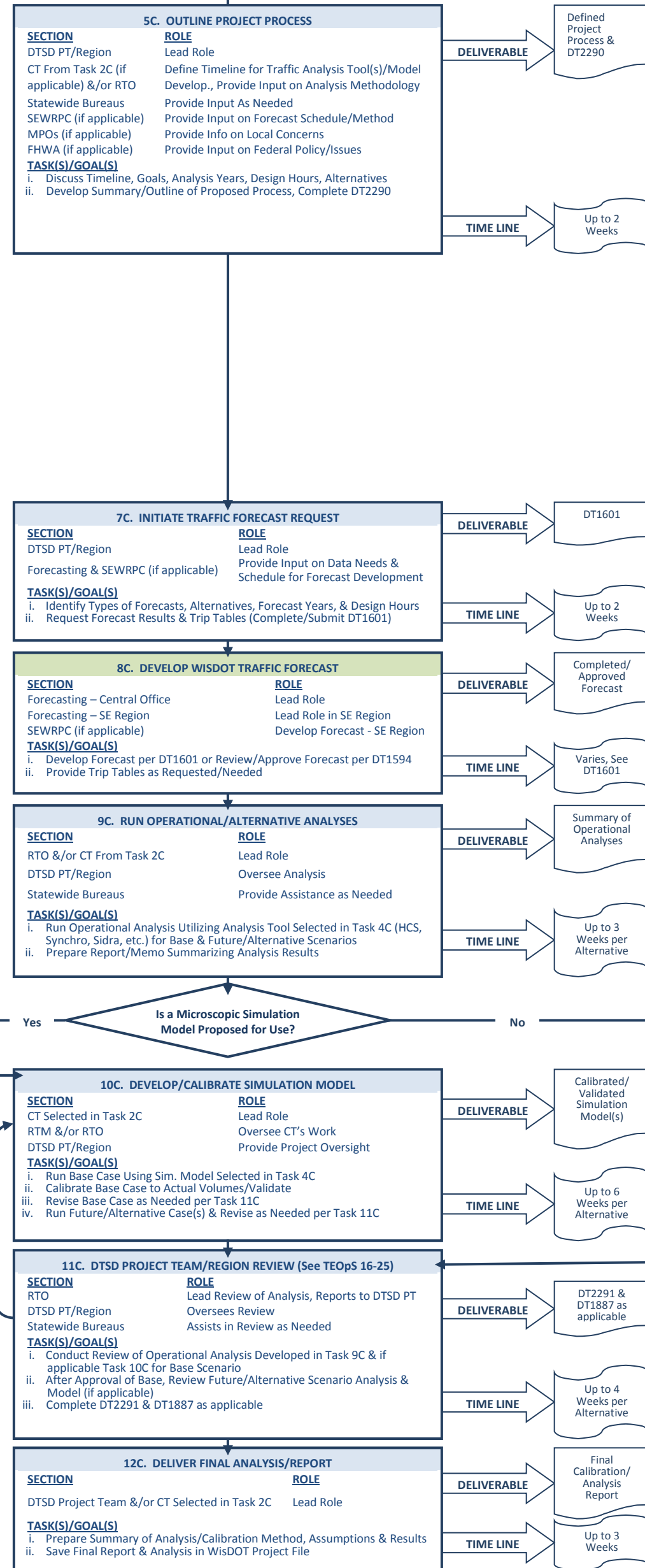
- DTSD Project Team &/or DTSD Region Leads Task
- Bureau of Traffic Operations (BTO) – Leads Task
- WisDOT Traffic Forecasting Leads Task

TRACK C

Region Level Review
 (Obtain Input from Statewide Bureaus as Needed)



Is a Microscopic Simulation Model Proposed for Use?



Additional Runs

Additional Runs



16-15-1 Basic Principles

January 2018

The Highway Capacity Manual (HCM) provides several analytical or deterministic tools that can estimate roadway or intersection capacity, delay, density, and other performance measures for various elements of the street and highway system. The HCM also includes procedures for evaluating bicycle, pedestrian, and transit facilities. In most cases, the HCM is the standard for traffic analysis in the US; its methods are generally reliable and have been well-tested through significant validation efforts. The Highway Capacity Manual, 6th Edition: A Guide for Multimodal Mobility Analysis (HCM6) (1) is the most current version of the HCM.

The HCM6 consists of the following four volumes:

- Volume 1: Concepts
- Volume 2: Uninterrupted Flow
- Volume 3: Interrupted Flow
- [Volume 4: Applications Guide](#) (a web-based document, requires a user account)

Each chapter within Volume 2 and Volume 3 of HCM6 has six or more sections covering the following topics: introduction, concepts, methodology, extensions to the methodology, applications and references. The methodology section (typically Section 3) highlights the scope, strengths and limitations of the applicable HCM methodology, and as such, serves as a good reference when determining whether use of the HCM methodology is appropriate. Additional guidance as to when an alternative (non-HCM based) analysis methodology may be appropriate is provided in HCM6, Volume 1, Chapter 7.

The HCM procedures are good for analyzing the performance of isolated and non-congested facilities, but do have limitations. For example, the HCM models cannot account for interactions between network elements (e.g., they cannot reflect the effect of a queue backup at a ramp terminal on the adjacent freeway operations) and they may under-predict the extent of congestion in oversaturated conditions. Consider the strengths and limitations of the HCM methods when selecting the methodology to apply to a particular analysis or study. (See Section 3 of the applicable HCM chapter to identify the strengths and weaknesses of the HCM methodology.) Document the rationale for choosing the selected traffic analysis methodology (HCM-based, microsimulation, etc.) in the Traffic Analysis Tool Selection memoranda and submit to the WisDOT regional traffic staff for approval.

[FDM 11-5-3.7](#) provides a brief description of when and how to apply the HCM methodologies and identifies the WisDOT-supported programs that implement the HCM methodology.

16-15-5 Signalized Intersections

January 2018

5.1 Introduction

Refer to [FDM 11-5-3.7](#) for general guidance on conducting deterministic analysis at signalized intersections. When conducting capacity analysis for signalized intersections, apply the basic signal parameters as outlined in the following section in conjunction with the analysis methodologies outlined in [FDM 11-5-3.7](#).

5.2 Basic Parameters for Capacity Analysis

[TSDM 3-2-2](#) provides recommended parameters to use for the general analysis of state-owned signals; including minimum and maximum green times, pedestrian phase times and cycle lengths. The following provides updated direction for the use of right-turn on red (RTOR) and saturation flow rate. Unless noted otherwise, the policy within this section supersedes the guidance provided in [TSDM 3-2-2](#). If it is unclear which guidance to follow, contact BTO-TASU via the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox for clarification.

5.2.1 Right-Turn on Red (RTOR)

5.2.1.1 Background

Right-turns made while facing a red traffic signal indication, permitted under Wisconsin statute 346.37(1)(c)3, can have a beneficial effect on traffic flow and intersection capacity as they reduce the number of vehicles serviced during the green phase. The following section describes how to apply RTOR when conducting capacity analysis for signalized intersections.

5.2.1.2 Dedicated Right-Turn Lanes

Since vehicles making other movements (through or left-turns) *may* block right-turn access at shared left-through-right (LTR) or shared through-right lanes, WisDOT has only investigated RTOR volumes at locations with dedicated right-turn lanes. For the purposes of RTOR inclusion in capacity analyses, a dedicated right-turn lane is any lane that satisfies at least one of the following criteria:

- Pavement markings and/or signage clearly show the lane is dedicated for a right-turn only movement
- Field observations indicate that the lane functions as a de-facto right-turn only lane (requires approval from WisDOT regional traffic staff)
- Subject approach flares out at the intersection such that a right-turning vehicle can safely fit beside a through vehicle within the same lane and field observations show vehicles using the approach flare to make right turns (requires approval from WisDOT regional traffic staff)

Additionally, for RTOR inclusion to be applicable for capacity analysis, the following must exist:

- Right-turns on red are permissible (i.e., field signage does not prohibit this maneuver during the analysis period)
- Vehicle queuing from the adjacent lane does not prevent vehicles wishing to make a right-turn from accessing the dedicated (or de-facto) right-turn lane

For additional clarification, as to what constitutes a right-turn lane for purposes of capacity analysis at signalized intersections, contact the WisDOT regional traffic engineer and or BTO-TASU.

5.2.1.3 RTOR Estimation

An estimate of the proportion of vehicles making RTOR from a dedicated right-turn lane is most accurate when derived from field counts taken at the intersection in question. As it is not always practical to gather this information, WisDOT developed the following recommendations regarding RTOR volumes (V_{RTOR}) in relation to total right-turn demand (V_{RT}):

- Single Right-Turn Lanes at Intersections: $V_{RTOR} = 0.38V_{RT}$ [Equation 5.1]
- Single Right-Turn Lanes at Interchanges: $V_{RTOR} = 0.66V_{RT}$ [Equation 5.2]
- Dual Right-Turn Lanes (Intersections and Interchanges): $V_{RTOR} = 0.30V_{RT}$ [Equation 5.3]

Field studies conducted throughout Wisconsin in 2009 (2) and 2015 (3) guided the development of these recommendations. WisDOT has not studied RTOR at any other intersection configuration, such as shared lanes or triple right-turn lanes, thus unless intersection-specific field data is available to indicate otherwise, the analyst *should* assume that vehicles do not make RTOR movements at these locations. Obtain approval from WisDOT regional traffic staff prior to including RTOR volumes for triple right-turn lanes or shared lanes within the capacity analysis.

The analyst **shall not** use RTOR volumes in the analysis when field signage prohibits this maneuver during the analysis period.

5.2.1.4 RTOR Application

Highway Capacity Software (HCS) and Synchro are the two WisDOT-supported HCM-based software programs for both traffic signal analysis and signal optimization (see [FDM 11-5-3.7](#)). HCS uses the same module for both HCM-compliant analysis and for signal optimization. Synchro, however, uses two distinct modules – one which provides HCM-compliant analysis and another which provides signal optimization as well as non-HCM-compliant analysis. The later module uses a proprietary methodology to calculate intersection delay and other values. Changes made in one module do not necessarily transfer to the other module. Therefore, there are nuances in how to conduct HCM-compliant analysis and signal optimization in Synchro which are not present in HCS.

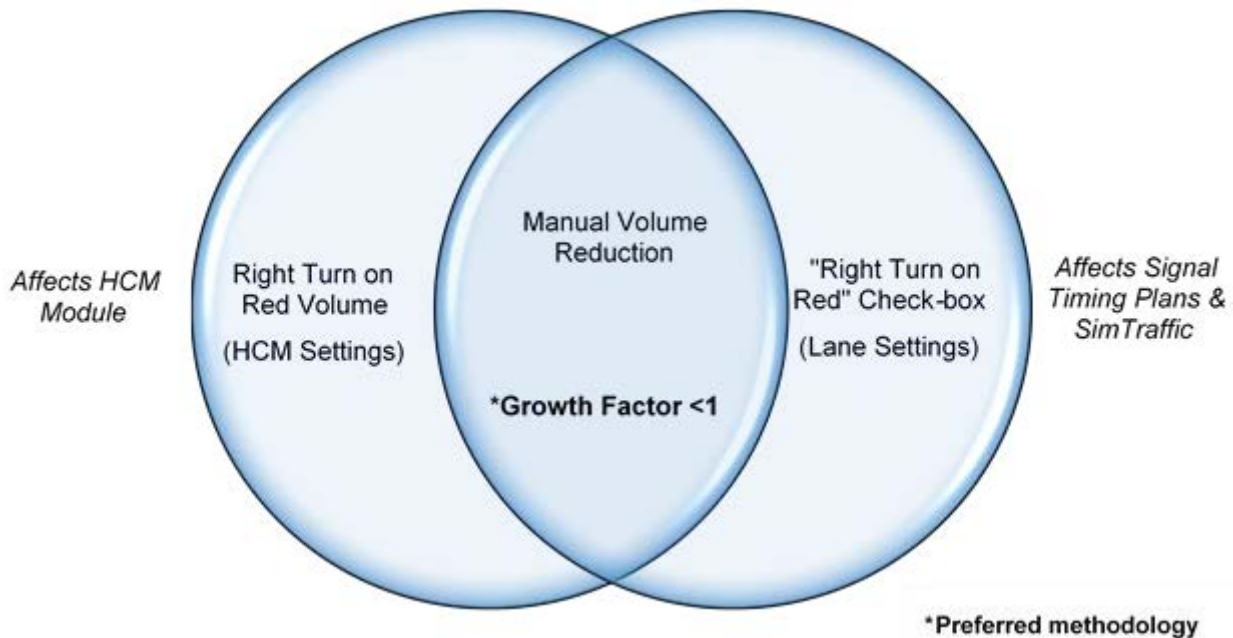
Figure 5.1 provides an overview of the various methodologies available for affecting RTOR in the two modules of Synchro. A subset of the methodologies, those which adjust demand, affect both Synchro modules. As noted in the figure, the “growth factor” method is the preferred methodology when the analyst is using Synchro to conduct HCM-compliant analysis and signal optimization. This methodology involves applying a growth factor of less than one to the right turn movements.

Apply the following growth factors, derived from Equations 5.1-5.3, unless field data is available and supports otherwise:

- 0.62 for Single Right-Turn Lanes at Intersections
- 0.34 for Single Right-Turn Lanes at Interchanges
- 0.70 for Dual Right-Turn Lanes (Intersections and Interchanges)

The other methodology to affect both modules in Synchro is to manually reduce the right-turn volumes by the V_{RTOR} . This is less transparent when conducting a peer review and is more prone to typographical error. Therefore, WisDOT prefers the use of the growth factor method in all situations.

Figure 5.1 Synchro RTOR Adjustments Venn Diagram



5.2.1.4.1 HCM-Compliant Analysis

WisDOT provides the following guidance on incorporating RTOR volumes when conducting HCM-compliant analysis. The RTOR volumes used may be based on field-collected values or the equations above (see Equations 5.1 – 5.3).

- **HCS:** Enter the V_{RTOR} , rounded to the nearest whole vehicle per hour (veh/h), into the "RTOR, veh/h" field for the relevant approaches. This field is at the bottom of the "Primary Input Data" within the HCS "Streets" module, which includes traffic signal analysis.
- **Synchro:** Use the growth factor method outlined above. Checking the "Right Turn on Red" box in the "Lane Settings" area **does not** affect the HCM-compliant analysis.

Entering the V_{RTOR} value associated with the approach into the "Right Turn on Red Volume" field in the Synchro HCM module is also acceptable, though WisDOT does not prefer this method as it only affects the HCM module. The analyst **shall not** enter a volume other than the default of 0 into the "Right Turn on Red Volume" field in combination with the growth factor method, as it will lead to incorrect results.

5.2.1.4.2 Signal Optimization

In Synchro, changes to the "Right Turn on Red Volume" field in the HCM module do not affect the signal timings or optimization calculations. If the analyst checks a box to allow RTOR within the "Lane Settings" module (automatically checked by default), Synchro uses an algorithm to determine a "Saturated Flow Rate (RTOR)". Synchro uses the "Saturated Flow Rate (RTOR)" value within the signal optimization function. The RTOR checkbox does not affect the HCM results. Synchro's proprietary RTOR methodology, enabled via the RTOR checkbox, is not straightforward and is thus not a preferred methodology for developing signal timing plans. When optimizing signals, the analyst *should* uncheck the RTOR box checkbox for all approaches.

WisDOT prefers the use of the growth factor method for conducting signal optimization in Synchro.

5.2.1.4.3 Microsimulation Analysis

WisDOT also currently supports three microsimulation software programs for traffic signal analysis: SimTraffic (associated with Synchro, affected by demand reductions but not by changes within the HCM module), Paramics, and Vissim although, effective January 1, 2018, WisDOT will no longer support for Paramics for new microsimulation analyses (see [FDM 11-5-3.7.1.4](#)). The analyst *should not* dictate RTOR volumes within microsimulation programs, as the models *should* determine when these turns happen based on how the right-turning vehicles interact with other vehicles in the system. Where right-turns at signals are critical movements, a good check for reasonableness could be comparing modeled RTOR volumes to field-collected ones. The analyst *should* direct any questions regarding how to model RTOR within a specific microsimulation software program to BTO-TASU via the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox.

5.2.2 Saturation Flow Rate

5.2.2.1 Background

One of the many variables that influence the performance of traffic signals is saturation flow (sat. flow) rate. The base saturation flow rate for a lane is the theoretical number of vehicles that could travel through the intersection during one hour of green time under ideal conditions. The saturation headway, or the average time between the front bumper of one vehicle and the front bumper of the vehicle behind it under ideal conditions, determines the saturation flow rate. The HCM6 default values for base saturation flow rate are:

- 1900 passenger cars per hour per lane (pc/h/ln) in metropolitan areas with population >250,000
- 1750 pc/h/ln otherwise

The HCM provides several factors to adjust these base saturation flow rates to account for prevailing conditions at the approach, including heavy vehicle percentages, grade, lane width, etc. More information on flow rate concepts is available in HCM6, Chapters 4 and Chapters 19.

Through movements at signalized intersections typically have high volumes relative to other movements, and therefore have an oversized role in determining the overall timing and phasing, as well as level of service (LOS). Therefore, this policy focuses on the saturation flow rate for through lanes. Additional guidance on the saturation flow rate for left and right turn lanes is forthcoming.

5.2.2.2 Saturation Flow Rate Methodology

A field saturation flow study at an intersection will provide the most accurate measure of experienced flow rates on its approaches. Given the expense, it *may* not be practical to conduct these studies, especially at locations that are operating significantly under capacity.

Since it is impractical to conduct field studies for every intersection and in an effort to gain a better understanding of the range of saturation flow rates, WisDOT funded a study in 2015 to evaluate saturation flow rates at various signalized intersections across the state (3). The study aimed to identify the variables, beyond those already accounted for by the HCM, which influenced the field saturation flow rates. The study followed the methodology laid out in the HCM and only collected data on the saturation flow rate for through lanes.

The 2015 WisDOT sat. flow study (3) found that the following three factors affect the base saturation flow rate of a through lane at a signalized intersection: the urbanized area or cluster population, the total number of approach lanes (left, through and right), and the posted speed limit of the approach. Accordingly, the base saturation flow rate *may* differ from one approach to the next at a given signalized intersection. The field conditions or traffic signal design dictate the total number of approach lanes and the posted speed limit of the approach. The urbanized area or cluster population information is available from either the table or map provided by the [2010 Census Bureau](#).

WisDOT used the results of this study to develop a methodology to estimate the base saturation flow rate for through lanes at signalized intersections in Wisconsin. Since the methodology accounts for more variables and reflects Wisconsin-specific data, analyst *should* use the WisDOT sat. flow methodology as described below to estimate the base saturation flow rate for through lanes at signalized intersections in Wisconsin. If the WisDOT estimation methodology results in a sat. flow rate less than the relevant HCM default value, specifically if it is less than 1750 pc/h/ln, the analyst *should* consider completing a field study or using the HCM6 default values.

Coordinate with WisDOT regional traffic staff to determine the most appropriate methodology for calculating the base saturation flow rate for through lanes. Unless instructed otherwise, use the HCM default values for the base saturation flow rate for left and right turn lanes.

5.2.2.3 Saturation Flow Rate Estimation

Use the [WisDOT sat. flow spreadsheet](#) (a Microsoft Excel based spreadsheet) or the adjustment factors shown in [Table 5.1](#) to implement the WisDOT sat. flow methodology. The WisDOT sat. flow spreadsheet implements equations to apply the various site-specific adjustments in the same general form as HCM6 and calculates the base sat. flow rate by approach.

In lieu of the WisDOT sat. flow spreadsheet, the analyst *may* use the adjustment factors shown in [Table 5.1](#) in conjunction with a starting saturation flow rate value of 1980 pc/h/ln (derived from the 2015 WisDOT sat. flow study (3)) and the following equation:

$$s_0 = 1980 \times f_{Pop} \times f_N \times f_{SL} \quad \text{[Equation 5.4]}$$

Where:

s_0 = Base saturation flow rate

f_{Pop} = Adjustment factor for population

f_N = Adjustment factor for number of approach lanes

f_{SL} = Adjustment factor for speed limit of approach

As with the WisDOT sat. flow spreadsheet, apply the adjustment factors at the approach level.

An example of how to apply the adjustment factors for saturation flow rate follows:

A signalized intersection is in a city with a population of 29,000 ($f_{Pop} = 0.95$). Looking at an approach with a left-turn lane, two through lanes, and two right-turn lanes (five total approach lanes, so $f_N = 0.97$) and a posted speed limit of 40 MPH ($f_{SL} = 1.00$), the resulting base saturation flow rate would be:

$$s_0 = 1980 \times 0.95 \times 0.97 \times 1.00 \quad s_0 = 1825 \text{ pc/h/ln}$$

Use the resulting S_0 , or base saturation flow rate (1825 pc/h/ln), for operational analysis of the two through lanes on this approach. Unless instructed otherwise, use the HCM default values for the left and right turn lanes. Calculate the base saturation flow rate for the other approaches in a similar manner.

Table 5.1 WisDOT Saturation Flow Adjustment Factors

| Population Adjustment Factor | | Lane Adjustment Factor | | Speed Adjustment Factor | |
|---------------------------------------|----------------------|---------------------------|----------------------|---|----------------------|
| Urbanized Area/ Cluster Population | Adjustment Factor | Total # Approach Lanes | Adjustment Factor | Posted Speed Limit of Approach (mph) | Adjustment Factor |
| < 2,000 | 0.91 | 1 | 0.88 | 25 | 0.94 |
| 2,000 - 4,499 | 0.92 | 2 | 0.94 | 30 | 0.96 |
| 4,500 - 8,999 | 0.93 | 3 | 0.96 | 35 | 0.98 |
| 9,000 - 18,999 | 0.94 | 4 | 0.97 | 40 | 1.00 |
| 19,000 - 39,999 | 0.95 | 5 | 0.97 | 45 | 1.02 |
| 40,000 - 82,999 | 0.96 | 6 | 0.98 | 50 | 1.04 |
| 83,000 - 170,499 | 0.97 | ≥7 | 0.98 | 55 | 1.07 |
| 170,500 - 347,499 | 0.98 | | | | |
| 347,500 - 704,499 | 0.99 | | | | |
| ≥ 704,500 | 1.00 | | | | |

Since the WisDOT sat. flow methodology calculates a Wisconsin, site-specific base saturation flow rate; the analyst *should* apply all other HCM adjustment factors, including the Central Business District (CBD) adjustment factor, as appropriate to calculate the final adjusted sat. flow rate. It is important to note that the WisDOT sat. flow estimation methodology applies only to exclusive through lanes and shared through-right lanes, as these two types of through lanes were the only ones included in the 2015 study.

5.2.2.4 Saturation Flow Rate Application

5.2.2.4.1 HCM-Compliant Analysis and Signal Timing Plan Development

As detailed in [FDM 11-5-3.7.3.1](#), WisDOT currently supports two HCM-based software programs for traffic signal analysis, HCS and Synchro. WisDOT provides the following guidance on entering base saturation flow rates generated from the WisDOT sat. flow methodology.

- **HCS:** Enter the base saturation flow rate, rounded to the nearest 5 pc/h/ln, into the “Saturation, pc/h/ln” field for the relevant approaches. This field is in the “Traffic” section within the HCS “Streets” module, which includes traffic signal analysis.
- **Synchro:** In the HCM module, used to generate fully HCM-compliant results, enter the base saturation flow rate, rounded to the nearest 5 vehicles per hour per lane (vphpl), into the “Ideal Satd. Flow (vphpl)” field for the relevant approaches. Alternately, edit this field through the “Lane Settings” module – changes made there carry through to the HCM module.

5.2.2.4.2 Microsimulation Analysis

Capacity is not typically an explicit input within microsimulation programs, as it will vary based on vehicle interactions and various parameters. Since headway dictates saturation flow rate and because each microsimulation program has one or more adjustable parameters characterizing the concept of headway, adjustments to these settings will increase or decrease potential and realized capacities. The analyst *should* calibrate each signalized intersection, ensuring that applicable validation thresholds are met and that field behavior is replicated adequately. Direct any questions regarding how to apply saturation flow rate within a specific microsimulation software program to BTO-TASU via the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox.

16-15-70 References

January 2018

1. **Transportation Research Board.** *Highway Capacity Manual, 6th Edition: A Guide For Multimodal Mobility Analysis.* Washington, D.C. : National Academy of Sciences, 2016. ISBN 978-0-309-36997-8.
2. **R.A. Smith National.** *Right Turn on Red Methodology Evaluation.* 2009.
3. **TranSmart Technologies, Inc.** *Signalized Intersection Capacity Data Collection: A Statewide Evaluation of Saturation Flow Rate and Right Turn on Red.* 2015.



1.1 Introduction

Microscopic traffic simulation, or microsimulation, refers to traffic analysis tools that analyze the movement of individual vehicles as they travel through a network. As the simulation progresses, it updates factors such as the vehicle's position and its need to increase/decrease speed or change lanes several times a second. Accordingly, these tools are suitable for evaluating the interaction of different components of the transportation network, such as queues from an intersection that cause lane blockages upstream or complex weaving and merging behaviors. Additionally, the visual animation of traffic flows can make microsimulation traffic models useful for public outreach and stakeholder presentations. Typical situations where microsimulation traffic analysis *may* be appropriate include scenarios that macroscopic tools cannot or do not address well, such as:

- Complex weaving along freeways and/or arterials
- Arterial and freeway interaction (e.g., spill-back from an arterial onto the freeway at an exit ramp)
- Non-traditional or alternative interchange/intersection analysis (e.g., diverging diamond interchanges and continuous flow intersections)
- Turn-lane spillover
- Oversaturated conditions
- Signal and roundabout interaction
- Vehicle/transit/pedestrian interaction

The primary purpose of traffic modeling is to simulate the transportation system under various volume and geometric conditions to assess what (if any) improvements are necessary. Most often, the models represent projected (or future) traffic conditions. Although analysts typically use traffic models to assess the impact of potential capacity/expansion improvements, they can also use microsimulation models to assess non-expansion improvements such as managed lanes, channelization optimizations (e.g., removing shared lane movements), and additional transit service.

WisDOT supports the use of microsimulation traffic models; however, it is important to match the analysis methods with the scale, complexity and technical requirements of the project. Microsimulation modeling work typically requires significantly more time, data and effort than other traffic analysis tools. Thus, prior to selecting microsimulation as the analysis tool, the project team *should* assess whether less resource-intensive traffic analysis tools can sufficiently meet the needs of the project. The project team *should* also consider the project schedule and budget to ensure that they can adequately accommodate the development and review of the microsimulation traffic models. [FDM 11-5-3.7](#) provides additional information and guidance on selecting the most appropriate traffic analysis tool(s).

1.2 Calibration vs. Validation

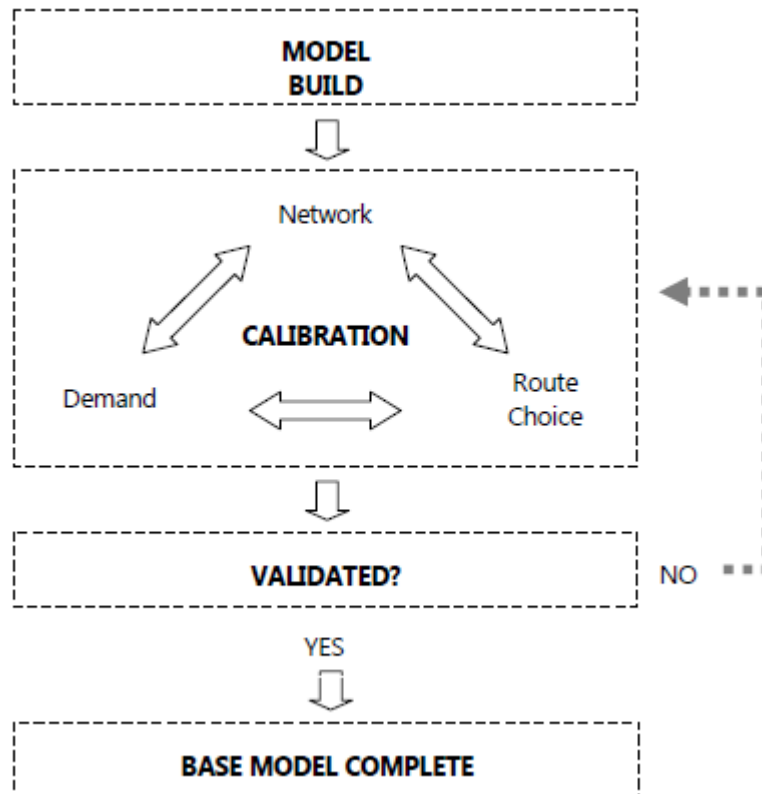
Microsimulation models contain multiple parameters that the analyst can modify to reflect varying degrees of driver behavior, vehicle characteristics and roadway conditions. Developing a traffic model with a reasonably accurate representation of real-world local traffic conditions requires calibration and validation of the model where, for purposes of WisDOT policy, calibration and validation have the following definitions.

Calibration: The process where the analyst adjusts selected input parameters within the traffic model (typically driver behavior elements such as headway and reaction times, driver aggressiveness, etc. and roadway elements such as sign posting) such that the traffic model represents field conditions. See [TEOpS 16-20-5](#) for additional details on the calibration process.

Validation: The independent process where the analyst checks the traffic model outputs against field measured data including, but not limited to, traffic volumes, travel speeds, travel times, intersection queuing and trip-making patterns (e.g., weaving volumes). See [TEOpS 16-20-8](#) for additional details on the validation process.

Calibration and validation are part of an iterative cycle. If, after the initial round of calibration, the model results do not satisfy the validation thresholds, the analyst must conduct additional model calibration and recheck the updated model results against the validation targets. This process continues until the model results meet the validation targets and the traffic model has reached a level of fidelity that is acceptable. Figure 1.1, taken from the New South Wales (NSW) Government Transport Roads & Maritime Services (RMS) 2013 *Traffic Modelling Guidelines* (1), illustrates the iterative relationship between model calibration and validation.

Figure 1.1 Traffic Model Calibration and Validation Process



Source: NSW Transport Roads & Maritime Services 2013 *Traffic Modelling Guidelines*, Figure 11.3 (1)

1.3 Purpose of Calibration & Validation

The process of developing a microsimulation model starts with an existing conditions model and then transitions into the development of various scenarios representing future-year alternatives. The only way to determine that a traffic model reasonably represents real-world traffic conditions is to compare the existing conditions traffic model to traffic conditions observed in the field. If the existing conditions traffic model cannot reproduce the existing traffic conditions with a reasonable degree of accuracy, then analyses of other scenarios will be highly suspect. Therefore, prior to using the model outputs for project or study decisions, especially any related to critical aspects of the design, the analyst **shall** calibrate and validate the microsimulation traffic model in accordance with [TEOpS 16-20-5](#) and [TEOpS 16-20-8](#), respectively. Additionally, the traffic model *should* undergo the peer review process in accordance with [TEOpS 16-25](#), prior to the commencement of work on any other traffic model scenarios or alternatives (e.g., design year no-build traffic model). Conducting the peer review process at the proper time will limit the potential of needing to modify multiple models to address reviewer comments.

After completion of the calibration, validation and peer review processes, the analyst can use the existing conditions model as the starting point for future-year alternative models. Most of the parameters calibrated in the existing conditions model *should* be transferable to the future-year models; however, the analyst *may* need to modify some parameters to account for changes in roadway geometry and/or associated driver behavior. The calibration, validation and peer review processes ([TEOpS 16-20-5](#), [TEOpS 16-20-8](#) and [TEOpS 16-25](#), respectively) are applicable for all future-year model alternatives and the analyst *should* apply them as appropriate.

2.1 Traffic Model Boundaries

Confusion about the purpose, objectives or physical boundaries of the traffic model can cause delays and other potential problems such as:

- Misunderstandings or ambiguities regarding the purpose/objectives of the traffic modeling effort
- Mission creep or unplanned expansion of the traffic model that could delay the delivery of results, such as unexpected enlargement of the geographical boundaries
- Misapplication of the traffic model (e.g., attempting to use the traffic model at a level of detail for which it was never intended)
- Inappropriate sequencing of activities (e.g., starting to develop the build scenarios before the existing conditions traffic model has been properly calibrated and validated)

Although the above problems can apply to all types of traffic analyses, the complexities associated with microsimulation traffic models only exacerbate the issues. To ensure that there is a clear understanding of the traffic analysis requirements, the project team **shall** work with WisDOT regional traffic staff to define the preliminary traffic model boundaries. After coordinating with WisDOT regional traffic staff, the project team *should* organize a meeting with other key stakeholders to finalize the traffic model boundaries and review/update the DT2290 Traffic Model Scope form as appropriate. In addition to the meeting, it *may* be beneficial to conduct an organized visit to the site to familiarize the team with the current traffic conditions/issues.

Typically, the traffic analysis kick-off meeting will include only those internal stakeholders, and applicable consultant team representatives, who will be involved in the development and/or review of the traffic model. It *may* be beneficial to promote early involvement with the Bureau of Traffic Operations – Traffic Analysis and Safety Unit (BTO-TASU) and the Federal Highway Administration (FHWA), as appropriate, by inviting them to this initial meeting. This is especially true for mega projects, high profile projects and FHWA Projects of Division Interest (PoDI). At a minimum, the project team **shall** invite the FHWA Wisconsin Division Operations Program Manager to the initial kick-off meeting for any interstate project that has a scope of work greater than pavement replacement. Refer to the FHWA/WisDOT “Risk-Based Project Stewardship and Oversight Agreement”, provided in [FDM 11-5-2-1](#), for details on FHWA and WisDOT stewardship and oversight of federal-aid projects.

Refer to [TEOpS 16-25-2](#) for additional guidance on determining who *should* participate in the review of the traffic model. In general, BTO-TASU **shall** be involved with the review of all models where FHWA participation is desired or required. It is also advisable to include BTO-TASU when dealing with new, unique or complex modeling concepts or analysis tools, especially if the region does not have the necessary knowledge and/or resources. Direct any questions regarding the need to involve BTO-TASU to the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

After the traffic-analysis kick-off meeting and any site visits, key stakeholders, including the consultant team as applicable, *should* have a good grasp on the following:

- Purpose and objective of the traffic model(s)
- Traffic issues/concerns for the study area
- Applicable traffic analysis method(s) and tool(s)
- Temporal and spatial boundaries of the traffic model(s)
- Analysis scenarios (e.g., existing, no-build, build, etc.)
- Potential data needs and sources

If, after the meeting, there are still components of the DT2290 form that are unknown, the project team *should* coordinate further discussions between WisDOT regional traffic staff, the traffic analyst (i.e., consultant team) and BTO-TASU as appropriate. The following provides additional details on how to define the model limits (spatial and temporal) and analysis scenarios.

2.1.1 Traffic Model Spatial Limits

The limits of the microsimulation traffic model *should* encompass not only the limits of the specific transportation project under study, but it *should* also include all parts of the surrounding transportation network (or zone of influence) that may significantly influence the operations of the study area. When setting the limits of the traffic model, the analyst *should* consider the potential impact of planned/proposed roadway improvement projects and/or strategies, especially if the future improvement may result in a shift in travel patterns. Other adjacent and/or nearby improvement projects may have a significant impact on the spatial limits of the traffic model, especially if the projects are proceeding concurrently (e.g., the traffic model *may* need to be extended to incorporate the adjacent projects or portions of the traffic model may overlap with the model of an adjacent project, etc.). Thus, it is critical to have early coordination with any adjacent and/or nearby projects.

Where practically feasible, the spatial boundaries of the traffic model *should* capture all congestion, existing and future, in the area. Where it is not possible to capture the congestion spatially, evaluate whether extending the temporal limits of the model will allow the traffic model to reflect the traffic congestion (see [TEOpS 16-25-2.1.2](#)). In situations where resource or other constraints prevent the traffic model from being extended (spatially or temporally) to allow for the capture of all congestion, coordinate with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate to set the traffic model limits. Include discussion on the potential risk of not being able to identify the full extent of congestion for future/alternative scenarios until after completion of the existing conditions model. All key stakeholders *should* agree on the approach to use to compensate for any congestion that occurs outside the established model limits. Initial discussions on the spatial limits of the traffic model *should* occur during project scoping.

The analyst *should* take care not to extend the model limits out further than necessary, as the larger the model, the more complex and time-consuming it will be to calibrate and validate. One-way to measure the complexity of the traffic model is to consider the size of its origin-destination (O-D) matrix, which represents each location (or zone) where vehicles can enter or exit the model. The O-D matrix increases with the square of the number of traffic zones included in a model: a 25-zone model has 625 O-D pairs ($25 \times 25 = 625$) while a 50-zone model has 2,500 O-D pairs ($50 \times 50 = 2,500$). Every O-D pair added to the traffic model adds additional time to the network coding, calibration and validation process. Therefore, depending on the size of the study area, it *may* make more sense to break the traffic model into two or more smaller models rather than to develop one large model. (Coordinate with WisDOT regional traffic staff and/or BTO-TASU to assess whether to break one large model into smaller models.) All boundaries of the traffic model *should* occur at logical break points in the roadway network (e.g., locations where the traffic volumes naturally drop-off or locations where traffic attributes such as travel speeds normalize or return to free-flow speeds). Avoid breaking the model at critical study area locations (e.g., avoid breaking the model in the middle of a complex weaving segment between two large interchanges).

Depending on the operational characteristics, it is possible for the limits of the traffic model to extend beyond the end of the project termini. Additionally, microsimulation analysis *may* only be necessary for a portion of the project study area such that the limits of the microsimulation model are smaller than the project limits. For example, if a project study area encompasses three interchanges (interchange A, B and C), of which only one (interchange A) involves complex weaving maneuvers and requires microsimulation analyses, the limits of the microsimulation model would only need to extend far enough to capture the weaving traffic behavior at interchange A. The analyst could then use an HCM-based analysis tool to evaluate the traffic conditions at interchanges B and C. Due to this variability, there is no standard set of guidance for determining the spatial limits of a traffic model. Rather, the geographical boundaries for a microsimulation traffic model needs to be determined on a project-by-project basis. FHWA's [Traffic Analysis Toolbox Volume III \(TAT III\) \(2\)](#) provides some general guidance on determining the spatial limits for a microsimulation model.

The analyst *should not* finalize the spatial limits of the traffic model until field observations document the extent of congestion and length of vehicle queues within the study area. Provide a brief discussion of the geographical traffic model boundaries within DT2290. Document all assumptions and methods regarding the geographical limits for the traffic model within the modeling methodology report and/or other project memoranda as appropriate.

2.1.2 Temporal Model Limits

The temporal limits of the traffic model are dependent on the location of the project and the experienced levels of congestion, and therefore, must be determined on a project-by-project basis. Some general guidance on defining the temporal model limits follows.

2.1.2.1 Temporal Analysis Periods

Depending on the purpose and objectives of the project, the microsimulation traffic model *may* need to address two or more temporal analysis periods (TAPs) where each TAP could encompass anywhere from one to six or more consecutive hours. Typical TAPs addressed with microsimulation models include, but are not limited to the

following:

| | |
|-------------------------------------|--|
| <u>AM Peak Period (AM):</u> | This typically comprises of one or two hours of each weekday between 6 a.m. and 9 a.m., although in severely congested areas it could comprise of four or more hours. |
| <u>Midday Peak Period (MD):</u> | This period is relevant in areas where traffic patterns peak in the non-traditional commuting hours such as a school or restaurant district. If applicable, it typically is one hour between 11 a.m. and 3 p.m. |
| <u>PM Peak Period (PM):</u> | This typically comprises of two or three hours of each weekday between 4 p.m. and 7 p.m., although in severely congested areas it could comprise of six or more hours. |
| <u>Friday Peak Period (Fri):</u> | This period is relevant in areas that experience higher traffic patterns during the Friday peak period versus the typical weekday commute, typically due to the combination of both commuter and recreational traffic. |
| <u>Sunday Peak Period (Sun):</u> | This period is relevant in areas where there is higher traffic than the typical weekday commute on a Sunday afternoon/early evening as travelers return home from a recreational weekend trip. |
| <u>Seasonal/Special Event (SP):</u> | This period is relevant in areas that experience unusual traffic patterns due to holidays, tourism and/or special events. This <i>may</i> coincide with the Friday and/or Sunday peak period. |

The length of the TAP is dependent on extent of congestion in the study area. Although the TAP will vary depending on local field conditions, FHWA's [TAT III \(2\)](#) and [TAT IV \(3\)](#) provide general guidance for determining the appropriate TAPs for a traffic model.

When selecting the TAPs, consider existing field data for traffic volumes, speeds and queues, along with anticipated future traffic volumes and levels of congestion. Where practically feasible, the TAP *should* encompass the entire extent of the congestion (existing and future). If it is not feasible to extend the TAP to capture all congestion, coordinate with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate to set the TAPs. Include discussion on the potential risk of not being able to identify the full extent of congestion for future/alternative scenarios until after completion of the existing conditions model. All key stakeholders *should* agree on the approach to use to compensate for any congestion that occurs outside the established TAPs.

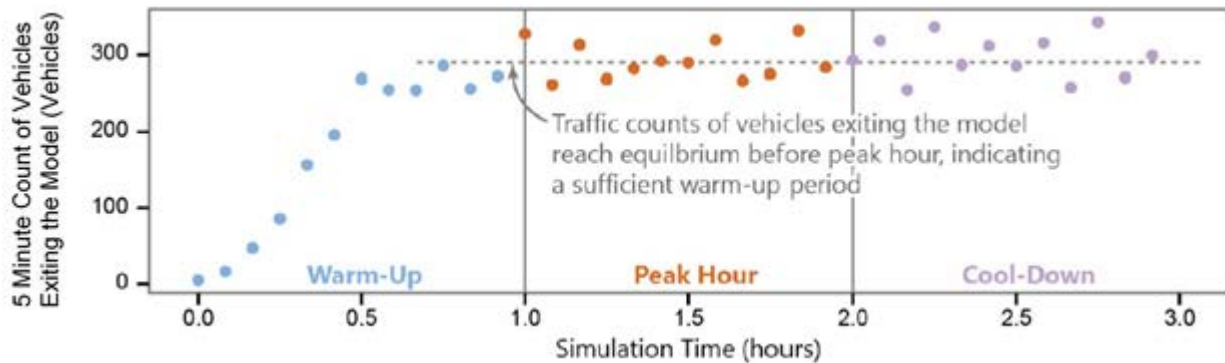
Provide a brief discussion of the TAPs within DT2290. Document all assumptions and methods regarding the TAPs for the traffic model within the modeling methodology report and/or other project memoranda as appropriate.

2.1.2.2 Warm-Up/Cool-Down Periods

In addition to the analysis period, the microsimulation models **shall** also include a warm-up period and *should* include a cool-down period to allow for the build-up and dissipation of congestion. The warm-up period is essential because the roadway network within the traffic model is initially empty and requires some time for the network to reach conditions that reflect the start of the analysis period. Essentially, the first vehicles to enter the study area are driving under free flow conditions. Without a warm-up period, data from the beginning of the analysis period would have a strong bias toward smaller delays (lower congestion) and *may not* reflect real-world conditions. The exact length of the warm-up period will vary from project-to-project; however, as referenced in FHWA's TAT III (2), a good way to approximate the minimum warm-up period, for at least the initial model runs, is to double the free-flow travel time from one end of the network to the other. After completing one or more model runs, verify the adequacy of the warm-up period and extend as appropriate.

The warm-up period is adequate when conditions at the end of the warm-up period reflect the field conditions at the start of the analysis period. One way to assess adequacy of the warm-up period is to review the number of vehicles present at any one time on the network to determine whether the model has reached equilibrium. Once the number of vehicles present on the network stays constant or increases by an amount consistent with the applicable profile, the model has reached equilibrium and signifies the conclusion of the warm-up period. Figure 2.1 provides an illustration of how to verify that the warm-up period is adequate by reviewing the number of vehicles exiting the model.

Figure 2. 1 Warm-Up Duration Verification Example



The cool-down period allows time for the dissipation of queues created during the analysis period which is typically necessary for the traffic model to replicate real-world conditions. Like the warm-up period, the cool-down period will vary depending on local field conditions, but is typically in the range of 15 to 60 minutes. After completing one or more model runs, verify the adequacy of the cool-down period and extend as appropriate.

FHWA's [TAT IV \(3\)](#) provides additional guidance for determining the appropriate warm-up and cool-down periods for a traffic model. Coordinate with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate to confirm the warm-up and cool-down periods. Provide a brief discussion of the warm-up and cool-down periods within DT2290. Document all assumptions, methods and exemptions regarding the warm-up and cool-down periods for the traffic model within the modeling methodology report and/or other project memoranda as appropriate.

2.2 Analysis Scenarios

It is generally advantageous to identify the anticipated analysis scenarios/alternatives prior to beginning development of the traffic models. Early identification of the analysis scenarios/alternatives aids in determining the level of effort requirements, resource needs and budget implications. Additionally, by knowing the potential analysis scenarios in advance, the analyst can assess whether the spatial and temporal model limits adequately address all analysis scenarios up front, minimizing the chances of rework and model inconsistencies. When assessing the scenarios/alternatives to model, consider the potential impacts of any adjacent planned or pending projects, especially if the adjacent projects will influence the traffic demand in the study area. The analyst *should* coordinate with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate to identify the analysis scenarios/alternatives.

Although the specific details of the analysis scenarios are project dependent, there are four basic analysis categories: 1) Existing (EX) Model, 2) Design Year, No-Build (FEC) Model, 3) Design Year with Minor Improvements (FEC+) Model and 4) Design Year, Build Model. A brief description of each of these analysis scenario categories follows.

Existing (EX):

The existing (or base) year traffic model replicates existing field conditions. Existing year traffic conditions *should* reflect the year that is as close to the original start of the traffic analysis as possible. Whenever possible, traffic data *should* be no more than three years old and ideally, all traffic data *should* be from the same year. Ongoing construction or other special circumstances may dictate the need to use older data or data from multiple years.

Coordinate with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate to select the existing year. Identify the existing year on the DT2290 form and document the rationale for selecting the existing conditions within the modeling methodology report and/or other project memoranda as appropriate. The analyst **shall** obtain approval of the existing year from the WisDOT regional traffic engineer prior to initiating development of the traffic model.

Design Year, No-Build (FEC):

The design year, no-build traffic model reflects design year conditions absent of the proposed project. It will reflect design year traffic volumes and existing geometry or existing geometry with other planned and enumerated (or committed) improvement projects and may include signal timing modifications. As such, another name for this scenario is the future with existing plus committed (FEC)

scenario. The planned improvement projects need to occur after the existing year but prior to the proposed project's design year in order to be included in the FEC model. Note that the FEC conditions for a specific project may not match the no-build conditions reflected in a travel demand model (TDM) used in forecasting traffic. Therefore, coordination with the WisDOT traffic forecasting section (TFS) is essential to verify that the traffic forecasts reflect the FEC scenario assumed in the microsimulation model.

The roadway geometry of the FEC model often limits (or constrains) the volume of traffic entering, traveling through or exiting the model. The FEC model, is thus a "constrained" model, and may not reflect the true demand on all segments within the model. Depending on the purpose and objectives of the project, full analysis of a true no-build or "constrained" traffic model *may not* be necessary.

Coordinate with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate to identify the need for developing a design year, no-build model and to clarify the need to assess "constrained" conditions. Document the rationale for including or not including the design year, no-build (FEC) model and/or "constrained" conditions within the modeling methodology report and/or other project memoranda as appropriate. The analyst **shall** obtain approval from the WisDOT regional traffic engineer on how to address the design year, no-build (FEC) conditions prior to initiating development of the traffic model.

Design Year, FEC+:

For the traffic model to function with the design year traffic volumes, it *may* be necessary to include minor geometric improvements (e.g., the extension of an existing right or left turn lane or channelization optimizations such as the removal of shared lane movements within the FEC right-of-way, etc.) beyond the committed projects. In these cases, the traffic model actually represents future with existing plus committed plus minor improvements (FEC+) conditions. The project team *should* clearly document these minor improvements within the modeling methodology report and/or other project memoranda as appropriate.

The inclusion of a design year with minor improvements (or FEC+) model is often driven by the need to eliminate the geometric constraints within or adjacent to the traffic model in order to reflect the true demand on all segments within the model. Thus, the FEC+ model is generally (but not always) representative of an "unconstrained" model. The analyst *may* elect to apply other methodologies (such as removing traffic volumes that exit the roadway network prior to the study area) in addition to or instead of including minimum geometric improvements, to develop a design year "unconstrained" traffic model.

Coordinate with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate to identify the need for developing a FEC+ model and to clarify the need to assess "unconstrained" conditions. Document the rationale for including or not including the FEC+ model and/or "unconstrained" conditions within the modeling methodology report and/or other project memoranda as appropriate. The analyst **shall** obtain approval from the WisDOT regional traffic engineer on how to address the FEC+ conditions prior to initiating development of the traffic model.

Design Year, Build (ALT):

The design year, build traffic models capture design year conditions with the proposed project improvements. The build traffic models may reflect "constrained" or "unconstrained" conditions. Typically, the analyst will need to develop a traffic model for more than one project alternative.

Due to the complexity and level of effort and resources required to develop microsimulation models, conduct a high-level review of potential alternatives using an HCM-based deterministic analysis tools to narrow down the number alternatives prior to developing the design year, build traffic model alternative using microsimulation.

Coordinate with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate to identify the design year, build model alternatives and to clarify the need to assess "constrained" conditions,

“unconstrained” conditions or both. Document the rationale for including or not including the “constrained” and/or “unconstrained” conditions within the modeling methodology report and/or other project memoranda as appropriate. The analyst **shall** obtain approval from the WisDOT regional traffic engineer on the design year build alternatives prior to initiating development of the traffic model.

Depending on the specifics of the project, it *may* be beneficial and/or necessary to develop a model that represents the conditions that will exist in the year the proposed project improvements are first opened to traffic (i.e., opening year conditions model). This scenario reflects the opening year traffic volumes and opening year geometry, which includes the existing geometry with the proposed project improvements and any other completed improvement projects. Discuss the need to develop and opening year model with WisDOT regional traffic staff and other key stakeholders (BTO-TASU, FHWA, etc.) as appropriate.

To ensure consistency, avoid confusion and aid in the model reviews, use the [file naming convention spreadsheet](#). For example, a PM peak model of existing conditions for a project referred to as “WIS 1194” submitted on June 15, 2018 would be “WIS 1194_EX_2017_PM_061518”. A future, unconstrained model for Alternative 3 looking at the PM peak in year 2045 and submitted on September 29, 2018 would be “WIS 1194_ALT-3_UCD_2045_PM_092918”.

2.3 Traffic Model Tree

Prior to development of the microsimulation traffic model, the analyst *should* coordinate with the project team, WisDOT regional traffic staff and BTO-TASU as appropriate to develop the traffic model tree. The purpose of the model development tree is to show all the scenarios to include in the analysis, along with their relationships to one another and the existing conditions model. It formally illustrates the way the model will evolve as the work progresses, and establishes the sequence of work activities. Developing the traffic model tree prior to development of the existing conditions model helps avoid unnecessary work. Whenever possible, the analyst *should* use the same transportation network structure for all temporal analysis periods (AM peak, PM peak, Friday peak, Sunday peak, etc.) within the same year. The fewer the number of model variations, the easier it is to maintain consistency between the different analysis scenarios. Figure 2.2 provides an illustration of a basic traffic model tree.

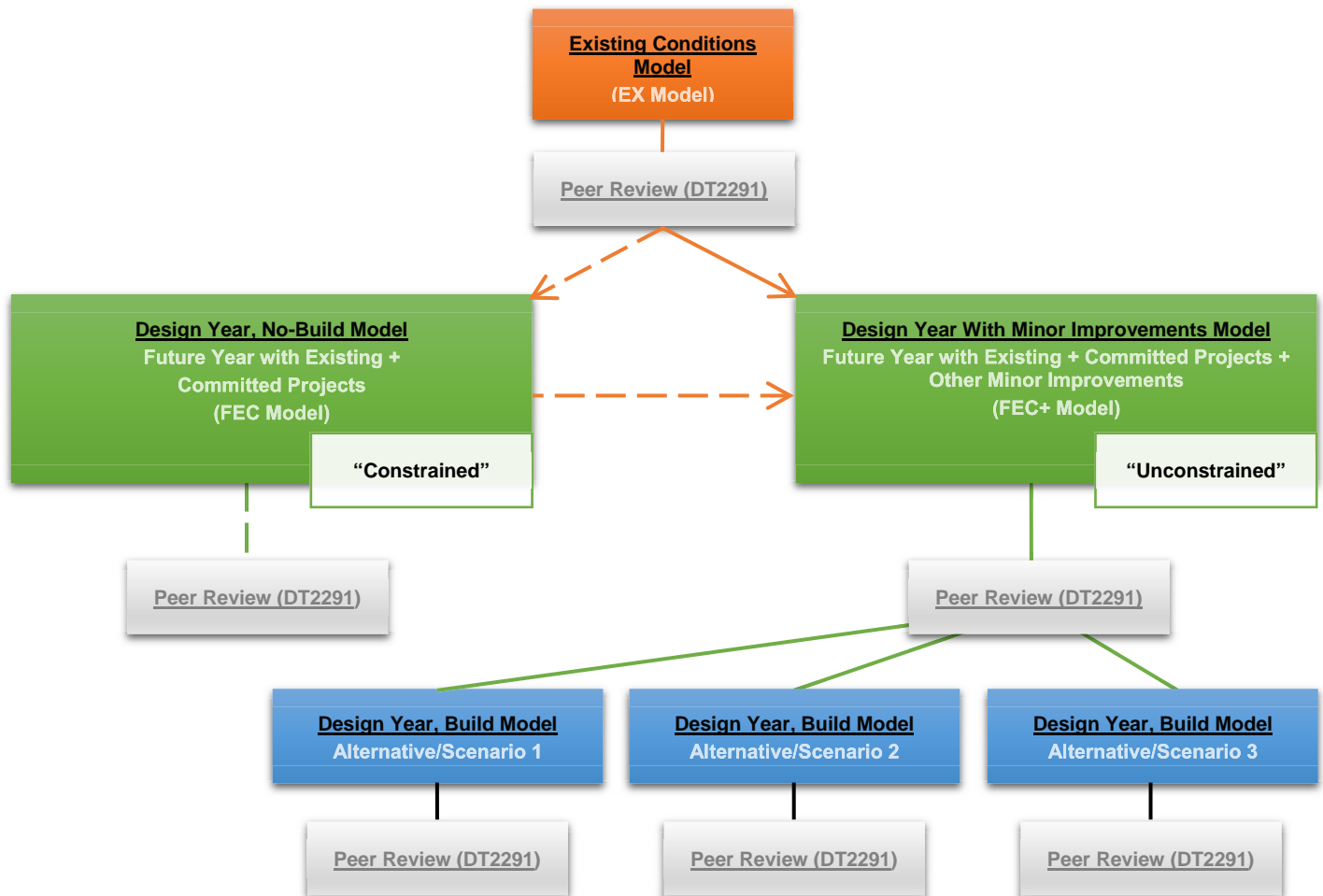
As illustrated in Figure 2.2, each version of the traffic model *should* undergo the peer review process prior to the development of the model for a new scenario. Refer to [TEOpS 16-25](#) for additional details on the peer review process. When the project has a compressed schedule, there may be a temptation to begin development of the design year models prior to completion of the peer review process of the existing conditions model. This is often counterproductive, as the analyst needs to address any comments from the peer review of the existing conditions model in not only the existing (parent) model but also in any of the design year (child) models under development.

2.4 Constructing the Traffic Model

Construct and code the traffic model in accordance with the recommendations of the user guides/manuals for the applicable microsimulation software platform. When developing the model, the analyst *should* consider the following best practices:

- Use aerials and/or design plans as background images to aid in the review
- Minimize the amount of non-link space (dead space in Paramics, connectors in Vissim) where practical
- Label major roadway segments
- Avoid the use of link-specific adjustment factors as much as possible. When their use is necessary, associate link-specific adjustment factors with roadway geometry and/or software limitations. This will make it easier to assess whether the adjustment factor is applicable for other modeling scenarios.

Figure 2.1 Example of a Typical Traffic Model Tree



2.5 Deliverables

It is generally advantageous to establish a list of deliverables prior to beginning development of the traffic models. This list will identify all the documents, videos, computer files and other items that the project team will need to produce. Early identification of the list of deliverables can clarify project expectations and assist with defining resource needs. Typical deliverables include, but are not limited to, the following:

- Traffic Forecasting Methodology Report, typically will include the following attachments
 - Forecasting and O-D Development Methodology
 - Traffic Forecasts
 - Traffic Volume Balancing Methodology
- Traffic Analysis Tool Selection Memoranda
- Modeling Methodology Reports for each model, typically will include the following attachments
 - Existing Traffic Data (e.g., traffic volumes, speeds, queuing, etc.)
 - Exhibit Illustrating the Project Design Plans/Improvements
 - Tables Showing Validation Checks
- Microsimulation Software Files (provide for all temporal analysis periods and analysis scenarios/alternatives)
- DT2290

- DT2291 for each model

For sample formats or questions on any of the above deliverables, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

16-20-3 Measures of Effectiveness (MOEs)

January 2018

3.1 Types of MOEs for Validation

The project's purpose, need and objectives typically dictate which MOEs the analyst *should* use for reporting the performance measures of the traffic model. The MOEs chosen for validation of the traffic model; however, are dependent on several factors including, but not limited to, the availability and quality of data, the size of a model, the capability of the microsimulation software, the purpose of the model, and the project scope. The following focuses on the MOEs chosen for validation of the traffic model.

3.1.1 Traffic Volumes

It is critical to validate traffic volumes on the roadway link level and/or the turning-movement level for every microsimulation model, regardless of size or complexity. There are several data sources for traffic volumes with varying levels of availability and/or data quality. Some of these resources include manual counts and various detection methods (e.g., loop, microwave, radar, video, etc.). Sources available in Wisconsin include, but are not limited to, the following:

- WisDOT interactive count map: [WisDOT Roadrunner link](#)
- Wisconsin Hourly Traffic Data: [WisTransPortal, Wisconsin Hourly Traffic Data Web Access Portal](#)
- V-SPOC detector database: [WisTransPortal, V-SPOC: Volume, Speed and Occupancy Application Suite](#)

The [BTO-TASU Data Hub](#) provides a list of additional data sources with a brief description of types of data available through each source, a hyperlink to the primary data source, and notes to consider when choosing to use or not use a particular data source. Prior to conducting specialized counts, contact WisDOT regional traffic staff to determine whether there are other data sources available for the project study area. Review, verify and document the validity of the volume data prior to developing the traffic model. Coordinate with WisDOT regional traffic staff as appropriate.

3.1.2 Traffic Speeds

Validation tests for traffic speeds *may* be representative of spot speeds and/or segment speeds. Common sources for spot speed data include, but are not limited to, loop detectors, radar detection or other resources. Common sources for segment speed data include, but are not limited to, Bluetooth detectors, probe data or floating car studies. Document the methodology used to collect and calculate the spot and/or segment speeds. Review, verify and document the validity of the traffic speed data prior to developing the traffic model. Coordinate with WisDOT regional traffic staff as appropriate.

Larger-scale traffic models *may* rely on a combination of spot speed and segment speed validation, while models that are smaller in length *may* rely more on spot speed validation. Where possible, collect and report out spot or segment speed in 15-minute intervals.

Discuss the type of speed data required for model validation with WisDOT regional traffic staff and/or BTO-TASU during the scoping stage of a project.

3.1.3 Travel Times

Travel time validation is a common MOE used for freeway models and arterial corridors. The availability and quality of travel time data has become better in recent years due to advancement in probe data and Bluetooth technologies. Common sources for travel time data include Bluetooth detectors, probe data or floating car studies. Where possible, collect and report out travel times in 15-minute intervals. Review, verify and document the validity of the travel time data prior to developing the traffic model. Coordinate with WisDOT regional traffic staff as appropriate.

If using both segment speeds and travel times for model validation, the roadway limits used for these comparisons *should* be of different lengths. It is desirable to have the travel time comparisons use longer lengths than the segment speed comparisons. The intent of the travel time validation test is to capture vehicle behavior at a larger scale while the intent of the speed validation test, whether spot or segment, is to capture the behavior at a more local level.

Discuss the limits, segmentation and type of travel time data required for model validation with the regional traffic engineer and/or BTO-TASU during the scoping stage of a project.

3.1.4 Intersection Queue Lengths

Intersection queue length is a common MOE used for arterial corridors or smaller freeway/interchange models where collection of other MOEs may not be possible or fiscally feasible. If there is significant congestion at an intersection in the existing conditions, the queue lengths may vary significantly day-to-day or even 15-minute period to 15-minute period. Video detection, loop detection, and field observations are common ways to collect intersection queue data. The methodology for the collection of intersection queues involves some subjectivity and requires sound judgment of vehicle speeds and the number of vehicles to include in the queue (e.g., *should* the vehicle queue include slow moving vehicles or just stopped vehicles?). Review, verify and document the validity of the queue data prior to developing the traffic model. Coordinate with WisDOT regional traffic staff as appropriate.

If queues are used for validation, the project team *should* consider the following questions prior to data collection and when performing comparisons to modeled data.

- If analyzing an interchange, do the exit ramp queues extend back to or close to the mainline?
- Do intersection queues spill back into the adjacent intersection(s)?
- Does data collection capture the average, 95th percentile, and/or maximum queue lengths? Is the desired type of queue length for model validation easily extractable from the selected microsimulation software?
- For multiple lanes, such as a triple left-turn lane, do the queue measurements and comparisons reflect the lane-by-lane queues or the worst-case lane queue?
- How, and at what frequency (every cycle, every 15 minutes, etc.), *should* queues be measured in the field?

Discuss the locations of intersection queues required for model validation with WisDOT regional traffic staff and/or BTO-TASU during the scoping stage of a project.

3.1.5 Lane Utilization

Lane utilization, or the volume/percentage of vehicles using a given lane relative to the other lanes in the same direction, is a common MOE used for freeway corridors or arterial corridors with complex intersection interaction. In Wisconsin, it may be possible to approximate lane utilization from lane-by-lane volume data available through the WisTransPortal, V-SPOC detector database ran by the Wisconsin Traffic Operations and Safety (TOPS) Lab ([WisTransPortal, V-SPOC](#)). The V-SPOC database has the most robust coverage in the Madison and Milwaukee metropolitan areas, with more sporadic coverage for other parts of the state. Other methods to collect lane utilization data include manual counts, time-lapse aerial photography or video detection. Review, verify and document the validity of the lane utilization data prior to developing the traffic model. Coordinate with WisDOT regional traffic staff as appropriate.

The analyst *may* use lane utilization as a validation metric for the traffic model; however, they *should* first carefully evaluate and document the quality and availability of the existing data. If used as a validation metric, perform lane utilization comparisons at critical locations within the corridor. Discuss the need for and locations of lane utilization comparisons with WisDOT regional traffic staff and/or BTO-TASU during the scoping stage of a project.

3.1.6 Lane Density

Observed density is a less common metric used for model validation. Video detection or time-lapse aerial photography may allow for the collection of lane density information. Coordinate with WisDOT regional traffic staff and/or BTO-TASU prior to using lane density as a validation metric.

3.1.7 Bottleneck Locations

Bottlenecks signify where recurring congestion occurs within a network. They have a direct relationship to travel times, traffic speeds, and/or intersection queue lengths. Validation of bottlenecks in a traffic model typically occurs through conducting visual observations and/or by creating spatiotemporal graphics displaying observed versus modeled MOEs. If observations indicate the presence of recurring congestion, or a bottleneck, in the existing conditions, the analyst *should* use this MOE as a validation metric.

3.1.8 Throughput

Throughput is a less common metric related to flow rates through an intersection or freeway segment. Possible ways to observe throughput include manual counts, video detection or other methods. WisDOT *should* approve throughput as an acceptable MOE for model validation prior to its use.

3.1.9 Visual Observation

Visual observation is a good preliminary or secondary check for validating the model results to field data, specifically for bottlenecks or queues, however, visual observations **shall not** be the sole MOE used for model validation. Instead, see the MOE descriptions for bottleneck or intersection queue validation.

3.1.10 Weaving Volumes

If existing O-D data is available, the analyst *should* evaluate weaving volumes. Common sources of O-D data included Bluetooth detection, video detection, time-lapse aerial photography and field observations. In absence of field data, it may be possible to conduct a high-level evaluation of weaving percentages using data from travel demand models. Comparisons of weaving volumes are typically applicable to freeway weaving; however, it could also apply to arterials with complex intersection interactions.

If field data is the basis of the weaving volumes/patterns used for validation, the project team *should* document the conditions during field data collection. This may include construction activities, atypical congestion, weather, if school is in session, or other pertinent information.

If a travel demand model is the source of the weaving volumes/patterns used for validation, the project team *should* document general inputs and calibration notes about the travel demand model. These may include the version, socioeconomic data, base year, horizon year, anticipated developments in the project area, or other pertinent information.

If used as a validation metric, perform weaving volume comparisons at critical locations within the corridor. Discuss the need for and locations of weaving volume comparisons with WisDOT regional traffic staff and/or BTO-TASU during the scoping stage of a project. Review, verify and document the validity of the weaving volume data prior to developing the traffic model. Coordinate with WisDOT regional traffic staff as appropriate.

3.1.11 Intersection Delay

Intersection delay dictates the intersection level of service (LOS), noting that if the volume-to-capacity ratio (v/c) exceeds 1.0 the LOS is F regardless of the delay value. Due to the difficulty of the data collection and the variance in day-to-day and minute-to-minute delays at congested intersections, it is not very common to obtain field data on intersection delay. Delay is typically more challenging to quantify than queue lengths, which also provide insight as to how the intersection operates at the approach level. WisDOT *should* approve intersection delay as an acceptable MOE for model validation prior to its use.

3.1.12 Capacity

Similar to throughput, capacity is a less common metric related to how much traffic an intersection, arterial segment or freeway segment can handle. It may be possible to gather field capacity data during oversaturated conditions using manual counts, video detection or other methods. Oftentimes, the analyst will indirectly adjust the capacity as part of the calibration process, therefore capacity may not be a suitable validation MOE. WisDOT *should* approve capacity as an acceptable MOE for model validation prior to its use.

3.1.13 Routing

Vehicle routing checks may be a qualitative exercise based on a project team's familiarity with a corridor, more of a quantitative exercise supported by O-D or demand modeling data, or a combination of both. Although a critical component of model calibration, vehicle routing checks *should not* be the primary model validation MOE.

3.2 Number of MOEs for Validation

3.2.1 Primary vs. Secondary MOEs

The project team *should* discuss, in detail, the type and number of MOEs to use for model validation with WisDOT regional traffic staff during the scoping of a project as they may have a significant effect on the project budget, schedule and resource needs. Involve BTO-TASU, and other key stakeholders, in these discussions as appropriate.

The factors that influence the number of MOEs required for microsimulation model validation may include data availability and quality as well as project type, geometric conditions, traffic patterns, and levels of existing and anticipated congestion. The capabilities of the applicable microsimulation software may have implications on the MOEs. For example, SimTraffic has fewer capabilities when it comes to reporting weaving volumes and routing metrics than Vissim, thus these MOEs may not be appropriate for a SimTraffic model.

To assist in formulating recommendations on the type and number of MOEs to use for model validation from the least to most complex models, each MOE (see [TEOpS 16-20-3.1](#)) has either a "primary" or "secondary" designation. The validation checks for all models, regardless of the model complexity, **shall** always include a

comparison of traffic volumes. Thus, traffic volumes do not have an associated primary or secondary designation.

The primary MOEs include spot speeds, segment speeds, travel times and intersection queue lengths. The secondary MOEs include intersection queue lengths, lane utilization, weaving, and any other MOE that a project team *may* request for approval (such as intersection delay, throughput, etc.) based on available data. Depending on the purpose and objectives of a project, intersection queue lengths may be either a primary or a secondary MOE. Table 3.1 shows the primary and secondary MOE designations.

Table 3.1 Summary of MOEs for Model Validation

| Metric (MOE) | MOE Designation | <p>Summary of MOEs for Model Validation</p> <ul style="list-style-type: none"> • 3 to 4 Primary • 2 to 3 Secondary • 6+ Upon WisDOT Approval |
|--------------------------------------|---------------------------|--|
| Link and/or Turning Movement Volumes | Required for all projects | |
| Segment Speeds | Primary | |
| Spot Speeds | Primary | |
| Travel Times | Primary | |
| Intersection Queues | Primary or Secondary | |
| Lane Utilization | Secondary | |
| Weaving Volumes | Secondary | |
| Density | Secondary Upon Approval | |
| Intersection Delay | Secondary Upon Approval | |
| Bottleneck Locations | Secondary Upon Approval | |
| Throughput | Secondary Upon Approval | |
| Capacity | Secondary Upon Approval | |
| Routing | Secondary Upon Approval | |
| Others? | Secondary Upon Approval | |

3.2.2 Scoring System

The number of MOEs required for validation will vary depending on the complexity of the traffic model, which is dependent on the project type, project scope, corridor type, traffic control, roadway congestion level and type of microsimulation tool used for analysis. To quantify the complexity of the traffic model (specifically a microsimulation traffic model), the department worked with a consultant to establish a scoring system. The same scoring system is applicable for determining the number of MOEs required for validation and defining the level of peer review required. Refer to [TEOpS 16-25-2](#) for details on the model complexity scoring system.

Figure 3.1 provides an illustration of the traffic model level of complexity scoring system. Use Figure 3.1 in conjunction with the Traffic-Model Complexity Scoring Template (a Microsoft Office Excel based worksheet) provided in [Attachment 3.1](#) to develop the overall complexity score for the traffic model. The project team's traffic lead or project manager, in coordination with WisDOT regional traffic staff, *should* complete the scoring template.

The overall traffic model complexity score defines the minimum number of MOEs required for model validation for the project. Depending on data availability, and the project objectives, it might be appropriate to use more than the minimum required MOEs for model validation. Ultimately, it is up to WisDOT regional traffic staff to define the type and number of MOEs to use for model validation. Refer to Table 3.2 for the complexity score associated with each MOE requirement level.

When assessing the complexity of the traffic model and number of MOEs needed for model validation, keep in mind that, due to modified roadway geometry, increased traffic volumes, reduced levels of congestion, etc., it is possible for the model complexity score to be different under future alternative scenarios than it is under existing conditions. Therefore, it is critical to consider both existing conditions and potential future alternatives (including levels of service) when defining the traffic model complexity score and the associated number of MOEs. The highest traffic model-complexity-score across all of the scenarios (existing and future alternatives) dictates the number of primary and/or secondary MOEs required for base model validation.

Figure 3.1 Traffic Model Complexity Scoring Diagram

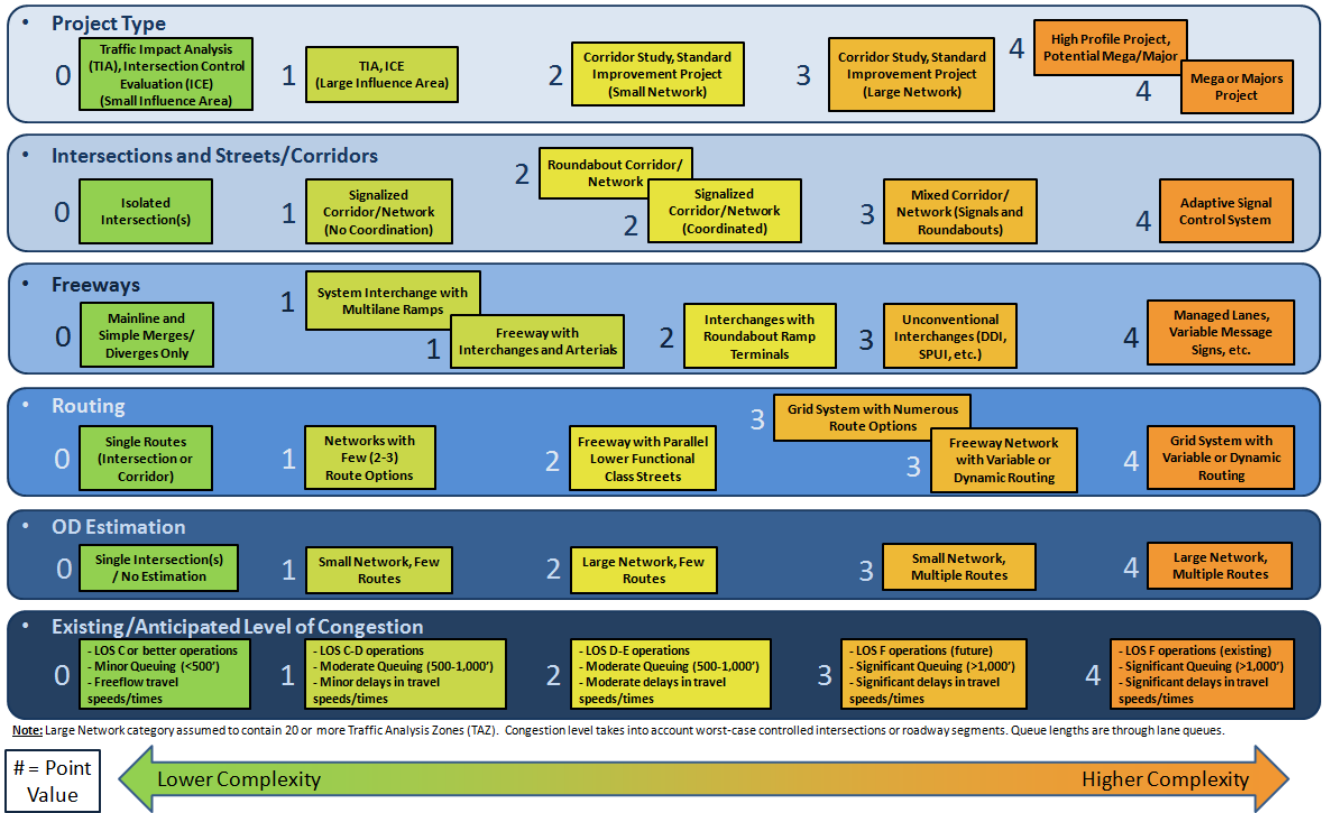


Table 3.2 Number of MOEs Required for Model Validation

| Model Complexity Score (a) | Minimum # of MOEs Required for Model Validation (b) |
|----------------------------|---|
| 0 – 3 | 1 to 2 Primary MOEs |
| 4 – 7 | 1 to 2 Primary MOEs 1 Secondary MOE |
| 8 – 10 | 2 to 3 Primary MOEs 1 Secondary MOE |
| 11+ | 2 to 3 Primary MOEs 1 to 2 Secondary MOEs |

(a) Model complexity score from the Traffic Model Complexity Scoring Template, [Attachment 3.1](#)
 (b) Minimum MOEs are those in addition to link and/or turning movement traffic volumes

Use the scores and recommendations shown in Table 3.2 as a guide only. Professional judgment and coordination with WisDOT staff needs to factor into the decisions on the number and type of MOEs to use for validation of the traffic microsimulation model. Document all assumptions and decisions regarding the number and type of MOEs to use for model validation within the modeling methodology report and/or other project memoranda as appropriate.

LIST OF ATTACHMENTS

[Attachment 3.1](#) Traffic Model Complexity Scoring Template

16-20-4 Microsimulation Analysis Software

4.1 WisDOT Supported Software

WisDOT currently supports the use of the following programs for microsimulation traffic analysis:

- SimTraffic Version 10, Trafficware
- Quadstone Paramics Version 6, Pitney Bowes (effective January 1, 2018, WisDOT will no longer support)
- Vissim Version 10, PTV Group

Use the most current build number for the software listed above (e.g., SimTraffic 10.1.2.20, Paramics 6.9.3, Vissim 10.03). However, please contact BTO-TASU for consideration of the use of different versions of the software (e.g., SimTraffic 9 vs. SimTraffic 10, Vissim 9 vs. Vissim 10). Do not switch from one software platform to another without first consulting with BTO-TASU. [TEOpS 16-20-11](#) provides additional information on when to consider upgrading the software for a microsimulation model that has either already been completed or is in the process of being developed.

4.2 SimTraffic Overview

Trafficware, a company based out of Sugar Land, Texas, is the developer for both SimTraffic and its companion software Synchro. SimTraffic is the microsimulation platform and Synchro is the macroscopic (or deterministic) platform. Trafficware typically releases major updates to the Synchro/SimTraffic Studio every two to three years.

The Synchro platform is the primary mechanism for drawing the roadway network and coding in several of the parameters for roadway geometry and traffic control. The SimTraffic platform is where the analyst can code in various driver behavior and vehicle characteristics. Both SimTraffic and Synchro use a link-node structure. SimTraffic tracks every vehicle in the traffic system on a 0.1-second interval. Typical MOEs available through SimTraffic include travel time, vehicle queues and intersection delay.

WisDOT only accepts SimTraffic for arterial analysis and this software is best suited for signalized corridors. Often times, the analyst will use SimTraffic to observe driver behavior and conduct a “reality check” on the Synchro outputs. SimTraffic may also be beneficial for reporting the vehicle queues, especially when vehicles spill-out of the turn lane and block through traffic. If the primary purpose of the SimTraffic model is to conduct “reality checks”, calibration and validation of the traffic model may not be necessary. However, prior to using the model outputs from SimTraffic (or any other microsimulation analysis tool) for project or study decisions, especially any related to critical aspects of the design, the analyst **shall** calibrate and validate the model in accordance with [TEOpS 16-20-5](#) and [TEOpS 16-20-8](#), respectively.

4.3 Quadstone Paramics Overview

Pitney Bowes Software provides support for the microsimulation software Quadstone Paramics from their international office out of Oxfordshire, England. The last update for Paramics occurred in 2012, and it is unclear whether Pitney Bowes Software has plans to release any future updates.

Paramics uses a link-node structure. It is best suited to freeway modeling, and is distinguished by its relatively quick and easy model coding, though this is counterbalanced (and ultimately outweighed) by its lack of detail for simulating complex arterials and its aging usability. Typical MOEs available through Paramics include travel time, speed, vehicle queues, intersection delay, and density. MOE extraction typically happens through the Analyser module.

Effective January 1, 2018, WisDOT will no longer support the use of Paramics on any new projects. Projects that initiated the microsimulation traffic analysis using Paramics prior to January 1, 2018 *may* continue to use Paramics for the duration of the project. However, if the traffic mode requires major revisions (e.g., the analyst has to update the traffic model to reflect different existing conditions), or if the traffic model is more than three years old, the analyst *should* consider switching the traffic models over to Vissim. Consult with the WisDOT regional traffic contact and/or BTO-TASU to determine whether it is appropriate to switch software platforms.

4.4 Vissim Overview

The PTV Group, a company based out of Karlsruhe, Germany (with U.S. offices in Oregon and Virginia), is the developer for the microsimulation software Vissim. The PTV Group typically releases major updates to the Vissim software once a year.

Vissim uses a link-connector structure. Vissim can model any facility, though it is especially known for being able to accurately represent complex arterial corridors. It provides great flexibility, but can be time-consuming to use for modeling due to the many aspects of the software that enable that flexibility. Vissim has many parameters to

adjust and ways to replicate real-world driver behaviors, leading to its applicability in almost any situation where deterministic tools and SimTraffic are not sufficient. Typical MOEs available through Vissim include travel time, speed, vehicle queues, intersection delay, and density, though Vissim provides ways to get data from the simulated vehicles at any granularity.

4.4 Other Microsimulation Software

Microsimulation analysis requiring the support, review and/or input from BTO **shall** use one of the WisDOT supported microsimulation software packages. BTO-TASU conducts periodic reviews/evaluations of the microsimulation tools to assess the need to add and/or remove microsimulation tools to/from WisDOT's traffic analysis toolbox. Please contact BTO-TASU, via the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox to request consideration of additional microsimulation software tools.

4.5 Selecting a Microsimulation Software

Consider the needs of the project along with the strengths and limitations of the software when selecting the most appropriate tool to use for developing the microsimulation model. In general, if you already have a Synchro model and/or you are looking at a relatively small scale/simple arterial network, consider the use of SimTraffic. All other scenarios, specifically freeway models, will generally require the use of Vissim for microsimulation analyses. Effective January 1, 2018, do not initiate any new microsimulation analyses using Paramics.

Document the rationale for choosing the selected microsimulation software tool in the Traffic Analysis Tool Selection memoranda and submit to the WisDOT regional traffic staff for approval.

16-20-5 Microsimulation Model Calibration

January 2018

5.1 Introduction

Calibrating a traffic model requires the analyst to review and possibly adjust various model parameters (e.g., global and local headway and reaction times, driver aggressiveness, etc.) to get the traffic model to reproduce conditions observed in the field. Failure to calibrate a microsimulation model properly can produce unrealistic or misleading results. Therefore, prior to using the microsimulation model outputs for critical design decisions, the analyst **shall** calibrate the traffic model.

5.2 Calibration Process

The model calibration process is often very complex, labor intensive and resource intensive and may take more time to complete than the initial development of the traffic model. Modifications to the input parameters in one component of the traffic model may have unexpected impacts in other areas of the traffic model. Skipping the model calibration process is not permissible and there is no shortcut to completing model calibration. However, applying the following principles will provide structure and efficiency to the calibration process.

By definition, a model is a simplified representation of reality and no model can reproduce reality perfectly. When developing the model, the analyst *should* strive to balance model perfection with practicality. To help achieve this balance, BTO-TASU developed both quantitative and qualitative validation thresholds for microsimulation models that are dependent on the purpose and need of the traffic model. See [TEOpS 16-20-8](#) for additional details on the WisDOT microsimulation validation thresholds.

5.2.1 Global, Categorical and Local Calibration Factors

The analyst can apply and modify the input parameters within a microsimulation model on a global, categorical or localized level. For the purposes of WisDOT policy, global, categorical and localized calibration factors have the following definitions:

- Global Factors: Global factors are those factors/parameters that affect the entire model.
- Categorical Factors: Categorical factors are those factors/parameters that affect a category of the links within the model (e.g., every off-ramp, all weaving segments, major street signalized intersection approaches, etc.).
- Localized Factors: Localized (or link-specific) factors are those factors/parameters that only influence vehicles while they are driving on a link, a short series of connected links, or through a specific intersection within the model.

When calibrating a traffic model, the analyst *should* adjust the global and categorical, parameters first, and *should* use localized/link-specific factors sparingly and only for the final fine-tuning of the model. Document and justify the

use of any localized/link-specific factors by associating them to limitations of the microsimulation software or specific geometric conditions that may influence driving behavior (e.g., a short weaving segment). Relating the localized adjustment factors to geometric conditions or software limitations makes it easier to assess whether to carry the adjustments forward from existing year to alternative scenarios.

5.2.2 Unreleased, Blocked, Stuck/Stalled Vehicles

For purposes of WisDOT policy, unreleased, blocked and/or stuck/stalled vehicles have the following definitions:

Unreleased Vehicles: Unreleased vehicles represent those vehicles that were able to enter the network but were unsuccessful in traveling through the model and were thus not able to exit the network. Typically, the presence of unreleased vehicles results in a downstream traffic volume undercount and gives the false impression that downstream operations are better than they actually are.

Blocked Vehicles: Blocked vehicles are those vehicles that are unable to enter the network at their desired time due to downstream vehicle queues. When vehicle blockage occurs, the traffic model will not be able to capture the true demand on the system and will thus not be able to accurately report out MOEs such as delay and vehicle queues. If the vehicle blockage in the model matches field conditions, it may be necessary to extend the link and/or temporal limits of the model in order to accommodate the entire queue (i.e., congestion). See [TEOpS 16-20-2](#) for additional details on the spatial and temporal model limits.

Stuck/Stalled Vehicles: Stuck or stalled vehicles are vehicles that unexpectedly slow or stop partway through their route. They can cause backups that do not exist in the field.

The presence of unreleased, blocked and/or stuck/stalled vehicles within the traffic model is an indicator of congestion within the model, but may also be a sign of a serious model calibration problem. When calibrating the traffic model, the analyst *should* consider the magnitude and location of the blocking that occurs. If the blocking occurring in the traffic model does not reflect field conditions, or does not meet expectations, reevaluate the spatial and temporal model boundaries, warm-up/cool-down factors and demand profiles (see [TEOpS 16-20-2.1](#)) as they may have a direct effect on issues related to blocked vehicles. It may not be necessary, or realistic, to prevent blocking of all vehicles, specifically for the design year, no-build or FEC constrained scenario.

Paramics and Vissim both contain features that allow the analyst to specify a maximum allowable time a vehicle can remain in the same position before removing the stuck/stalled vehicle from the model as if it never existed. The terminology is “blockage removal” for Paramics and “diffusion” for Vissim. Using these features leads to undercounting vehicles and is not realistic. The use of these features in the pre-calibration model building can be helpful, but it is not acceptable for a final calibrated model.

5.2.3 O-D Matrix Estimation

Oftentimes the analyst *may* use a separate O-D matrix estimating software (e.g., Cube by CITILABS, TransCAD by Caliper, Visum by PTV Group, etc.) to develop the O-D matrices for the microsimulation models. Use of a O-D matrix estimating software that is separate from the microsimulation model may be useful, as it will allow the O-D matrix to reflect true demand without influence from network coding problems. However, intersection or other network coding errors within the microsimulation model may affect throughput such that the microsimulation model outputs may not reflect the same volumes as those developed by the O-D matrix estimation tool. Therefore, for preparing the model validation checks, the analyst **shall** run the volumes through the network using the primary modeling software. It is not acceptable to prepare the model validation checks using statistics from the O-D matrix estimation software.

5.3 Traffic Volume Balancing

Usually the available traffic data for a microsimulation study area is unbalanced. For example, starting at an Automatic Traffic Recorder (ATR) station on a freeway mainline and proceeding in the direction of travel, adding the raw on-ramp volumes and subtracting the raw off-ramp volumes, the result will almost never match the volume measured at the next downstream ATR. This happens for three main reasons:

- Often, due to limited resources, it may be necessary to collect intersection and/or ramp traffic counts for multiple locations along the corridor at different times and/or on different days.
- There are inherent imperfections in the data collection process. For example, if a vehicle is changing lanes as it drives over a detection loop, the detector loop could count the vehicle twice (or not count it at all) or, with respect to microwave detectors, a larger vehicle could occlude a smaller vehicle making the smaller vehicle undetectable.

- Data collected manually (such as intersection turning counts) is subject to human error.

Microsimulation models cannot account for these imperfections, so the analyst *should* balance the data to create a mathematically consistent volume set. In general, the analyst *should* use balanced volumes as the traffic volume targets for the existing conditions model. The use of balanced volumes usually removes statistical outliers from the target volume set, making it easier to achieve validation targets.

On arterials and other corridors that are not access controlled, to account for traffic generated by developments located between intersections, it may be necessary to include side or “dummy” zones in the model.

The analyst *should* use a “soft” balancing process to make sure that the development along the corridor can account for any variation in traffic volumes between intersections. Soft balancing means that the volume entering each intersection is comparable to the sum of the volumes leaving the intersections that feed it. Hard balancing, on the other hand, requires the entering volume to equal (exactly) the sum of the relevant upstream volumes (as is the case for an access-controlled facility). Soft balancing is generally acceptable for SimTraffic; however, Vissim and Paramics require the use of hard balancing.

5.4 Vehicle Characteristics and Classification

When coding and calibrating the traffic model, it is important to verify that the vehicle composition (vehicle type, classification, operating characteristics, etc.) included in the model accurately represents that which is present in the project study area.

When available, the analyst *should* use field data to determine the appropriate vehicle mix or classifications, specifically as it pertains to the volume or percentage of heavy vehicles, buses, high-occupancy vehicles (HOVs), pedestrians/bicycles and other vehicle types included in the analysis. Oftentimes the microsimulation model will use separate demand profiles and/or O-D matrices for heavy trucks and passenger vehicles. However, depending on the project purpose, it may be necessary to have additional demand profiles and/or O-D matrices for other travel modes as well.

The format for entering in the specifics on vehicle characteristics and classifications varies depending on the microsimulation software package. However, most software packages have predefined default values that specify various vehicle characteristics including, but not limited to, vehicle length, vehicle acceleration/deceleration rates and vehicle occupancy. The default values are a good starting point; however, the analyst *should* adjust the default values as appropriate to reflect local conditions.

For SimTraffic, the default values are automatically included as part of the initial model set-up. Paramics and Vissim, however, require the analyst to load in the vehicle characteristics files. For Vissim, the analyst *should* use the North American Fleet default values for the initial input values and adjust them as appropriate. For Paramics, use the Wisconsin-specific vehicle fleet file housed by BTO-TASU as the initial starting point. Please contact BTO-TASU via the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox to request a copy of the Wisconsin-specific vehicle fleet file for Paramics.

5.5 Route Assignment

The analyst *should* develop the route assignment in coordination with WisDOT regional traffic staff, BTO-TASU and other key stakeholders as appropriate.

16-20-6 Calibration Parameters and Simulation Settings

January 2018

6.1 Overview

Microsimulation models contain many adjustable parameters, and the relevant adjustments vary for each software package. If a model fails to satisfy the validation thresholds, it is essential for the analyst to adjust the appropriate parameters to correct the situation. For example, adjusting driver aggressiveness or link cost factors will not successfully compensate for a flawed O-D matrix. The user manuals and technical support service for each software product provide some guidance on calibration parameters, but these sources may not be privy to the local or specific characteristics for the project study area. Local peer/user groups such as the ITE Simulation and Capacity (SimCap) user group or other independent experts with experience in the relevant software may also provide valuable insight with respect to which model calibration parameters to adjust during the calibration process.

The following text provides details on the key parameters of the traffic model that the analyst *should* consider during the model calibration process. The guidance below is specific for SimTraffic, Paramics and Vissim; however, the general principles are applicable for all microsimulation software packages. This list is not all-inclusive and *should* only serve as a guide to the project team.

6.1.1 Network Coding

Network coding establishes the horizontal and vertical geometry of the roadway network, including intersection spacing and roadway curvature. Network coding also includes appropriate use of settings such as link free-flow speed and turning speeds.

6.1.2 Intersection Traffic Control and Ramp Metering

Intersection controls are devices that regulate traffic flow at intersections (e.g., signals, roundabouts, stop control and ramp meters). Elements of the signals/ramp meters may include the controller type, detector placement, signal heads, signal groups, coordination between signals, signal phasing and/or signal/ramp meter-timing plans.

6.1.3 Closures, Restrictions and Incidents

Closures represent temporary or permanent roadway segment, link, or lane closures (i.e., traffic is restricted from using that particular roadway segment, link, or lane). Restrictions represent links or lanes where travel is restricted, either temporarily or permanently, to specific vehicle types (e.g., lanes designated for HOV or lanes restricting truck use). Incidents include simulated vehicle breakdowns, crashes, etc.

6.1.4 Entrance Ramps

Entrance ramps or freeway merge areas typically require careful coding in microsimulation. This section generally refers to parallel freeway entrance ramps, although there are instances where this feature is appropriate for arterials as well. The reviewer *should* review the lane utilization upstream of the entrance ramp, the aggressiveness of the merging vehicles (e.g., minimum time on entrance ramp, driver headway factors), and the length of the acceleration lane and/or taper parallel to the entrance ramp.

6.1.5 Lane Use Parameters

Lane use parameters control the amount and/or destination of the traffic using each lane. A typical application of these parameters is to pre-position vehicles in advance of a fork in the road.

6.1.6 Zone Structure/Vehicle Inputs

Zone structure and vehicle inputs define where and how traffic is loaded into the network.

6.1.7 O-D Matrices, Demand Profiles & Time Periods

O-D matrices contain the network demand patterns (number of trips traveling between each pair of zones). Time periods and demand profiles control the timing for the release of vehicles into the network (e.g., are the vehicles released at a steady rate or at a gradually increasing/decreasing rate). In some cases, it is necessary to use multiple O-D matrices and/or demand profiles (e.g., there may be one matrix for cars and a second matrix for trucks).

6.1.8 Core Simulation Parameters

Core simulation parameters affect fundamental aspects of vehicle behavior in the network, such as driver aggressiveness and the willingness to merge into small gaps. Default values are acceptable for some parameters, but other parameters require project- or area-specific values.

6.1.9 Routing Parameters/Vehicle Routes

Routing parameters influence the way vehicles travel through the network. If coded improperly, these controls can cause unrealistic or erratic routing.

6.1.10 Vehicle Types and Proportions

The proportion and types of vehicles (such as trucks, buses and HOVs) influences the overall performance of each part of the network.

6.1.11 Stuck/Stalled Vehicles

Stuck or stalled vehicles are vehicles that unexpectedly slow or stop partway through their route. They can cause backups that do not exist in the field.

6.1.12 Special Features

Special features include site or study-specific items such as the use of detectors, car parks, variable message signs, special purpose lanes, speed harmonization, public transit routes, toll lanes, toll plazas, pedestrian modeling, special graphics, plugins or scripts, among others.

6.2 SimTraffic Calibration Parameters

6.2.1 Interval Settings

A critical component of performing a SimTraffic simulation is to set up appropriate simulation intervals. The default settings for the simulation interval include a 3-minute seeding period and a 10-minute analysis period. To be more compliant with HCM analysis methodologies and common microsimulation practices, the modeler *should* extend the seeding period and analysis period beyond these default values. WisDOT recommends using the interval settings setup shown in Table 6.1 for SimTraffic simulation models if SimTraffic is one of the project's official traffic analysis tools (i.e., the project will rely on SimTraffic volume and operation reports to make critical decisions).

The interval setting shown in Table 6.1 are not necessary for applications such as conducting reality checks on Synchro outputs, creating videos for public involvement or performing a high-level screening of an alternative. For high-level applications, a seeding period and one 15-minute analysis interval may be appropriate.

Table 6.1 Recommended Interval Settings for SimTraffic

| Interval | Seeding | Recording | Recording | Recording (Peak)* | Recording |
|--|--|-----------|-----------|-------------------|-----------|
| Duration | 7 mins** | 15 mins | 15 mins | 15 mins | 15 mins |
| PHF Adjust | No | No | No | Yes | No |
| Anti-PHF Adjust | No | Yes | Yes | No | Yes |
| Random Seed | Non-zero for repeatable results; Zero for random seeding | | | | |
| *Peak 15-minute interval is recommended to be the 2nd or 3rd interval in the simulation. | | | | | |
| **Seeding interval <i>should</i> be long enough for one vehicle to travel through the network or longer than the maximum cycle length in the network, whichever is greater | | | | | |

6.2.2 Parameter Discussion

[Attachment 6.1](#) provides a list of the parameters, along with recommended ranges, that the modeler will typically adjust while calibrating a SimTraffic model. This list provides a good starting point for the parameter value adjustment. A complete list of the adjustable parameters for SimTraffic is available on the [BTO, Traffic Analysis, Modeling and Data Management](#) webpage. Unless field data supports doing otherwise, modify only those parameters recommended as settings to adjust. Obtain WisDOT staff approval prior to modifying non-recommended adjustment parameters.

Refer to the *Synchro Studio 10 User Guide* (4), for some tips on calibrating a SimTraffic model. Departing from the Synchro/SimTraffic defaults may not be necessary to validate modeled traffic volumes at moderately congested locations. However, at highly congested locations, it may be necessary to modify the Synchro/SimTraffic defaults to calibrate and validate the traffic model. If validating to intersection queue data, the analyst may need to make minor adjustments to settings such as turning speeds (based on geometry of the intersection) or local headway factors (change in small increments only to improve the locations with long queues).

6.2.3 Common Errors and Warnings

Chapter 23 of the *Synchro Studio 10 User Guide* (4) provides a list of common errors and warning messages along with potential causes and tips for resolving the issues. This list of common errors and warnings may serve as a beneficial resource during the calibration process.

6.3 Paramics Calibration Parameters

WisDOT is currently phasing out the use of Paramics. As noted in [TEOpS 16-20-4.3](#), effective January 1, 2018, WisDOT will no longer support the use of Paramics on any new projects. However, projects that initiated the microsimulation traffic analysis using Paramics prior to January 1, 2018 *may* continue to use Paramics for the duration of the project (although the analyst should consider switching the traffic models over to Vissim if major revisions to the traffic model is necessary or if the model is more than three years old). As such, it is possible that Paramics will still be in use in Wisconsin for several more years necessitating the need to provide some guidance on calibrating Paramics models, specifically for the alternative model development.

[Attachment 6.2](#) provides a list of the parameters, along with recommended ranges, that the modeler will typically adjust while calibrating a Paramics model. This list provides a good starting point for the parameter value adjustment. A complete list of the adjustable parameters for Paramics is available on the [BTO, Traffic Analysis, Modeling and Data Management](#) webpage. Unless field data supports doing otherwise, modify only those parameters recommended as settings to adjust. Obtain WisDOT staff approval prior to modifying non-

recommended adjustment parameters.

The following typically-used parameters all have direct impacts on model performance. Since different methods with multiple parameter combinations may exist to calibrate a specific modeling condition in Paramics, the analyst *should* first adjust the global parameters and then, only if necessary, adjust the local parameters. As noted in [Attachment 6.2](#), the analyst *should* adjust several of the global and local parameters, such as the dynamic feedback routing factors, in small increments. Apply local adjustment factors (e.g., link-specific headway and reaction time factors) sparingly.

6.3.1 Introduction

This section contains suggested calibration parameter settings based on Wisconsin experience with Paramics. The use of these suggestions may help achieve a well-functioning model more quickly, but do not guarantee success.

6.3.2 Mean Target Headway

Headway is the time between two successive vehicles as they pass a point on the roadway, measured from the same common feature of both vehicles (for example, the front axle or the front bumper). As vehicles drive closer together, the headway decreases and the throughput of the roadway increases. A related concept is the gap, which is the time or distance from the back bumper of the first vehicle to the front bumper of the second vehicle.

Several vehicle behaviors depend on the minimum headway vehicles are willing to accept. An example is the smallest gap that a vehicle will accept when it merges or changes lanes. In Paramics, the MEAN TARGET HEADWAY coefficient strongly influences this behavior.

In effect, reducing the MEAN TARGET HEADWAY coefficient makes vehicles drive more aggressively and increases capacity. Therefore, base any adjustments to this coefficient on the prevalent driving style in the study area. People tend to drive more aggressively in big, congested cities than they do in uncongested rural areas or small towns. As such, use the following as the initial starting point for the MEAN TARGET HEADWAY

- Urban areas: 0.85 to 0.90
- Small Cities: 0.90 to 0.95
- Rural areas: 0.95 to 1.00

Provide documentation and justification for any deviations in these settings in the modeling methodology report.

6.3.3 Generalized Cost Coefficients

Many Paramics networks have situations where vehicles can use more than one route between a given origin and destination. The generalized cost coefficients have a strong influence on the route choice algorithm in the model. These coefficients determine how much weight to assign to time, distance and toll price.

By default, Paramics assumes that such decisions are made 100% based on time, but the coefficients can (and *should*) be adjusted to take distance and tolls into consideration.

For routes without tolls, use the following coefficients:

- 0.667 Time
- 0.333 Distance

Wisconsin does not currently have any toll roads; as such, the toll price cost coefficient is generally not applicable.

6.3.4 Ramp Calibration

Several global and localized parameters affect ramp performance. The following offers some general principles to consider when calibrating the Paramics model to ensure realistic ramp operations.

- Driver gap acceptance is a controlling parameter concerning the operation of ramps. As such, the model timestep settings may affect the ramp performance.
- Increasing ramp length and decreasing minimum ramp time have about the same effect.
- When calibrating the ramps, first adjust ramp aware distance and minimum ramp time leaving any adjustments to local ramp headway factors to the end of the process.
- Generally, leave the local ramp headway factor set to 1.00.
- Unless field conditions indicate otherwise, implement the same settings for all other ramps in the network.

6.3.5 Truck-Related Coefficients

WisDOT recommends using “HEAVIES USE ALL LANES” for Wisconsin Paramics models to spread trucks out into all mainline lanes. Wisconsin does not require trucks to stay in the right lane.

6.3.6 Vehicle Fleet

Use the Wisconsin-specific vehicle fleet file housed by BTO-TASU as the initial starting point for the vehicle fleet and adjust as appropriate to reflect the project-specific conditions. Please contact BTO-TASU via the DOT Traffic Analysis & Modeling(DOTTrafficAnalysisModeling@dot.wi.gov) mailbox to request a copy of the Wisconsin-specific vehicle fleet file for Paramics.

6.4 Vissim Calibration Parameters

Given the complex and iterative nature of model calibration and the large number of calibration parameters provided in Vissim, it is a good practice to start calibration using parameters that a modeler is certain about based on field data or experience. If additional calibration is still necessary, the analyst *may* move to parameters that they are less certain about but willing to experiment with different values. [Attachment 6.3](#) provides a list of the parameters, along with recommended ranges, that the modeler will typically adjust while calibrating the Vissim model. This list provides a good starting point for the parameter value adjustment.

The following typically-used parameters all have direct impacts on model performances. Since different methods with multiple parameter combinations may exist to calibrate a specific modeling condition in Vissim, the analyst *should* first adjust the global parameters and then, only if necessary, adjust the local parameters.

6.4.1 Vehicle Fleet

Use the “North American” vehicle compositions from PTV Group for the initial input values. Based on local project conditions and road types included in the model, it may be necessary to refine or adjust the vehicle classifications (e.g., it may be best to remove the AASHTO WB67D/WB65 tractor and trailer from the fleet when simulating downtown or small neighborhood streets). Direct any specific questions on adjusting the vehicle fleet in Vissim to BTO-TASU via the DOT Traffic Analysis & Modeling(DOTTrafficAnalysisModeling@dot.wi.gov) mailbox.

6.4.2 Simulation Step

In most cases, use 10 seconds per simulation second.

6.4.3 Car Following Model for Freeways

For freeway segments, apply the Wiedmann 99 car following model. Standstill distances (CC0), headway time (CC1) and following variation (CC2) have significant impacts on the car following behaviors. Higher values represent more cautious driving behaviors and lower roadway capacity.

6.4.4 Car Following Model for Urban Arterials

For urban arterials, apply the Wiedmann 74 car following model. Higher values of average standstill distance, additive part of safety distance and multiplicative part of safety distance means more distance between vehicles and therefore lower roadway capacity.

6.4.5 Lane Change Parameters

Lane change parameters are the same for both freeway and arterial segments and the analyst *should* adjust them to match field conditions, especially at merging, diverging and weaving areas.

6.4.6 Local Car Following and Lane Change Parameters

Additional car following and lane change parameter sets can be defined separately as global settings and then only applied for local links and connectors where driving behaviors are different from global definitions.

6.4.7 Connector Lane Change Distance

The default lane change distance for all connectors is 656 feet and is typically representative of arterials. The analyst can, and *should* adjust the default lane change distance higher or lower as needed, especially for freeways and closely-spaced intersections. Additionally, there is an option to have this lane change distance increase for each lane that a vehicle must cross to travel via the connector. The analyst *should* adjust the lane change distance parameters to avoid unrealistic repositioning and last-minute lane-changing behavior that may arise.

6.4.8 Other Adjustable Parameters

A complete list of the adjustable parameters for Vissim is available on the [BTO, Traffic Analysis, Modeling and Data Management](#) webpage. Unless field data supports doing otherwise, modify only those parameters recommended as settings to adjust. Obtain WisDOT staff approval, prior to modifying non-recommended adjustment parameters.

LIST OF ATTACHMENTS

| | |
|--------------------------------|-----------------------------------|
| Attachment 6.1 | SimTraffic Calibration Parameters |
| Attachment 6.2 | Paramics Calibration Parameters |
| Attachment 6.3 | Vissim Calibration Parameters |

16-20-7 Simulation Runs

January 2018

7.1 Need for Multiple Simulation Runs

Real-world traffic varies considerably from day to day, and even from minute to minute. Microsimulation models attempt to mimic this effect by using stochastic (randomized) variables to account for variations in driver behavior and departure time. The source of this stochasticity is an algorithm within the microsimulation software package known as a pseudo-random number generator. Since purely random generation of numbers is mathematically problematic, pseudo-random number generators require a seed that initiates the underlying algorithm. This algorithm then generates a stream of millions or more apparently random numbers, which determine the release pattern of vehicles (i.e., how many and when) and the distribution of driver characteristics such as speed, among others, for each microsimulation model run. If the microsimulation software is functioning correctly, two model runs with the same seed will produce identical results.

If the analyst were to conduct only one run of the simulation model, there would be no way to assess whether the model was a good representation of reality as, depending on the seed value and the validity of the model, the results could represent a typical day, an abnormal day or they could misrepresent reality altogether. Running multiple runs of the model with different seed values allows the analyst to get a better sense as to whether the model results accurately reflects the range of traffic conditions encountered in the real world. Thus, during the calibration and validation process, the analyst **shall** complete multiple simulation runs.

7.2 Simulation Seeds

Microsimulation software packages use many different types of pseudo-random number generating algorithms, potentially including multiple options within each package, but due to their pseudo-random nature, every type of algorithm will eventually begin to repeat if left running continuously. At the point of repetition, the algorithm will start generating the same stream of numbers in the same order. With certain types of pseudo-random number generators, the seed type can dictate the length of the resulting stream of numbers; zero and even numbers can cause some algorithms to repeat quickly or have other undesirable effects. Out of an abundance of caution, WisDOT has historically and will continue to require the use of prime numbers as seeds.

The purpose of this policy is to assure the uniform use of prime numbers as seeds, provide transparency and allow for the reproducibility of results. It has long been good modeling practice to record the seed number associated with each model run, but this has never been a formal requirement. With adoption of the formal peer review policy (see [TEOpS 16-25](#)), it has become necessary to document how the results recorded can be replicated. To ease this process and ensure consistency statewide, WisDOT is specifying the use of the seed values listed in [Table 7.1](#) for all traffic model scenarios. Typically, a calibrated model will not require more than 30 simulation runs. If there is a desire to conduct additional runs, the analyst *should* carefully weigh the potential benefits of conducting additional runs against the additional resource requirements. If, warranted, contact BTO-TASU via the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox to receive seed values for additional runs.

Table 7.1 Seed Values

| Run Number | Seed Value | Run Number | Seed Value | Run Number | Seed Value |
|------------|------------|------------|------------|------------|------------|
| 1 | 199 | 11 | 7 | 21 | 23 |
| 2 | 409 | 12 | 157 | 22 | 29 |
| 3 | 619 | 13 | 307 | 23 | 13 |
| 4 | 829 | 14 | 457 | 24 | 103 |
| 5 | 1039 | 15 | 607 | 25 | 193 |
| 6 | 1249 | 16 | 757 | 26 | 283 |
| 7 | 1459 | 17 | 907 | 27 | 373 |
| 8 | 1669 | 18 | 5 | 28 | 463 |
| 9 | 1879 | 19 | 11 | 29 | 28657 |
| 10 | 2089 | 20 | 17 | 30 | 514229 |

Notes:

- To simplify the process of running the models using the specified seed numbers (especially for Vissim), the seed numbers above represent prime numbers. The first ten runs are prime numbers that have an increment of 210 between each seed value. (To run the first ten runs in Vissim, enter the first seed (199) in the “Random Seed” box under Simulation>Parameters. Set the “Number of runs” to the desired number (up to 10), and then enter 210 as the “Random seed increment”. This allows Vissim to complete runs 1-10 with the seed values shown above.
- The SimTraffic simulation engine generates sequential seeds for multiple runs, the seed values shown above are **not** applicable

7.3 Number of Simulation Runs - Background

The purpose of this policy is to provide transparency and consistency with the determination of the number of simulation runs. Multiple forms of federal guidance exist on the number of simulation runs. FHWA’s [TAT III \(2\)](#), Appendix B, outlines a method for determining the number of model runs using the standard deviation of the model results, confidence level (typically 95 percent), confidence interval (suggested to be a multiple or fraction of the model standard deviation) and corresponding t-statistic (see Equation 13 in [TAT III \(2\)](#), Appendix B). The use of the t-statistic reflects the deviation from the normal distribution when there are a limited number of trial runs, typically less than 30. If the initial estimate of the minimum number of runs exceeds the number of runs completed, the analyst must conduct additional model runs and then update the number of runs equation in an iterative fashion until the number of runs completed is equal to or greater than the number of runs required.

The *Highway Capacity Manual 2010* (HCM2010) (5) provides a slightly different method for determining the number of required repetitions for stochastic simulation analyses. The HCM2010 (5) methodology identifies three factors that have an influence on the number of required repetitions: the amount of error allowed in the model results, the confidence level for the model results, and the model variability. This is a more explicit restatement of the methodology outlined in [TAT III \(2\)](#), and the final equation (see HCM2010 (5) Page 7-27, Equation 7-2) to determine the required number of runs is the same with the exception that the HCM2010 (5) methodology uses the z-score instead of the t-statistic. The *Highway Capacity Manual, 6th Edition: A Guide for Multimodal Mobility Analysis* (HCM6) (6) maintains this methodology (see HCM6 (6), Page 7-29, Equation 7-2).

The most recent national guidance on the minimum required number of runs is included as part of the [Guidance on the Level of Effort Required to Conduct Traffic Analysis Using Microsimulation](#) (7), published by FHWA in March 2014. The methodology outlined in this document uses field data to calculate the error tolerance. After completing several (5-10) initial model runs, the analyst can evaluate the number of required runs, and then, if necessary continue conducting additional model runs until the required number of runs is satisfied.

After reviewing the national guidance describe above, BTO-TASU chose to use the methodology outlined in the [FHWA 2014 Guidance](#) (7) as the basis for WisDOT’s policy on determining the number of simulation runs. The following details WisDOT’s policy regarding the number of simulation runs.

7.4 Number of Simulation Runs - Process

7.4.1 Selecting Test Location Sites

To complete the required number of runs calculations, the analyst **shall** select at least one representative location within the model study area for each peak period of analysis. A location is representative if it meets all of the following criteria:

- Lies within the area of interest associated with the purpose of the model
- Is on a facility of the highest or second-highest functional class being modeled
- Experiences higher-than-average traffic demand during the peak period being modeled

Given the data requirements spelled out below, the location(s) selected *should* have enough field data available to complete the required number of runs calculations.

The analyst *may* use the same location for more than one peak period provided it is representative of the peak period conditions. A location may be directional – that is, the location may reflect only the eastbound direction of a two-way facility. In fact, directional locations that match up with the peak traffic flows may be more representative than a location that reflects both directions of travel.

Although the minimum number of locations is one per peak period, for larger models, the analyst *should* include more than one location. A general rule would be to have one location per five miles of freeway or other principal arterial included in the model, with a practical upper limit of four locations per peak period.

7.4.2 Selecting the MOEs to Test

Volume, has historically been, the MOE used for calculating the required number of simulation runs. The national publications providing guidance on determining the number of runs cited in the simulation background ([TEOpS 16-20-7-3](#)) use volume in their examples. This may be because volume, in the past, has been the most data-rich MOE. Given advances in technology and data collection methodologies, WisDOT has other MOEs (such as travel time and speed) with sufficient field data that may be available for calculating the number of runs. Refer to [TEOpS 16-20-3](#) for details on other potential MOEs.

In general, the analyst has latitude in selecting the MOE to use for determining the number of runs. The analyst *should* use the same MOE for every location and peak period included in the number of runs evaluation. Volume remains a good starting point, though data availability, the nature of the facility, and the model purpose *should* play a role in the MOE selection.

7.4.3 Use of Field Data

Rather than determining *a priori* what level of error is acceptable when calculating the required number of runs, the analyst *should* compute the error tolerance based on the variability observed in field data. To assist with determining the error tolerance using field data and calculating the number of required runs, BTO-TASU developed a [Microsoft Excel based workbook](#).

The [number of runs workbook](#) requires the use of between 3 and 365 field data points, which the analyst would enter into the “Variability Analysis of Field Data” area of the workbook. To preserve the integrity of the test, the data entered **shall** be representative of the operating conditions that align with the purpose of the modeling effort. This permits filtering out data points with atypical conditions such as incidents or inclement weather when normal operating conditions are being modeled, while also requiring that only comparable situations be used where a special condition, such as an event at a stadium, is being analyzed. Selecting field data for entry in such a way as to unduly influence the resulting calculations, is not permissible.

The field data generates a margin of error, from which the spreadsheet then computes an error tolerance percentage. The workbook then uses this tolerance in combination with the initial model run results to calculate a required number of runs. Through thorough testing of the workbook, to account for the stochasticity inherent in the modeling processing, BTO-TASU set a minimum tolerance of one percent, even if the calculated tolerance from field data is lower. There is no upper limit to the tolerance.

7.4.4 Initial Simulation Runs

After entering the field data into the [number of runs worksheet](#), the analyst must perform a series of initial model runs to allow for comparisons between the field data and model result variability. Historically, seven runs have proven to be a sufficient number of runs to capture the variation observed in the field. It provides enough samples to run summary statistics on, and falls within the 5 to 10 initial runs recommended in the most recent national guidance. Accordingly, the analyst **shall** complete seven initial model runs.

To facilitate the consistent use of prime seeds, discussed above in [TEOpS 16-20-7.2](#), the “Initial Runs” portion of the [number of runs workbook](#) contains the seeds to use for each simulation run. Using prime number seeds in arithmetic sequence, or primes that are evenly spaced, substantially simplifies the process of running the models using the specified seed numbers, at least in Vissim. To run the initial seven runs in Vissim, enter the first seed, 199, in the “Random Seed” box under Simulation>Parameters. Set the “Number of runs” to 7, and then enter 210 as the “Random seed increment.” This allows Vissim to complete seven successive runs with the appropriate seed values.

After the model runs are complete, enter the results from the first location for the selected MOE for the peak hour of the first peak period into the [number of runs workbook](#). The workbook will automatically eliminate any statistical outliers (at the 95% confidence level), and will update the number of valid (non-outlier) runs accordingly. For additional information on how to address outliers, see [TEOpS 16-20-7.4.7](#).

Using the tolerance from the field data, the [workbook](#) will compute an estimated number of runs. If the number of valid runs is less than or equal to the estimated number of runs, the test is completed for that location. Continue for other locations and/or other peak periods. If the number of valid runs is less than the estimated number of runs, more runs will be necessary (see the following section).

7.4.5 Additional Simulation Runs

If additional runs are required, enter the additional results data in the “Additional Runs” part of the [number of runs workbook](#). The results from the first seven runs will automatically transfer over. The workbook will update the required number of runs calculations as appropriate to reflect the additional run data. The analyst *should* continue with additional runs, adding one at a time, until either the number of runs completed exceeds the number of runs required, or they have completed 30 runs. If the analysis indicates a need for more than 30 runs, contact BTO-TASU via the DOT Traffic Analysis & Modeling(DOTTrafficAnalysisModeling@dot.wi.gov) mailbox.

7.4.6 Number of Runs to Use for Reporting Results

It is likely that the number of runs will vary for each location and/or peak period of analysis; it may be higher than the seven initial runs for one or more locations and lower for others. The analyst *should* use the highest required number of runs value from any location for reporting model results. This will ensure that the required number of runs is met (and often exceeded) everywhere. If the highest required number of runs is less than seven, use the seeds for the initial seven runs to report results.

Typically, a calibrated model will not require more than 30 simulation runs. However, if the number of runs calculations find that more than 30 runs are necessary, coordinate with WisDOT regional traffic staff and/or BTO-TASU as appropriate to assess whether or not to conduct additional model runs, as it may be necessary to perform additional model calibration. If additional model runs are warranted, contact BTO-TASU via the DOT Traffic Analysis & Modeling(DOTTrafficAnalysisModeling@dot.wi.gov) mailbox to receive the seed values to use.

Unless the results of the model run are determined to be a statistical outlier (see [TEOpS 16-20-7.4.5](#)), the analyst **shall** use the results for the appropriate number of runs for the corresponding seed number shown in [Table 7.1](#). See the following section ([TEOpS 16-20-7.4.7](#)) for additional information on how to address outliers, in both the number of runs calculations and runs used to report model results.

7.4.7 Model Run Outliers

In a non-technical sense, a model run is a statistical outlier if its value is significantly higher or lower than expected given the other model runs. For the purposes of WisDOT microsimulation analyses, WisDOT defines an outlier as anything outside of the 95% confidence interval, or more than 1.96 standard deviations away from the average value assuming a two-tailed normal distribution. Normally, a t-statistic-based test would be most appropriate data sets with less than 30 samples; however, this would add complexity to the process. More importantly, assuming a normal distribution is consistent with the [FHWA 2014 Guidance](#) (7) which serves as the basis for the number of run calculations ([TEOpS 16-20-7.3](#)).

Model run outliers are identified in both the initial seven runs and in any additional runs that are required. It is possible for there to be more than one outlier, though this is highly unlikely in the initial seven runs given the significant effect of the outliers themselves on the standard deviation of the sample.

The analyst **shall** remove the statistical outliers from calculations related to the number of runs required, as they overstate the dispersion of results observed in the model and would unnecessarily require a higher number of runs. Identifying outliers in an objective manner eliminates questions surrounding the analyst manually selecting runs to eliminate and will introduce greater consistency across projects.

7.4.8 Model Runs for Future Year Scenarios

The above policy applies to the existing conditions models, as they are the only scenarios with field data. For future scenarios, or for those without any applicable field data, use the same seed numbers associated with the required number of runs from the existing conditions (see [Table 7.1](#) for the seed numbers to use). This includes using the highest required number of runs when reporting results for all other scenarios.

7.4.9 Recommended Process with Limited Field Data

When insufficient field data is available for representative locations, the analyst **shall** use the methodology laid out in Chapter 7 of HCM6 (6). Use volume as the MOE and seven initial runs. For the E_T , the maximum tolerable error, BTO-TASU recommends the use of 2 percent of the average volume at the representative location. If using an alternate maximum tolerable error, document the rationale for using the selected percent tolerable error within the modeling methodology report. Complete this calculation at each location for each peak period. Comply with the “Number of Runs to Use for Reporting Results” section above ([TEOpS 16-20-7.4.6](#)).

7.5 Software Considerations

The above policy is applicable for all Vissim and Paramics models, noting that WisDOT will cease support for the use of Paramics on new projects effective January 1, 2018 (see [TEOpS 16-20-4](#)). For SimTraffic models, conduct a minimum of seven runs. The SimTraffic simulation engine generates sequential seeds for multiple runs, the seed values shown in [Table 7.1](#) is not applicable. To ensure the use of the same seed values for all model scenarios, make sure to start the multiple run recording with the same value.

16-20-8 Model Validation

January 2018

8.1 Introduction

This section describes the validation metrics and acceptance thresholds required for the MOEs discussed in [TEOpS 16-20-3](#). This policy addresses the validation process for microsimulation traffic models and replaces the 2014 WisDOT Draft Microsimulation Guidelines previously housed on the www.wisdot.info website. **The policy provided within this document will become final and take effect on January 1, 2018.**

After January 1, 2018, use of the 2014 WisDOT Draft Microsimulation Guidelines will continue to be acceptable only for those projects that satisfy all the following conditions:

- The existing conditions traffic model is complete
- The existing conditions traffic model has undergone the peer review process
- The WisDOT regional traffic engineer and/or BTO-TASU determined that the model was adequately calibrated and validated
- No major revisions to the existing conditions model are necessary

If the project satisfies all the above conditions, the 2014 WisDOT Draft Microsimulation Guidelines may be applicable for all traffic modeling scenarios. However, WisDOT strongly encourages the analyst to assess whether the traffic model would satisfy the new validation thresholds as outlined below. Please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov) to request a copy of the 2014 WisDOT Draft Microsimulation Guidelines.

8.2 Validation Process

To validate that the traffic model reflects real world conditions, the analyst **shall** conduct both quantitative and qualitative checks on the model outputs for the analysis period. The analyst **shall** conduct validation checks of the existing conditions model using field-measured data, including but not limited to, traffic volumes, travel speeds, travel times, intersection queuing and trip-making patterns (e.g., weaving volumes). The analyst shall conduct the validation checks of the alternative models using traffic forecast and other data that is available for the alternative scenario. See [TEOpS 16-20-8.3](#), [16-20-8.4](#) and [16-20-8.5](#) for details on the quantitative and qualitative validation thresholds.

During validation, it is also important to confirm that the model meets the purpose and need of the project (e.g., if the purpose of the project is to assess the feasibility of managed lanes, during validation it is important to confirm that the model can capture managed lane alternatives, etc.).

If the model outputs satisfy the validation thresholds (see [TEOpS 16-20-8.3](#), [16-20-8.4](#) and [16-20-8.5](#)), and the model meets the purpose and need of the project the analyst can consider the model to be valid and can use the

model to assess various performance measures and/or MOEs. If the model outputs fail to satisfy the validation thresholds and/or the model does not meet the purpose and need of the project, additional calibration of the model will be necessary.

8.2.1 Historical Validation Process (pre January 1, 2018)

The 2014 WisDOT Draft Microsimulation Guidelines validation process consisted of three realism tests, where realism test 1 looked at traffic volumes, realism test 2 assessed travel times and speeds and realism test 3 considered travel patterns. Realism tests 1 and 2 were quantitative/mathematical tests that used GEH (Geoffrey E. Haver's volume tolerance formula) and absolute and/or percent differences to assess the differences between observed (field) and modeled data. Realism test 3 was a qualitative test that relied on professional judgement to determine if the modeled travel patterns were a good representation of field conditions. The 2014 WisDOT Draft Microsimulation Guidelines required the traffic model to satisfy all criteria in all three realism tests.

Although the realism tests generally provided a good assessment as to whether a traffic model accurately represented real world conditions, there were some concerns with the methodology. Specifically, WisDOT had the following concerns with the 2014 realism tests:

- The acceptance targets for GEH were initially developed for travel demand models, and thus may not be appropriate for microsimulation models.
- Since the original intent of the GEH formula was to evaluate daily or hourly volumes, was it appropriate to apply the GEH formula to 15-minute volumes?
- Depending on whether the modeled value was higher or lower than the target value, the same incremental difference could result in different GEH values. For example, if the target value was 250, a modeled volume of 325 (75 higher than the target) would yield a GEH of 4 while a modeled volume of 175 (75 lower than the target) would yield a GEH of 5. In this example, it appears that a modeled volume that is 75 vehicles higher than the target volume is a closer match to reality than a modeled volume that is 75 vehicles lower than the target volume. Does this make sense?
- Did it make sense to apply travel time realism tests to short routes, especially if performing travel speed realism tests on the same segment?
- How could BTO-TASU ensure that travel times are not blended in with travel speeds (i.e., travel speeds were calculated as the inverse of travel time)?
- How *should* project teams handle situations where there is no data available for a MOE included in one of the realism tests? Data is not always available for both travel time and travel speeds, making it impossible to conduct all three realism tests.
- Was it appropriate to apply the same validation tests for all types of microsimulation models?

In light of the concerns WisDOT had with the 2014 realism tests, BTO-TASU worked with a consultant team to assess whether there were other Goodness of Fit (GoF) metrics and/or validation thresholds that would be better suited for assessing whether a traffic model provided a good representation of reality. As part of the assessment, BTO-TASU and the consultant team conducted literature reviews, surveys of other state DOT practices and evaluation testing. To evaluate the GoF metrics, the consultant team used output from previously developed models, most of which had previously been calibrated and validated in accordance with the 2014 realism tests. The evaluation included models from the three WisDOT supported software tools (SimTraffic, Paramics and Vissim). The SimTraffic models were the only models that did not previously go through the calibration and validation process.

Since most of the models used in the evaluation testing had already undergone the calibration and validation process, the consultant team performed sensitivity testing by modifying model output to broaden the sample size of the data sets. After completing the sensitivity testing, the consultant team assigned a ranking system (with 1 being the best and 7 being the worst) for each MOE to determine the quality of validation for each model. This ranking system helped evaluate both the feasibility and acceptance levels for each of the GoF validation tests.

Through the literature reviews, surveys and evaluation testing; WisDOT determined that an overhaul of the 2014 realism tests were necessary. Although the new validation tests use different GoF metrics, models previously calibrated and validated using the 2014 realism tests *should* still be able to pass the new validation process. The following sections describe the new validation thresholds.

8.2.2 Tiered Validation Process (post January 1, 2018)

Effective January 1, 2018, WisDOT will require the use of a tiered validation approach. In this tiered approach, the Tier 1 test would be a global validation test for a metric and the Tier 2 test would be a local test for that same metric. If a model passes the Tier 1 (global) test, the modeling team would not need to perform the Tier 2 (local) test and a detailed summary of the Tier 2 test would not be necessary. BTO-TASU established the validation acceptance criteria to allow only well calibrated and validated models to pass the Tier 1 (global) test.

[Table 8.1](#) summarizes the tiered validation tests. Refer to [TEOpS 16-20-3](#) to identify the number and type of MOEs on which to perform validation tests, noting that the volume validation tests are required for all traffic models. The analyst *should* satisfy the validation thresholds shown in [Table 8.1](#) for the selected MOEs to the best extent that is practically feasible. If the model is unable to satisfy the validation thresholds outlined in [Table 8.1](#), the analyst **shall** consult with WisDOT regional traffic staff and BTO-TASU prior to finalizing the modeling methodology report and/or proceeding with the development of additional modeling scenarios.

8.3 Tier 1 (Global) Validation Tests

The Root Mean Squared Percent Error (RMSPE) is the primary validation metric for the global tests. This metric was based on the results of literature reviews, surveys of other state DOT practices with respect to GoF metrics to apply to microsimulation models and evaluation testing. The equation for RMSPE is as follows:

$$\text{RMSPE} = \sqrt{\frac{1}{N} \sum_{i=1}^N \left(\frac{M_i - O_i}{O_i} \right)^2}$$

Where:

M = Modeled Data

O = Observed Data

N = Number of Data Points

i = Observation Point

The Tier 1 (global) validation tests are applicable for link/segment volumes, travel times and travel speeds. [Table 8.2](#) summarizes the Tier 1 (global) validation tests. Refer to [TEOpS 16-20-3](#) to identify the number and type of MOEs on which to perform the Tier 1 (global) validation tests, noting that the Tier 1 volume validation tests are required for all microsimulation traffic models.

Table 8. 1 Validation Tests

| MOE | Criteria | Validation Acceptance Threshold | |
|-----------------------|---|---------------------------------|--|
| Volume ^(a) | All Links > 100 vph (Mainline and Critical ^(b) Arterials) | Tier 1: | RMSPE <5.0% |
| | | Tier 2: | RNSE <3.0% for >85% of links |
| | All Turns | Tier 1: | Not Applicable |
| | | Tier 2: | RNSE <3.0% for >75% of turns |
| Speeds | All Segments or Spot-Speed Locations | Tier 1: | RMSPE <10.0% |
| | | Tier 2: | Within \pm (Mainline Posted Speed X 20%) for >85% of locations |
| Travel Times | All Routes > 1.5 Miles | Tier 1: | RMSPE <10.0% |
| | | Tier 2: | Within \pm 15% for >85% of routes |
| Queues | All Critical ^(b) Queue Locations | Tier 1: | Not Applicable |
| | | Tier 2: | \pm 150 feet for queues 300 to 750 long, Within \pm 20% for queues >750 feet long |
| Lane Use | All Critical ^(b) Lane Utilization Locations | Tier 1: | Not Applicable |
| | | Tier 2: | RNSE <3.0% for >85% of locations Consistent with field conditions |

(a) Volume validation (Tier 1) tests are required for all traffic models

(b) Critical locations are those locations likely to have an impact on operations to the project study area (e.g., locations with higher traffic volumes, existing or projected level of service is at or approaching unstable flow, queues block or impede travel, weaving areas, merge/diverge locations, etc.)

vph = vehicles per hour

RMSPE = Root Mean Squared Percent Error, See [TEOpS 16-20-8.4](#) for equation

RNSE = Root Normalized Squared Error, See [TEOpS 16-20-8-5.1](#) for equation

Table 8.2 Tier 1 (Global) Validation Tests

| MOE | Criteria | Validation Acceptance Threshold | |
|-----------------------|---|---------------------------------|--------------|
| Volume ^(a) | All Links > 100 vph (Mainline and Critical ^(b) Arterials) | Tier 1: | RMSPE <5.0% |
| Speeds | All Segments or Spot-Speed Locations | Tier 1: | RMSPE <10.0% |
| Travel Times | All Routes > 1.5 Miles | Tier 1: | RMSPE <10.0% |

(a) Volume validation (Tier 1) tests are required for all traffic models

(b) Critical locations are those locations likely to have an impact on operations to the project study area (e.g., locations with higher traffic volumes, existing or projected level of service is at or approaching unstable flow, queues block or impede travel, weaving areas, merge/diverge locations, etc.)

vph = vehicles per hour

RMSPE = Root Mean Squared Percent Error, See [TEOpS 16-20-8.4](#) for equation

8.3.1 Traffic Volumes

The Tier 1 volume validation test is required for all microsimulation traffic models, see [Table 8.2](#). This test requires a global evaluation of the modeled versus observed (field) traffic volumes for all roadway links/segments for which traffic volume data is available. The volume validation tests evaluate the volumes during the peak period analysis times (does not include the warm-up or cool-down periods) included in the model (see [TEOpS 16-20-2.1.2](#) for additional direction on determining the temporal analysis periods).

The traffic model will often be broken into smaller links than what exists in the field, so use the roadway segmentation that exists or is planned to exist in the field to identify locations where volume data comparisons are justified. Focus on the mainline segment and other critical arterials and ramps included in the study area, where critical locations are those locations likely to have an impact on traffic operations.

A benefit of the RMSPE is that it considers relative error, so the results will be the same whether the modeled volume is higher or lower than the observed volume. Sensitivity testing, however, found that the RMSPE was somewhat unstable when volumes were less than 100 vehicles per hour (vph). Thus, the Tier 1 volume validation threshold is only applicable for those roadway links with a minimum volume of 100 vph during the analysis period. Values that may be under 100 vph likely include ramps or arterial roadways that have minimal to no effect on the operations of the facility under study.

The acceptance criteria for the global link volume test is a RMSPE of 5 percent (i.e., to pass the Tier 1 volume validation test, the RMSPE for all links must be less than 5 percent). This acceptance criterion was based on the results of the evaluation testing on previously developed, calibrated and validated models. Only well validated models will pass the 5 percent acceptance criteria. If the model does not pass the 5 percent acceptance criteria, the analyst **shall** proceed onto the Tier 2 volume validation to pinpoint where any issues in the model may exist.

Conduct the Tier 1 volume validation tests by direction for every model run. The analyst should conduct the volume validation for the finest resolution that is feasible, with practical bounds from 15 minutes up to one hour. BTO-TASU realizes that using sub-hourly time periods for validation may not be practical (e.g., data is unavailable at the sub-hourly level, the additional value does not justify the added level of effort required, etc.). Consider the volume validation test satisfied if the model passes the tests at the hourly level. Ideally, however, if using sub-hourly data, strive to satisfy the volume validation test at the sub-hourly level.

Summarize and document the results of the volume validation tests. Include a copy of the volume validation tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the volume validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

8.3.2 Travel Speeds

See [TEOpS 16-20-3](#) to identify whether to apply the Tier 1 travel speed validation test. As shown in [Table 8.2](#), the Tier 1 travel speed validation test requires a global evaluation of the modeled versus observed (field) travel speeds during the analysis period (does not include the warm-up or cool-down period) for all segments where travel speeds are available (either average segment travel speeds or spot speeds). To ensure that the travel speed validation test is independent from the travel time validation test, take care not to use the inverse of travel times to derive the segment travel speeds for the travel speed validation.

The acceptance criteria for the global travel speed test is a RMSPE of 10 percent (i.e., to pass the Tier 1 travel speed test, the RMSPE for all segment/spot speed locations must be less than 10 percent). This acceptance criterion was based on the results of the evaluation testing on previously developed, calibrated and validated models. Only well validated models will pass the 10 percent acceptance criteria. If the model does not pass the 10 percent acceptance criteria, the analyst **shall** proceed onto the Tier 2 travel speed validation to pinpoint where any issues in the model may exist.

Conduct the Tier 1 travel speed validation tests by direction for every model run. The analyst should conduct the speed validation for the finest resolution that is feasible, with practical bounds from 15 minutes up to one hour. BTO-TASU realizes that using sub-hourly time periods for validation may not be practical (e.g., data is unavailable at the sub-hourly level, the additional value does not justify the added level of effort required, etc.). Consider the speed validation test satisfied if the model passes the tests at the hourly level. Ideally, however, if using sub-hourly data, strive to satisfy the speed validation test at the sub-hourly level.

Summarize and document the results of the travel speed validation tests. Include a copy of the travel speed validation tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the travel speed validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling

mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

8.3.3 Travel Times

See TEOpS 16-20-3 to identify whether to apply the Tier 1 travel time validation test. As shown in [Table 8.2](#), the Tier 1 travel time validation test requires a global evaluation of the modeled versus observed (field) travel times during the analysis period (does not include the warm-up or cool-down period) for all study routes greater than 1.5 miles in length. To ensure that the travel time validation test is independent from the travel speed validation test, take care not to use the inverse of the segment travel speeds to derive the travel times for the travel time validation.

It is easier for drivers to relate travel time to longer routes versus shorter routes (i.e., a driver may say they drove ½ mile at an average of 60 miles per hour but typically will not say they took 30 seconds to drive the ½ mile). Further, on shorter segments, travel times and travel speeds tend to blend together (i.e., the travel time is often taken as the inverse of travel speed). WisDOT experience with previous projects has shown that it is easiest to make a distinction between travel time and travel speeds when the travel route is at least 1.5 miles long. For these reasons, the Tier 1 validation test for travel times is only applicable to travel routes greater than 1.5 miles long. Unless the use of shorter segments is logical, the analyst *should* combine short travel time segments (those less than 1.5 miles) together to make one longer travel time segment to use for the Tier 1 travel time validation test. If unsure whether to combine segments for the travel time validation test, please contact WisDOT regional traffic staff and/or BTO-TASU. Document the rationale for using the shorter travel time routes or combining routes into one longer segment in the modeling methodology report.

The acceptance criteria for the global travel time test is a RMSPE of 10 percent (i.e., to pass the Tier 1 travel time test, the RMSPE for all routes greater than 1.5 miles must be less than 10 percent). This acceptance criterion was based on the results of the evaluation testing on previously developed, calibrated and validated models. Only well validated models will pass the 10 percent acceptance criteria. If the model does not pass the 10 percent acceptance criteria, the analyst **shall** proceed onto the Tier 2 travel time validation to pinpoint where any issues in the model may exist.

Conduct the Tier 1 travel time validation tests by direction for every model run. The analyst should conduct the travel time validation for the finest resolution that is feasible, with practical bounds from 15 minutes up to one hour. BTO-TASU realizes that using sub-hourly time periods for validation may not be practical (e.g., data is unavailable at the sub-hourly level, the additional value does not justify the added level of effort required, etc.). Consider the travel time validation test satisfied if the model passes the tests at the hourly level. Ideally, however, if using sub-hourly data, strive to satisfy the travel time validation test at the sub-hourly level.

Summarize and document the results of the travel time validation tests. Include a copy of the travel time validation tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the travel time validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

8.4 Tier 2 (Local) Validation Tests

If the model fails to pass the Tier 1 (global) validation tests, the analyst **shall** perform the Tier 2 (local) test for the applicable MOEs. The purpose of the Tier 2 validation test is to pinpoint where potential problems in the model may exist. Since the Tier 2 validation test is a localized test, the GoF metric varies depending on the MOE. The Tier 2 (local) validation tests are applicable for link/segment volumes, turning movement volumes, travel speeds, travel times, queues and lane use. [Table 8.3](#) summarizes the Tier 2 (local) validation tests. Refer to [TEOpS 16-20-3](#) to identify the number and type of MOEs on which to perform validation tests, noting that if a model passes the Tier 1 (global) tests for a specific MOE, it is not necessary to perform the Tier 2 (local) tests for that same MOE. Document the rationale for excluding the Tier 2 validation tests (e.g., the MOE in question successfully passed the Tier 1 validation test) in the modeling methodology report. The analyst, however, *should* always perform the Tier 2 turning movement volume test for projects that include intersections.

Table 8.3 Tier 2 (Local) Validation Tests

| MOE | Criteria | Validation Acceptance Threshold | |
|-----------------------|---|---------------------------------|---|
| Volume ^(a) | All Links > 100 vph (Mainline and Critical ^(b) Arterials) | Tier 2: | RNSE <3.0% for >85% of links |
| | All Turns | Tier 2: | RNSE <3.0% for >75% of turns |
| Speeds | All Segments or Spot-Speed Locations | Tier 2: | Within ± (Mainline Posted Speed X 20%) for >85% of locations |
| Travel Times | All Routes > 1.5 Miles | Tier 2: | Within ± 15% for >85% of routes |
| Queues | All Critical ^(b) Queue Locations | Tier 2: | ± 150 feet for queues 300 to 750 long, Within ±20% for queues >750 feet long |
| Lane Use | All Critical ^(b) Lane Utilization Locations | Tier 2: | RNSE <3.0% for >85% of locations Consistent with field conditions |

(a) Link/Segment Volume Tier 2 validation tests are required for all traffic models that do not pass the Tier (1) validation test and Turning Volume Tier 2 validation tests are required for all traffic models that include intersections

(b) Critical locations are those locations likely to have an impact on operations to the project study area (e.g., locations with higher traffic volumes, existing or projected level of service is at or approaching unstable flow, queues block or impede travel, weaving areas, merge/diverge locations, etc.)

vph = vehicles per hour

RNSE = Root Normalized Squared Error, See [TEOpS 16-20-8-5.1](#) for equation

8.4.1 Traffic Volumes

The volume validation test is required for all microsimulation traffic models, however, the Tier 2 volume validation test for links/segments is only required if the model fails to pass the Tier 1 volume validation test. The analyst, however, *should* always perform the Tier 2 turning movement volume test for projects that include intersections. A metric named root normalized squared error (RNSE), which is a variation of the GEH (Geoffrey E. Havers) tolerance formula is the validation metric for local volume tests. The RNSE removes the modeled volume from the basis of normalizing error. The RNSE metric was developed based on literature reviews and evaluation testing. . The equations for GEH and RNSE are shown below.

$$GEH = \sqrt{2 \frac{(M-O)^2}{(M+O)}} \quad RNSE = \sqrt{\frac{(M-O)^2}{O}}$$

Where:

M = Modeled Data

O = Observed Data

The RNSE shares the same general form as the global RMSPE test that is the basis for the global volume test. Additionally, RNSE provides a consistent value above and below a target volume, whereas GEH does not, eliminating some of the concerns BTO-TASU has with the GEH.

Sensitivity testing found that volumes less than 100 vph may erroneously influence the statistics by potentially reducing the impact of critical links with higher volumes not meeting the threshold. Thus, the Tier 2 (local) volume validation threshold is only applicable for those roadway links with a minimum volume of 100 vph during the analysis period. Values that may be under 100 vph likely include ramps or arterial roadways that have minimal to no effect on the operations of the facility under study. The RNSE, however, is applicable to all turning movements (i.e., there is no minimum volume threshold for turning movements).

For the local link volume test, a RNSE of less than 3.0 is required for greater than 85 percent of links over 100 vehicles per hour. For the local turning movement volume test a RNSE of less than 3.0 is required for greater than 75 percent of turns. These acceptance criteria are based on the results of the evaluation testing on previously

developed, calibrated and validated models. Though the RNSE test value is more robust than the WisDOT 2014 local volume criteria (realism test 1.1, 1.2 and 1.3), its use did not result in well-validated models becoming invalid. Other agencies including the Washington Department of Transportation and London Department for Transport use a similarly strict criterion (GEH criteria of 3.0).

Conduct the Tier 2 volume validation tests by direction for every model run. The analyst should conduct the volume validation for the finest resolution that is feasible, with practical bounds from 15 minutes up to one hour. BTO-TASU realizes that using sub-hourly time periods for validation may not be practical (e.g., data is unavailable at the sub-hourly level, the additional value does not justify the added level of effort required, etc.). Consider the volume validation test satisfied if the model passes the tests at the hourly level. Ideally, however, if using sub-hourly data, strive to satisfy the volume validation test at the sub-hourly level.

Summarize and document the results of the volume validation tests. Include a copy of the volume validation tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the volume validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

8.4.2 Travel Speeds

See [TEOpS 16-20-3](#) to identify whether to apply the Tier 2 travel speed validation test (note Tier 2 is only required if the model fails to pass the Tier 1 validation test). A combination of absolute error and percent error related to the posted speed limit of a roadway segment is the validation metric for local travel speeds (see [Table 8.3](#)). These validation metrics are based on the results of literature reviews, surveys of other state DOT practices and evaluation testing. The range of acceptance for this test is determined by using a threshold of plus or minus 20 percent of the posted speed limit (i.e., a posted speed of 40 mph would have a range of acceptance of plus or minus 8 mph). For the validation testing, the analyst would apply this range of acceptance (plus or minus 20 percent of the posted speed limit) to the observed speed. For example, an observed speed of 31 mph would have a range of acceptance between 23 and 39 mph (31 +/- 8 MPH) if the posted speed were 40 mph.

Since the 2014 realism tests had an acceptance criterion of plus or minus 10 mph regardless of the speed, it was possible for models to pass the realism test even if portions of the study corridor had modeled speeds that were 50% or more higher or lower than the observed speeds. This was most noticeable on arterials. The new local speed test tightens up the travel speed criteria for arterials and provides more flexibility for freeways experiencing congestion as compared to the 2014 realism tests.

Conduct the Tier 2 travel speed validation tests by direction for every model run. The analyst should conduct the travel speed validation for the finest resolution that is feasible, with practical bounds from 15 minutes up to one hour. BTO-TASU realizes that using sub-hourly time periods for validation may not be practical (e.g., data is unavailable at the sub-hourly level, the additional value does not justify the added level of effort required, etc.). Consider the travel speed validation test satisfied if the model passes the tests at the hourly level. Ideally, however, if using sub-hourly data, strive to satisfy the travel speed validation test at the sub-hourly level.

Summarize and document the results of the travel speed validation tests. Include a copy of the travel speed validation tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the travel speed validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

8.4.3 Travel Times

See [TEOpS 16-20-3](#) to identify whether to apply the Tier 2 travel time validation test (note Tier 2 is only required if the model fails to pass the Tier 1 validation test). The 2014 realism test for travel times had separate acceptance thresholds for routes less than seven minutes and routes equal to or greater than seven minutes, where routes less than seven minutes had an acceptance criterion of plus or minus one minute. The one-minute acceptance criterion for short routes was very easy to meet, especially if considering routes with observed travel times of less than one minute. For this reason, BTO-TASU and the consultant team considered several local testing options for travel times to develop a validation threshold that would address the issues the 2014 realism test had concerning short segments.

Percent error is the metric the local travel time validation test. This metric was developed based on the results of literature reviews, surveys of other state DOT practices and evaluation testing. The selected travel time criterion requires modeled travel times to be within plus or minus 15 percent of observed travel times (see [Table 8.3](#)). WisDOT experience with previous projects has shown that it is easiest to make a distinction between travel time and travel speeds when the travel route is at least 1.5 miles long. Further, a driver is more likely to start noticing

slight changes in travel times on routes 1.5 miles long or longer (e.g., at 45 mph, the driver would take 2 minutes to travel 1.5 miles, any changes in travel time less than 2 minutes will likely be unnoticeable). For these reasons, the local travel time test is only applicable for routes over 1.5 miles in length. Unless the use of shorter segments is logical, the analyst *should* combine short travel time segments (those less than 1.5 miles) together to make one longer travel time segment to use for the Tier 2 travel time validation test. If unsure whether to combine segments for the travel time validation test, please contact WisDOT regional traffic staff and/or BTO-TASU. Document the rationale for using the shorter travel time routes or combining routes into one longer segment in the modeling methodology report.

Conduct the Tier 2 travel time validation tests by direction for every model run. The analyst should conduct the travel time validation for the finest resolution that is feasible, with practical bounds from 15 minutes up to one hour. BTO-TASU realizes that using sub-hourly time periods for validation may not be practical (e.g., data is unavailable at the sub-hourly level, the additional value does not justify the added level of effort required, etc.). Consider the travel time validation test satisfied if the model passes the tests at the hourly level. Ideally, however, if using sub-hourly data, strive to satisfy the travel time validation test at the sub-hourly level.

Summarize and document the results of the travel time validation tests. Include a copy of the travel time validation tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the travel time validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

8.4.4 Queue Lengths

Refer to [TEOpS 16-20-3](#) to identify whether or not to apply the Tier 2 (local) queue validation test, noting that queues can be either a primary or a secondary validation MOE. Typically, if intersection queuing is critical to the design decisions (e.g., the project is assessing the storage length requirements for a left turn lane), queue lengths will be one of the primary validation MOEs for the arterials. Intersection queue lengths are often the primary MOE for validation of a SimTraffic model. The quantitative metrics for queues shown in [Table 8.3](#) are applicable for all models where queue lengths are a primary validation MOE (typically applicable for arterial segments). The qualitative measures discussed in [TEOpS 16-20-8.5](#) are applicable for models that use queue length as a secondary validation MOE (typically applicable for freeway segments).

Upon conducting, BTO-TASU decided to use The validation metric for intersection queue length is a combination of absolute error and percent error. This validation metric was developed based on the results literature reviews, surveys of other state DOT practices and evaluation testing. The acceptance criterion for the intersection queue validation test is an absolute error of plus or minus 150 feet for all observed queues between 300 and 750 feet and a percent error of plus or minus 20 percent for all observed queues greater than or equal to 750 feet. Similar to other tests, 85 percent of locations compared are required to pass the intersection queue validation criteria.

Although the analyst *should* perform the queue length validation test for all models where queue lengths are a primary validation MOE, BTO-TASU realizes there are potential issues with using queue length as a validation metric including, but not limited to:

- Queue lengths are generally unstable and can fluctuate significantly from one moment to the next, thus the queues observed in the field may not reflect the queues that were present during the time of the turning movement count.
- There is no standard procedure for measuring the length of queue. Queues could include only stopped vehicles or they could include stopped and slow moving (less than 5 mph) vehicles.
- Each microsimulation analysis tool has its own proprietary methodology for reporting on queue lengths, so there is a lack of consistency.

As such, the Tier 2 (local) queue validation test is non-binding, in that failure to meet the queue validation thresholds alone will not necessarily require further calibration and validation of the model. If the model is unable to satisfy the queue validation thresholds outlined in [Table 8.3](#), the analyst **shall** consult with WisDOT regional traffic staff and BTO-TASU to assess the need for further model calibration. This coordination **shall** occur prior to finalizing the modeling methodology report and/or proceeding with the development of additional modeling scenarios

Conduct the Tier 2 queue validation tests by direction for every model run. The analyst should conduct the queue validation for the finest resolution that is feasible, with practical bounds from 15 minutes up to one hour. BTO-TASU realizes that using sub-hourly time periods for validation may not be practical (e.g., data is unavailable at the sub-hourly level, the additional value does not justify the added level of effort required, etc.). Consider the queue validation test satisfied if the model passes the tests at the hourly level. Ideally, however, if using sub-

hourly data, strive to satisfy the queue validation test at the sub-hourly level.

Summarize and document the results of the queue validation tests. Include a copy of the queue validation tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the queue validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

8.4.5 Lane Utilization

Refer to [TEOpS 16-20-3](#) to identify whether to apply the Tier 2 (local) lane utilization validation test. Other agencies (such as Oregon DOT, Minnesota DOT and Washington DOT) use their traffic volume validation criteria and a comparison of modeled and observed lane utilization percentages. Comparable to the criteria used by Oregon DOT, Minnesota DOT and Washington DOT, the acceptance criterion for lane utilization is a RNSE of less than 3.0 for greater than 85 percent of data points (see [Table 8.3](#)). The data points chosen for the lane utilization validation *should* represent those locations where lane usage is critical for the operations of the facility (e.g., weaving areas, upstream of lane drops, etc.).

Although the analyst is encouraged to perform the quantitative lane utilization validation test for areas where lane usage has a significant influence on operations, BTO-TASU acknowledges that data may not always be available to conduct mathematical checks on lane utilization. As such, it may be acceptable to do more of a qualitative assessment to assess that the model reasonably reflects the lane utilization observed in the field. Justify and document the use of any qualitative assessments in the modeling methodology report.

Conduct the lane utilization validation tests by direction for every model run. The analyst should conduct the lane utilization validation for the finest resolution that is feasible, with practical bounds from 15 minutes up to one hour. BTO-TASU realizes that using sub-hourly time periods for validation may not be practical (e.g., data is unavailable at the sub-hourly level, the additional value does not justify the added level of effort required, etc.). Consider the lane utilization validation test satisfied if the model passes the tests at the hourly level. Ideally, however, if using sub-hourly data, strive to satisfy the lane utilization validation test at the sub-hourly level.

Summarize and document the results of the lane utilization validation tests. Include a copy of the lane utilization validation tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the lane utilization validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

8.4.6 Density

Acceptance of quantitative validation testing for density may be acceptable. To use density as a validation check for microsimulation models; the analyst **shall** obtain approval from WisDOT regional traffic staff and/or BTO-TASU.

8.5 Qualitative Validation Tests

The goal of the model validation process is to assure that the model is a good representation of the actual traffic conditions. This means that the model must not only meet the mathematical targets related to traffic volumes, speeds and travel times, but must also be reasonable in terms of overall traffic patterns such as lane choice and routing. [Table 8.4](#) provides a summary of the qualitative validation checks. The analyst **shall** perform the qualitative validation tests for all models, even those that pass the Tier 1 (global) mathematical validation thresholds. Document and justify the decisions made as they pertain to the qualitative validation tests and summarize the findings of the tests in the modeling methodology report.

Table 8.4 Qualitative Validation Tests

| MOE | Criteria | Validation Acceptance Threshold |
|-------------------------------------|---|--|
| Queues | All Critical Queue Locations | Visually realistic for intersection queues. Quantitative checks required if queues are a primary validation MOE. |
| Bottlenecks | Replication of Real-World Bottlenecks | Visually realistic for intersection queues and freeway bottlenecks |
| Routing | All Routes | Represents field conditions and driver behavior. Acceptance of quantitative results require WisDOT approval. |
| Lane Use | All Critical Lane Utilization Locations | Visually realistic. Quantitative checks encouraged for areas where lane usage has a significant influence on operations. |
| Freeway Merging | All Merge Locations | Visually realistic |
| Vehicle Types and Truck Percentages | All Locations | Represents field conditions. |

16-20-9 Design Year Analysis**January 2018****9.1 Recommended Process**

Only after calibrating and validating the existing conditions and only after completing the peer review process of the existing conditions model, *should* the analyst proceed with the development of other modeling scenarios. If the analyst chooses to develop the alternatives model prior to calibrating and validating the existing conditions model and/or prior to having the model go through the peer review process, they take the risk that they must go back and revise not only the alternatives model but the existing conditions model as well. This can lead to potential inconsistencies in the modeling scenarios and could result in the need for additional time to calibrate and perform the peer review(s) of the alternatives model. Although it may be tempting, especially when the project has a compressed schedule, to skip or delay the calibration, validation and/or peer review process of the existing conditions model, it may end up being counterproductive and is strongly discouraged.

Refer to [TEOpS 16-20-2](#) for additional details on the model development process, analysis scenarios and traffic model tree.

9.1.1 Carrying Parameters Forward into Model Scenarios

Unless changes to roadway geometry or traffic conditions are expected to alter the driving behavior, the analyst *should* carry the parameters from the calibrated existing conditions model forward, without any changes, to each subsequent scenario. For example, if it is necessary to use a headway of 0.85 to reproduce the level of congestion in the existing real-world network during the AM peak hour, then the analyst *should* use the same 0.85 headway value for the AM peak hour model in the design year.

Document and justify the rationale for modifying any of the existing conditions parameters. Where possible, associate any modification to the existing conditions parameters to changes in geometric conditions that may influence driving behavior (e.g., the design year build alternative lengthens the weaving area resulting in the need for drivers to be less aggressive thus increasing the headway).

9.1.2 Validation of Design Year Models

The only mathematical validation test that is applicable for design year models is the volume validation (both Tier 1 and Tier 2) tests. When conducting the volume validation tests (see [Table 8.1](#)) for the design year models, the analyst *should* compare the modeled volumes (i.e., output from the microsimulation model) to the appropriate design year traffic forecasts. Due to future congestion, the microsimulation model may not be able to sufficiently capture the true design year traffic demand within the analysis period, specifically for the no-build or FEC conditions. Under this scenario, the analyst *should* run the model with only the traffic demand for the analysis period (e.g., do not include the demand from the warm-up or cool-down periods) until all vehicles have exited the network, thereby capturing the full demand reflected in the design year traffic forecasts. Apply the volume validation tests (typically for each one-hour period) to both the seed matrix (full demand, no warm-up or cool-down) and analysis period matrix (includes warm-up, analysis period, and cool-down periods) runs. Running the model with the seed matrix allows the analyst to validate that the peak period demand matrix, when isolated, is sound.

Given the context within which quantitative checks on MOEs (specifically travel speeds, travel times, queue lengths and lane utilization) are conducted for the design year models, the validation tests for the MOEs for design year models consist of a visual check of the traffic model for reasonableness. Additionally, the analyst *should* perform the qualitative validation tests as summarized in [Table 8.4](#) as appropriate.

In addition to the visual and qualitative tests, the analyst *should* compare the travel times, travel speeds and queue results from the design year model to existing conditions data to assess whether the relative increase/decrease in each MOE between the scenarios is reasonable.

Conduct the quantitative volume validation tests and qualitative/visual checks by direction for each 15-minute analysis period for every model run. Summarize and document the results of the quantitative volume validation tests and qualitative/visual checks for the average of all (valid) runs. Include a copy the volume validations tests as an attachment to the modeling methodology report and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate. For sample formats or questions on the design year volume validation test, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

9.2 Traffic Volume Development

Work with the WisDOT regional traffic staff and WisDOT-TFS to develop the forecasts for the design year. Chapter 9 of the WisDOT [Transportation Planning Manual](#) provides details on the process for obtaining and developing traffic forecasts.

The forecasts developed by the WisDOT-TFS typically provide forecasts for the average annual daily traffic (AADT) and peak-hour intersection turning movement volumes (if requested). The microsimulation models, however, often require the use O-D matrix tables in addition to or instead of turning movement volumes and generally need to capture 15-minute profiles for the warm-up, analysis and cool-down periods. Further, microsimulation models require the use of a balanced volume data set, and oftentimes the traffic forecasts will reflect unbalanced volumes. Thus, in most cases, it will not be possible to enter the forecasts into the microsimulation model directly as provided by the WisDOT-TFS.

Document the methodology used to develop and modify the forecasts for use in the microsimulation models in the Traffic Forecasting Methodology Report and submit to the regional office and WisDOT-TFS for approval. The WisDOT-TFS will typically provide any comments on their review of the forecasting methodology report in [DT2340](#). The regional office will involve BTO-TASU in the review as appropriate.

9.2.1 Design Hour Volumes for Microsimulation Models

The analyst shall coordinate with WisDOT regional traffic staff, WisDOT-TFS and BTO-TASU as appropriate to develop design-hour volumes (DHV) for microsimulation models.

9.2.2 Origin-Destination Matrix Development for Microsimulation Models

The analyst shall coordinate with WisDOT regional traffic staff, WisDOT-TFS and BTO-TASU as appropriate to develop the O-D matrices for microsimulation models.

16-20-10 Documentation/Reporting/Presentation of Results

January 2018

10.1 Modeling Methodology Report

Prior to submitting the traffic model to the WisDOT regional office and other members of the peer review team (see [TEOpS 16-25](#)), document the methodology and assumptions used to develop, calibrate and validate the traffic model. Prepare a separate modeling methodology report for each model scenario. The exact format of the modeling methodology report will vary depending on the specifics of the project; however, the content of the report *should* always include the following:

- Project background – What is the goal/purpose of the project and why is microsimulation being used?
- Methodology/assumptions – Identify the methodology used to develop the model, being sure to note any assumptions.
- Calibration parameters – Identify and describe any user-defined parameters (i.e., note where changes to default parameters were made). Provide justification for the use of any localized (link-specific) calibration parameters.
- Validation summary – Summarize the findings of the validation tests. Provide the detailed validation testing results as an attachment to the report. Additionally, submit an electronic copy (preferably in Excel format) of the validation tests to the peer review team members.

Reference other reports such as the Traffic Analysis Tool Selection memo or Traffic Forecasting Methodology Report as appropriate, being sure to provide copies of any referenced documents as an attachment to the modeling methodology report.

For sample formats or questions on what to include in the modeling methodology report, please contact BTO-TASU via the DOT Traffic Analysis & Modeling mailbox (DOTTrafficAnalysisModeling@dot.wi.gov).

10.2 Presentation or Results

It is critical to format the presentation of microsimulation results to the audience because the expectation is that managers, technical staff, public officials and the traveling public will each have different levels of comprehension. For example, the average transportation user may understand the impacts on roadway performance through travel times, delay or congestion levels. If the average commute on a particular corridor increases from 20 minutes in a current year to 40 minutes in the future, the average user may understand how this is going to affect them. Whereas this same audience may have a much more difficult time understanding how future traffic conditions are going to affect them if density increases by 100%.

Generally, most audiences can understand pictures, graphical presentations, simulation videos or screen shots that describe the results. Presentations at public meetings *should* begin by orienting the audience around the modeled scenario. Point out the basic elements of the simulation display and identify traffic conditions that will help to gain the audience's confidence in the model. Animation videos or screen shots are very powerful to display a traffic flow concept that is difficult to grasp using numerical output. For example, depending on the type of data, it may be difficult to identify the start of a freeway bottleneck using numerical output alone. It may be obvious to the analyst where the bottleneck begins but a 30-second video or series of screen shots can convey this message clearly to an audience that is unfamiliar with the model.

10.2.1 Animation Output

Use animation videos or static screen shots exclusively for qualitative assessment. The analyst *should* review the simulation model and focus on the key points of a particular scenario. Before showing the animation videos to an audience outside of the modeling development and/or review team, verify that the driver behavior is realistic. Most microsimulation tools now provide the option to show a 3D visualization of the model, complete with roadway infrastructure and other architectural features. While these features may help to orient the audience to the project study area, take care not to let the presentation graphics overshadow the fundamental engineering objectives of the model. Discuss the requirements for the needs and emphasis of animation output of the traffic model with the WisDOT project team during the project scoping process.

Choosing an appropriate segment of the model to display during presentations requires professional judgment and an understanding of the project's objectives. Typically, the analyst *should* consider the average condition unless the worst case is realistic and the result causes system failure.

Recording animation output minimizes the chance for software and technology issues during presentations. It is generally best to keep the recorded animation videos relatively short (a run time of 2 to 3 minutes). Overlay text on the simulation videos as appropriate to orient the audience and provide information on the model outputs.

10.2.2 Graphical and Numerical Output

A seemingly endless amount of data can be output from most microsimulation models. The importance of such outputs is dependent upon the purpose of the project, operational analysis and microsimulation model. The objective of the analyst is to focus on a few key performance measures that tell the story of how the transportation facility is operating. The analyst *should* carefully choose numerical output that best addresses the objectives of the simulation model and ultimately the overall project.

Understanding the strengths of microsimulation software and knowing how different performance measures are calculated are important aspects of the analysis process. The methods and effectiveness of each software to measure performance may require analysts to use multiple tools to provide a comprehensive analysis of the traffic operations.

Display graphical or tabular data in a clear and concise format so the intended audience can draw conclusions without becoming overwhelmed with the amount of data. Analysts *should* consider supplementary visual cues to draw the audience's attention to the most important pieces of data. Bolding, indenting or highlighting text with different colors can help to increase discrimination between the different levels of data. Colored shading typically represents the following conditions.

| Color | Performance Level |
|--------------|-------------------|
| Green / Blue | Good |
| Yellow | Acceptable |
| Orange | Poor |
| Red | Failing or Severe |

Analysts *should* be cognizant of common vision deficiencies when presenting results with different colors. Consider using redundant visual cues instead of relying on color alone (e.g., use colors along with letters or shapes).

16-20-11 Upgrading Simulation Models

January 2018

Keeping a model relevant and useful often requires upgrading it to the latest release of the simulation software. As noted in [TEOpS 16-20-4](#), the PTV Group typically releases major updates to the Vissim software once a year and Trafficware typically releases major updates to the Synchro/SimTraffic Studio software every two to three years. The software vendor may release minor updates, to address software bugs/errors, as often as once a month. As a note, there have not been any updates to Paramics since 2012.

These releases may or may not affect a specific simulation model but it is important to understand that no matter how small a change, any change could influence the results and validity of a model. This section will go over the questions to ask and the steps to follow when upgrading a model. The purpose of these steps is to give the modeler the information they need to assess the potential impact of upgrading the traffic model and to identify the additional work that may be necessary to re-calibrate and re-validate the traffic model. Before upgrading to a new model version, the analyst **shall** consult with the WisDOT project team, WisDOT regional traffic engineering staff and/or BTO-TASU as appropriate. When determining whether to upgrade, be cognizant of the version of the software that the peer review team has available to them to review the models (it may not be possible to open/use one version of the software in another version).

11.1 Software Upgrades

The general goals of large-scale projects involving microsimulation models usually involve multiple project stages/phases and may take 12 months or longer to complete. During this extended timeline, a software package may go through one or more updates. These updates usually occur for one or more of the following reasons:

- Software bug or error fix
- Feature addition
- Major version release

These updates can play an important role in the application of the software to a project and may require the need to update the model. For example, if the software vendor discovers a bug within the latest version of the software, they may release an update to address/fix the bug. Generally, the analyst *should* update the model to apply the bug fix as soon as possible. If the software update includes new or enhanced features, the modeling team may decide that the new features would benefit the project. If the benefit of adding the additional feature outweighs any potential implications (e.g., additional time/resources needed to revise the model), updating the model to apply the new features may be justified. Since major version releases of the software typically involve larger changes to the analysis methodologies, upgrading the traffic model to a new version may introduce new problems and the analyst is encouraged to hold off on upgrading the model to a later date.

11.2 When to Upgrade

In most cases, when establishing the project scope and budget, the project team assumes/expects that the traffic modeling will be done using a specific version of the software. Thus, the project scope and budget may not be able to absorb the additional time/costs needed to upgrade the traffic model to a new release of the software.

The stage/phase of the model is the most important thing to consider when evaluating whether it is the correct time to upgrade the model. The best time to upgrade a model is usually between major stages of a project. The following list highlights scenarios when the analyst and project team *may* want to consider upgrading a model:

- A new project is using an older model
- There is a major break in a project schedule
- The latest update feature(s) to the software addresses a geometric element or other concern of the project that the older version of the model could not accurately capture

- The latest version update to the software addresses/fixes major bugs/errors

The following list highlights scenarios when upgrading a model might introduce new problems and the analyst and project team *may* decide to upgrade the model later or not at all:

- Current project is almost finished
- Current model is still currently being used to test scenarios
- Model is very large and complex
- Newer version if not available to the peer review team

Ultimately, before upgrading to a new model version, the analyst **shall** consult with the WisDOT project team, WisDOT regional traffic engineering staff and/or BTO-TASU as appropriate.

11.3 Verify Model Calibration and Validation

If the WisDOT project team, WisDOT regional traffic engineering staff and BTO-TASU all agree that there is enough reason to convert the model to a new release/version of the software, it is often advisable for the analyst to compare the outputs/results of the key MOEs from the upgraded model to those of the original calibrated/validated model. This check *should* give the modeler an idea of how much work will be required to get the model to the same level of validity as the previous model. A model that does not require an extensive amount of modifications following an upgrade *should* be able to provide results that are similar and close to the original model.

Depending on the software package and the extent of the software modifications, upgrading the traffic model to the newest software version/release may cause a previously calibrated/validated model to fall out of validation. Therefore, the analyst *should* verify that the model still meets the validation thresholds. The modeler *should* first conduct a high-level, qualitative, assessment of the model, focusing on the components most significantly impacted by the software upgrade, to identify where revisions to the model may be necessary. Upon completing any necessary revisions to the model, the analyst *should* verify the validity of the model by performing the quantitative and qualitative validation tests summarized in [TEOpS 16-20-8](#).

Document the results of the validation tests, either as part of the modeling methodology report or as a separate addendum, and submit to the regional office for review and comment. The regional office will involve BTO-TASU in the review as appropriate.

16-20-12 References

January 2018

1. **NSW Transport Roads & Maritime Services.** *Traffic Modelling Guidelines*. New South Wales (NSW), Australia : s.n., 2013. ISBN 978-1-922194-21-3.
2. **Federal Highway Administration.** *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software*. 2004. FHWA-HRT-04-040.
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SimTraffic Calibration Settings

Last Updated: 11-27-2017

| Type of Setting | Parameter Grouping | Parameter Name | Default Settings (per SimTraffic v. 10.1.1.1) | Recommended Parameter Value | Typical Parameters Adjusted During Calibration | Parameter Description |
|---|---|--|--|--|--|---|
| GLOBAL SETTINGS (Adjusted within SimTraffic) | Driver Parameters | Yellow Deceleration (ft/s ²) | 7.0 - 12.0 | 8 to 10 | Yes | Increase to make drivers less prone to running red lights. |
| | | Speed Factor (%) | 0.85 - 1.15 | No range specified | Yes | Can be changed to increase or decrease the range of driver speeds (e.g. for a link speed of 50 mph and a speed factor of 1.1, the driver will attempt to maintain a speed of 55 mph). |
| | | Courtesy Deceleration (ft/s ²) | 3.0 - 10.0 | 7 to 9 | Yes | Amount of deceleration a vehicle will accept in order to allow a vehicle ahead to make a mandatory lane change. Higher value = more courteous driver. |
| | | Yellow Reaction Time (s) | 0.7 - 1.7 | No range specified | No | Amount of time it takes a driver to respond to a signal changing to yellow. More aggressive drivers will have a longer reaction time to yellow lights. Longer reaction times tends to reduce red light running for higher speed approaches and vehicles slowing to make a turn, however, may increase red light running for low speed approaches. |
| | | Green Reaction Time (s) | 0.2 - 0.8 | 0.5 to 2.0 | Yes | Amount of time it takes the driver to respond to a signal changing green. More aggressive drivers will have a shorter reaction time to green lights. |
| | | Headway at 0 mph (s) | 0.35 - 0.65 | No range specified | Yes, typically modify last | Interpolation used between these factors. May be necessary to change to match local driver parameters. The default headways provide an Saturation Flow Rate similar to the HCM (1900 vphpl) from 25 to 50 mph. |
| | | Headway at 20 mph (s) | 0.80 - 1.80 | 2 to 2.5 | | |
| | | Headway at 50 mph (s) | 1.00 - 2.20 | 1.7 to 2.0 | | |
| | | Headway at 80 mph (s) | 1.00 - 2.20 | 2.0 to 2.5 | | |
| | | Gap Acceptance Factor | 0.85 - 1.15 | No range specified | Yes | Gap vehicles will accept at unsignalized intersections, for permitted left-turns, and for right turns on red. Higher values represent more conservative drivers. |
| | | Positioning Advantage (veh) | 1.2 - 15.0 | Use defaults | No | Drivers will make a positioning lane change when there is $\geq x$ vehicles ahead in the target lane than in the current lane. Higher values are associated with more conservative drivers and cause drivers to line up in correct lane. Low values are associated with aggressive drivers and cause drivers to avoid lining up in the correct lane until reaching the mandatory lane change point. |
| | | Optional Advantage (veh) | 0.5 - 2.3 | Use defaults | No | Drivers will make a desired lane change when $\leq x$ vehicles are ahead in the target lane than in the current lane. Higher values are associated with more conservative drivers and cause drivers to have unbalanced lane use. Lower values are associated with aggressive drivers and cause drivers to use lanes evenly. |
| | | Mandatory Distance Adjustment (%) | 50 - 200 | No range specified | Yes | Global multiplier for local lane change settings. |
| | | Positioning Distance Adjustment (%) | 60 - 150 | No range specified | Yes | Global multiplier for local lane change settings. |
| | Average Lane Change Time (s) | 10 - 55 | No range specified | No | Average time between lane change maneuvers. Applies only to optional lane changes, which are made to choose a lane with less congestion. Less time applies to more aggressive drivers. | |
| Lane Change Variance +/- (%) | 10 - 30 | No range specified | No | Adjustment similar to Average Lane Change Time, but base on driver type. Applies only to optional lane changes, which are made to choose a lane with less congestion. Higher percentage leads to increased awareness of lane change. | | |
| Vehicle Parameters | Vehicle parameters (Occurrence, acceleration, dimensions, etc.) | See Synchro Studio 10 User Guide, Chapter 26 (page 26-7) | Defaults typically acceptable Modify vehicle fleet based on field classification counts if needed | Yes | Modify vehicle percentages based on nearest classification count. Fleet mix should add up to 100% for all truck types and 100% for all car types. | |

SimTraffic Calibration Settings

Last Updated: 11-27-2017

| Type of Setting | Parameter Grouping | Parameter Name | Default Settings (per SimTraffic v. 10.1.1.1) | Recommended Parameter Value | Typical Parameters Adjusted During Calibration | Parameter Description |
|--|---------------------|--|---|---|---|---|
| LOCAL SETTINGS (Adjusted within Synchro) | Synchro Settings | Link Speed (Lane Settings) | 30 | Start with posted. Adjust to reflect free flow speed (typically posted + 5 mph), if needed. | Yes | May be adjusted to match field speeds if data is available and speeds are not being used for validation |
| | | Ideal Saturation Flow Rate (Lane Settings) | 1,900 | Adjust to match field if field data is available | Yes | Refer to TEOpS 16-15-5 for additional guidance on saturation flow rates for through lanes |
| | | Growth Factor (Volume Settings) | 1.0 | Use for sensitivity testing or future year scenarios. Do not use for RTOR | No | |
| | | Headway Factor (Simulation Settings) | 1.0 | 0.8 to 1.2 | Yes | Can be set on a per-movement basis. Can be used to calibrate the Saturated Flow Rates. |
| | | Turning Speed (Simulation Settings) | 9 mph (right-turns) 15 mph (left-turns) | Right turns = 12 to 15 mph | Yes | Default speeds are set for small radius urban intersections. With large suburban intersections, turning speeds may be significantly higher. Right-turns speeds need to be adjusted to or near the freeway speeds when simulating entrance ramps. At low speeds, the Saturated Flow Rate is highly sensitive to small changes in speed. Right-turns: SimTraffic = 9 mph (1545 vph). HCM for protected rights = 1615 vphpl Left-turns: SimTraffic = 15 mph (1883 vph). HCM for protected left-turns = 1805 vph. |
| | | Mandatory Distance (Simulation Settings) | 333 | Base on field conditions | Yes | Distance ahead vehicle is forced to make lane change. Measured from Stop bar. Increase to allow vehicles to shift into correct lane earlier. Decrease to allow vehicles to shift into lane at the last possible moment. Large cities: Shorter mandatory distances Small towns: Longer mandatory distances. Useful to adjust with congested signals or lane drops after signals. With long turn bays consider setting this to less than the storage distance to allow for some late lane changes. |
| | | Positioning Distance (Simulation Settings) | 1320 | Base on field conditions | Yes | Distance ahead vehicle starts to attempt lane change. Measured from Stop bar. |
| | | Mandatory Distance2 (Simulation Settings) | 880 | Base on field conditions | Yes | Additional mandatory distance to make 2 lane changes. Measured from Stop bar. Typically used more for high-speed facilities. See Synchro Studio 10 User Guide, Chapter 28 (pages 28-5 to 28-18) |
| | | Positioning Distance2 (Simulation Settings) | 1760 | Base on field conditions | Yes | Additional positioning distance to make 2 lane changes. Measured from Stop bar. Typically used more for high-speed facilities. See Synchro Studio 10 User Guide, Chapter 28 (pages 28-5 to 28-18) |
| | | Lane Alignment (Simulation Settings) | Right for right-turns Left for left-turns and thru movements Right-NA for U-turns | Base on field conditions | Yes | |
| | | Enter Blocked Intersection (Simulation Settings) | "No" for intersections | Code 1 vehicle if used Yes for driveways No for high speed movements | Yes | Enter "No" for high speed approaches and movements. "Yes" can help capacity of driveways. In general, controls gridlock avoidance. |
| | | Taper Length (Simulation Settings) | 25 | Code as part of storage based on field conditions | Yes | Impacts when vehicles can start entering the storage. |

Paramics Calibration Settings

Last Updated: 08-31-2017

| Type of Setting | Parameter Grouping | Parameter Name | Default Settings (per Paramics v. 6.9.3) | Recommended Parameter Value | Typical Parameters Adjusted During Calibration | Parameter Description |
|---|--|--|--|--|---|---|
| GLOBAL SETTINGS | Core Settings | Time steps | 2 | 2 to 4, Typically 4 for models with freeway merging | Yes | Higher Time Step allows vehicles to make decisions based on the car following and lane change logic at a higher frequency. |
| | | Queue gap distance (ft) | 32.81 | Typically not modified | No | Maximum distance between queuing vehicles. |
| | | Queuing speed (mph) | 4.47 | Typically not modified | No | Maximum speed of queuing vehicles. |
| | | Heavy vehicles weight (ton) | 2.95 | Typically not modified | No | Minimum weight of a heavy vehicle. |
| | | Mean target headway (s) | 1.00 | Urban areas: 0.85 to 0.90 Small Cities: 0.90 to 0.95 Rural areas: 0.95 to 1.00 | Yes | Raise to increase distance between vehicles and represent more passive drivers. Lower to decrease distance between vehicles and represent more aggressive drivers. |
| | | Mean driver reaction time (s) | 1.00 | Urban areas: 0.85 to 0.90 Small Cities: 0.90 to 0.95 Rural areas: 0.95 to 1.00 | Yes | Value is associated with the lag in time between a change in speed of the preceding vehicle and the following vehicle's reaction to this change. Raise for more passive drivers. Lower for more aggressive drivers. |
| | | Speed memory | 3 | 1.5x the Time steps value | Yes, if time step value is changed. | Speed Memory is used to store previous vehicle speeds at each Time Step. Speed Memory x time step should be > than the global Driver Reaction Time. |
| | | Minimum gap (ft) | 6.56 | Typically not modified | No | Minimum gap between stationary vehicles in a queue. |
| | | Loop length (ft) | 6.56 | Typically not modified on global level | No | Default distance between upstream and downstream edges of a loop detector (2 meters). Detector lengths may be modified locally as well. |
| | | Amber time (s) | 3 | Typically not modified on global level | No | Default yellow time included in traffic signal phases. This setting should be modified locally based on field signal timing and phasing settings. |
| | | Red time (s) | 5 | Typically not modified on global level | No | Default red time included in traffic signal phases. This setting should be modified locally based on field signal timing and phasing settings. |
| | | Default curve speed factor | 1 | Typically not modified | No | Allows vehicles to make turns at a safe speed. Typically not modified. |
| | | Speed drift unit | 5 | Typically not modified | No | Specifies minimum number of units that the link speed can be altered by in the Link Editor. Typically not modified. |
| | Wrong lane diversion time (s) | 300 | Typically not modified | No | Additional cost a vehicle would tolerate in order to reach its destination by choosing an alternative route. Only applies to links that have the "re-route stuck vehicles" flag enabled. | |
| | Assignment Settings | Assignment settings-Time Cost Coefficient | 1.000 | 0.667 | Yes, change from default in initial network setup. | Coefficient that defines how travel time affects routing for all vehicles in the network. |
| | | Assignment settings-Distance Cost Coefficient | 0.000 | 0.333 | Yes, change from default in initial network setup. | Coefficient that defines how distance affects routing for all vehicles in the network. |
| | | Assignment settings-Toll Price Cost Coefficient | 0.000 | 0 | Only if tolling applies. Should be based on prevailing wage rate in the study area. | Coefficient that defines how toll pricing affects routing for all vehicles in the network. |
| | | Assignment settings-Dynamic Assignment: Feedback Period | 0 | Start with 5 minute feedback period | Yes, change in small increments | Sets period at which link times are fed back into the routing calculations. At the beginning of each feedback period route cost tables are calculated for each viable network node to each destination zone. |
| | | Assignment settings-Dynamic Assignment: Feedback Smoothing | 0.500 | Adjust to reflect field conditions | Yes, change in small increments | Determines the percentage of historical data to be included in the routing table calculations. The lower the value the more emphasis is placed on historic data. |
| | | Assignment settings-Dynamic Assignment: Feedback Decay | 0.995 | 0.3 to 0.5 | Yes, change in small increments | Reduces dynamic feedback costs over time if there is no new data to make new calculations with. This avoids having a rapid oscillation in costs. |
| Assignment settings-Dynamic Assignment: Feedback Envelope | | 0 | Adjust to reflect field conditions | Yes, change in small increments | Defines how delay at a distance from a vehicle affects routing decisions. The further away a delay value is from the driver's position, the less weight the driver applies to their route choice decision. | |
| Assignment settings-Matrix Tuning Level | | None | Typically not modified | No | Modifies the demand distribution during simulation. For large networks there is a performance penalty with selection this option. | |
| Other Parameters | Other parameters-Vehicle types (proportion, familiarity, kinematics, dimensions, etc.) | - | Use Wisconsin-tailored vehicles file. Adjust vehicle type proportions to represent field conditions if possible. | Yes | Adjust to reflect vehicle proportions observed in the field. | |
| | Other parameters-Other global parameters (options menu, etc.) | - | 1) Check "Heavies Use All Lanes" 2) TWOPAS HGV climbing model 3) Gap reduction for stopped buses | 1) Always check "Heavies Use All Lanes" 2) TWOPAS HGV climbing model use is project specific. 3) Gap reduction for stopped buses use is project specific | 1) Allows heavy vehicles (i.e. trucks) to drive in all lanes. WI does not require trucks to stay in right lane. 2) TWOPAS HGV climbing model allows for grades coded in model to affect truck kinematics. Additional effort in coding grades accurately and correctly is needed. 3) Gap reduction for stopped buses should only be used in special-case scenarios where pick ups and drop offs are being modeled. | |

Paramics Calibration Settings

Last Updated: 08-31-2017

| Type of Setting | Parameter Grouping | Parameter Name | Default Settings (per Paramics v. 6.9.3) | Recommended Parameter Value | Typical Parameters Adjusted During Calibration | Parameter Description |
|-----------------|--------------------------|--|---|--|--|--|
| LOCAL SETTINGS | Link Parameters | Link Speed | Varies, set by link category | Use field data to code links speeds. If field data is not available, code link speed as posted speed | Yes, changes that stray from posted speed limit should be based on field data. | Drivers typically drive 10% over the posted speed limit in uncongested conditions. Link speed may need to be adjusted to reflect observed travel speeds. |
| | | Link Signpost and Signrange | Varies, set by link category | Base on field conditions. Allow signpost to enter zone on freeways. | Yes | Controls how and when vehicles move to the correct lane upstream of a hazard. Propagation of signposting can be used for widening hazards. |
| | | Link Force Merge | unchecked | Lower priority use | Yes, use sparingly | For links with priority other than major, drivers that have exceeded their patience threshold will force their way into the flow of traffic as long as a conflicting vehicle is not in the driver's path. |
| | | Link Force Across | unchecked | Lower priority use | Yes, use sparingly | For links with priority other than major, drivers that have exceeded their patience threshold will force their way across traffic to join any desired traffic stream as long as a conflicting vehicle is not in the driver's path. |
| | | Link Force Vehicle Aware | unchecked | Could be adjusted if applicable | Yes, if applicable | Used in shared-space pedestrian applications. Can be used to improve the quality of vehicle/pedestrian interaction logic by forcing all vehicles to be aware of pedestrians. |
| | | Link Reaction factor | 1.00 | Lower priority use, small adjustments only | Yes, use sparingly | Value is associated with the lag in time between a change in speed of the preceding vehicle and the following vehicle's reaction to this change. Raise for more passive drivers. Lower for more aggressive drivers. |
| | | Link Headway factor | 1.00 | Lower priority use, small adjustments only | Yes, use sparingly | Raise to increase distance between vehicles and represent more passive drivers. Lower to decrease distance between vehicles and represent more aggressive drivers. |
| | | Link Approach Visibility | Normal Link = 0 Roundabout approach = 32.8 | Important for roundabouts. Can be used with other unsignalized control. | Yes, typically adjusted with roundabouts. | Aids in vehicles identifying gaps at an unsignalized intersection approach. Important for roundabout calibration. |
| | | Link Stimulus Time | 5 | Typically not modified based on survey results | No | Lower value results in faster decision time for lane change |
| | | Link Transition Time | 5 | Typically not modified based on survey results | No | Lower value results in faster lane changing maneuver |
| | | Category Cost Factors | 0.8 to 1.0 | Typically not modified from defaults | No | Aids in routing control for unfamiliar drivers |
| | | Link Cost Factor | 1.00 | Adjust as needed to correct local routing issues. | Yes | Aids in routing control for all drivers |
| | Node Parameters | Node parameters-Allow sneaking | Unchecked | Could be used at congested intersections | Yes | Applies only when multiple vehicles are waiting to transfer to the same outbound link. Allows blocked vehicles to perform their movement before other vehicles of a higher priority. Could be used to reduce queue lengths and simulate more aggressive driving behavior. |
| | | Node parameters-Anticipate gaps | Unchecked | Could be used at congested intersections | Yes | By default vehicles wait for crossing vehicles to complete clear a node before completing their turning movement. This option allows vehicles to complete turning movement once the driver's path across the node is cleared. Could be used to reduce queue lengths and simulate more aggressive driving behavior. |
| | | Turning Penalties | 1.00 | No range specified | No | Aids in routing control for all drivers |
| | Entrance Ramp Parameters | Entrance ramp settings-Minimum Ramp Time (s) | 2 | 0 to 2 Typically 1 | Yes | Specifies amount of time vehicles must spend on the ramp prior to considering merging maneuver. Use 0 seconds as last resort after modifying headway, ramp aware, or other parameters to calibrate entrance ramp. Use of 0 seconds may be necessary with high volume merges and/or freeway segments. |
| | | Entrance ramp settings-Headway Factor | 1.00 | 0.80 to 1.00 | Yes | Target headway for all vehicles on the entrance ramp. Raise to increase distance between vehicles and represent more passive drivers. Lower to decrease distance between vehicles and represent more aggressive drivers. |
| | | Entrance ramp settings-Ramp Aware Distance (ft) | 656.2 | Modify on case-by-case basis depending on field conditions (topography, visibility of onramp, signing, etc.) and driver behavior or courtesy in study area | Yes | Defines point at which vehicles on the mainline become aware of the entrance ramp. Mainline drivers will only change lanes to allow for merging gaps and will not decelerate or accelerate to create gaps. |
| | Other Parameters | Other parameters-Gap Acceptance Rules | - | Lower priority use | Yes | Estimation of the minimum time required to clear the theoretical collision point with oncoming vehicles. If time is less than estimation, the driver will complete their movement. Typically used to calibrate queues at unsignalized intersections. |
| | | Other parameters-Variable Speed Limit Rules | - | Typically not modified | No | Controls the speed limit on a route over a set timeframe. Transition times can be specified to avoid abrupt changes. |
| | | Other parameters-Dynamic Tolling Rules | - | Typically not modified | No | May be used in HOT analysis. |
| | | Other parameters-Spatial Test Transfer Rules (Merge or Crossing) | - | Could be used | Yes, typically with roundabouts or short links | Aids in gap acceptance. Generally used with roundabouts or areas with short links. |
| | | Other parameters-Spatial Test Movement Rules | - | Could be used | Yes, typically with roundabouts or short links | Aids in gap acceptance. Generally used with roundabouts or areas with short links. |

VISSIM Calibration Settings

Last Updated: 11-27-2017
Source: PTV Vissim 9 User Manual

| Type of Setting | Parameter Grouping | Parameter Name | Default Settings (per Vissim v. 9.00-04) | Recommended Parameter Range | Typical Parameters Adjusted during Calibration | Parameter Description | |
|-----------------|---------------------|--|---|---|--|--|--|
| GLOBAL | Simulation Settings | Simulation resolution; Time steps (seconds)/Simulation second | 10.00 | 5 to 10 | Yes | The simulation resolution has an impact on the behavior of vehicles, pedestrians, and the way they interact. A higher simulation resolution allows vehicles to make decisions based on the car following and lane change logic at a higher frequency. | |
| | | Simulation Speed, Simulation second/second | 10 | Value 1.0: the simulation is run in real-time Value 2.0: The simulation is run at double real-time speed, etc. Maximum option: Runs the simulation at the maximum speed | No | Corresponds to a time lapse factor. It indicates simulation seconds per real-time second. The simulation speed does not affect the simulation results. The simulation speed can be changed during the simulation run. | |
| | Traffic Settings | Vehicle Composition (Veh Type; DesSpeedDistr; RelFlow) | | Adjust to represent field conditions | Yes | Adjust relative flows to represent field conditions | |
| | | Pedestrian Composition (Ped Type; DesSpeedDistr; RelFlow) | | Adjust to represent field conditions | Yes | Adjust relative flows to represent field conditions | |
| | Base Settings | Vehicle Fleet | | Use "North American" as default | Yes | Adjust to represent field conditions | |
| | | Vehicle/Pedestrian Types | Car, HGV, Bus, Tram, Man, Woman | Adjust to represent field conditions | Yes | Vehicle/pedestrian type allows you to form a group of vehicles/pedestrians with the same technical driving/walking characteristics (e.g., SUV, Crossover, Sedan, Pickup Truck, Sedan, etc.) | |
| | | Vehicle/Pedestrian Classes | | Typically separate into passenger cars and heavy trucks, but may use any of the FHWA 13 vehicle classes | Yes | By default, the data for all vehicle and pedestrian classes is entered together, but you can show the data for certain vehicle classes and/or pedestrian classes separately in the evaluation. | |
| | | Functions (Maximum and Desired Acceleration/Deceleration) | - | Typically use defaults per vehicle type/class | No | Impacts how fast or slow a vehicle will accelerate/decelerate. Generally more critical on steeper grades. | |
| | | Distributions (vehicle characteristics, function and distribution) | | 2D/3D Model - Use "North American" as default, adjust to match field conditions as appropriate | Yes | Allows you to define the specific vehicles (Volkswagen Golf, Audi A4, etc.) that are included in the vehicle fleet. | |
| | | Vehicle Characteristics function and distribution | | Speed Distribution: left turn 12.4 to 18.6 mph; right-turn 7.5 to 15.5 mph | | Adjust to represent field conditions | |
| LOCAL | Car Following | Look ahead distance min. (feet) | 0.00 | Typically not modified | No | Minimum distance that a vehicle can see forward in order to react to other vehicles either in front or to the side of it (within the same link). The minimum look-ahead distance is important when modeling lateral vehicle behavior. If several vehicle can overtake within a lane, this value needs to be greater than 0.00. If several vehicles can overtake within a lane, you can enter a greater look ahead distance to prevent any vehicle from running a red light (when doing so, do not change the number or Observed vehicles as this can lead to unrealistic simulation). | |
| | | Look ahead distance max. (feet) | 820.21 | Typically not modified | No | Maximum distance that a vehicle can see forward in order to react to other vehicles either in front or to the side of it (within the same link). May want to extend if modeling rail traffic with block signals. | |
| | | Look ahead distance. Observed vehicles | Arterial: 4 Freeway: 2 | 4 | Yes | The number of observed vehicles or number of certain network objects affects how well vehicles in the link can predict other vehicles' movements and react accordingly. Higher value means vehicles can better react to multiple network objects in the network | |
| | | Look back distance min. (feet) | 0.00 | Typically not modified | No | Defines the minimum distance that a vehicle can see backwards in order to react to other vehicles behind (within the same link). The minimum look-back distance is important when modeling lateral vehicle behavior. If several vehicles can overtake with a lane, this value needs to be greater than 0.00. This way you make sure the cars drive in an orderly fashion when two or more vehicles, than specified in the Observed vehicles attribute, on the same route want to position themselves at a stop line. This applies in particular to bicycles. | |
| | | Look back distance max. (feet) | 492.13 | Typically not modified | No | Defines the maximum distance that a vehicle can see backwards in order to react to other vehicles behind (within the same link). You can reduce the maximum look-back distance in close-meshed networks (e.g., many connectors over a short distance). This may positively affect the simulation speed. | |
| | | Temporary lack of attention duration (s) | 0.00 | 0.00 to 1.00 | No | The period of time when vehicles may not react to a preceding vehicle (they do react, however, to emergency braking). With increasing values, the capacity of the affected links decreases. | |
| | | Temporary lack of attention probability | 0% | 0 to 5% | No | Frequency of the lack of attention. With increasing values, the capacity of the affected links decreases. | |
| | | Smooth closeup behavior | Selected | Typically not modified | No | If this option is checked, vehicles slow down more evenly when approaching a stationary obstacle. If this option is not selected, the following vehicle uses the normal following behavior until the speed of the preceding vehicle drops to less than 3.28 feet/second and it comes almost to a halt. The later approach behavior can include a temporary acceleration. | |
| | | Standstill distance for static obstacles | Not Selected, 1.64 ft if selected | Typically not modified | No | Standstill distance upstream of static obstacles such as signal heads, stop signs PT stops, priority rules, conflict areas. Not valid for stop signs in parking lots. The attribute Smooth closeup behavior must be selected. If this option is not selected, the vehicles use a normally distributed random value [0.5;0.15]. If this option is selected, the vehicles will use the given value. | |
| | | Wiedemann 74 Car following model (applicable for arterials) | Wiedemann 74-Average standstill distance (feet) | 6.56 ft | 3.28 to 9.84 ft. | Yes | Defines the average desired distance between two cars. Higher value means larger standstill distance and lower capacity |
| | | | Wiedemann 74-Additive part of safety distance | 2.00 | 1 to 3.75 ft | Yes | Value used for the computation of the desired safety distance. Higher value means larger standstill distance and lower capacity |
| | | | Wiedemann 74-Multiplic. Part of safety distance | 3.00 | 2 to 4.75 ft | Yes | Value used for the computation of the desired safety distance. Greater value equals greater distribution (standard deviation) of safety distance. Higher value means larger standstill distance and lower capacity |

VISSIM Calibration Settings

Last Updated: 11-27-2017
Source: PTV Vissim 9 User Manual

| Type of Setting | Parameter Grouping | Parameter Name | Default Settings (per Vissim v. 9.00-04) | Recommended Parameter Range | Typical Parameters Adjusted during Calibration | Parameter Description |
|---|---|--|--|--|--|--|
| Car Following (Cont) | Wiedemann 99 Car following model (applicable for freeway/highway) | Wiedemann 99-CC0 (Standstill Distance) (feet) | 4.92 ft | Basic segment: 4.0 to 5.5 Weaving/Merge/Diverge: >4.92 | Yes | The average desired standstill distance between two vehicles, it has no variation. Higher value means larger standstill distance and lower capacity |
| | | Wiedemann 99-CC1 (Headway Time) (s) | 0.90 | Basic segment: 0.7 to 3.0 Weaving/Merge/Diverge: 0.9 to 3.0 | Yes | Time distribution of speed-dependent part of desired safety distance. Higher value means more cautious driver and lower capacity |
| | | Wiedemann 99-CC2 ('Following' Variation) (feet) | 13.12 ft | Basic segment: 6.56 to 22.97 Weaving/Merge/Diverge: 13.12 to 39.37 | Yes | Restricts the distance difference (longitudinal oscillation) or how much more distance than the desired safety distance a driver allows before he intentionally moves closer to the car in front. Higher value means more cautious driver and lower capacity |
| | | Wiedemann 99-CC3 (Threshold for Entering 'Following') | -8.00 | Typically not modified | No | It controls the start of the deceleration process (i.e., the number of seconds before reaching the safety distance.) At this stage the driver recognizes a preceding slower vehicle. |
| | | Wiedemann 99-CC4 (Negative 'Following' Threshold) | -0.35 | Typically not modified | No | Defines negative speed difference during the following process. Low values result in a more sensitive driver reaction to the acceleration or deceleration of the preceding vehicle. |
| | | Wiedemann 99-CC5 (Positive 'Following' Threshold) | 0.35 | Typically not modified | No | Defines positive speed difference during the following process. Low values result in a more sensitive driver reaction to the acceleration or deceleration of the preceding vehicle. |
| | | Wiedemann 99-CC6 (Speed dependency of Oscillation) | 11.44 | Typically not modified | No | Influence of distance on speed oscillation while in the following process. If the value is 0, the speed oscillation is independent of the distance. Larger values lead to a greater speed oscillation with increasing distance. |
| | | Wiedemann 99-CC7 (Oscillation Acceleration) (ft/s ²) | 0.82 ft/s ² | Typically not modified | No | Oscillation during acceleration |
| | | Wiedemann 99-CC8 (Standstill Acceleration) (ft/s ²) | 11.48 ft/s ² | Typically not modified | No | Desired acceleration when starting from standstill (limited by maximum acceleration defined within the acceleration curves). |
| | | Wiedemann 99-CC9 (Acceleration with 50 mph) (ft/s ²) | 4.92 ft/s ² | Typically not modified | No | Desired acceleration when starting at 80 km/h, approximately 50 mph, (limited by maximum acceleration defined within the acceleration curves). |
| | | LOCAL (CONT) | Lane Change | General behavior | Free lane selection | Free lane selection or Slow lane rule |
| Maximum deceleration - Own (ft/s ²) | -13.12 ft/s ² | | | -15 to -12 | Yes | Upper bound of deceleration for own vehicle. Higher absolute value means more aggressive lane changing behaviors |
| -1 ft/s ² per distance - Own (feet) | Arterial: 100 Freeway: 200 | | | 100 to 250 | No | This reduces the Maximum deceleration with increasing distance from the emergency stop distance linearly by this value down to the Accepted deceleration . |
| Accepted deceleration - Own (ft/s ²) | Arterial: -3.28 Freeway: -1.64 | | | -2.5 to -4 | No | Lower bound of deceleration for own vehicle for a lane change |
| Maximum deceleration - Trailing (ft/s ²) | -9.84 ft/s ² | | | -12 to -8 | No | Upper bound of deceleration for trailing vehicle. Higher absolute value means more aggressive lane changing behaviors |
| -1 ft/s ² per distance - Trailing (feet) | Arterial: 100 Freeway: 200 | | | 50 to 250 | No | This reduces the Maximum deceleration with increasing distance from the emergency stop distance linearly by this value down to the Accepted deceleration . |
| Accepted deceleration -Trailing (ft/s ²) | Arterial: -3.28 Freeway: -1.64 | | | -1.5 to -2.5 | No | Lower bound of deceleration for trailing vehicle for a lane change |
| Waiting time before diffusion (s) | 60.00 | | | 60.00 to 200.00 | Yes | The maximum amount of time a vehicle can wait at the emergency stop distance for a necessary change of lanes. When this time is reached, the vehicle is removed from the network. Higher value means more tolerance on vehicles waiting at the emergency stop distance for necessary lane changes. |
| Min. headway (front/rear), (ft) | 1.64 | | | 1.5 to 6 | No | The minimum distance between two vehicles that must be available after a lane change, so that the change can take place. A lane change during normal traffic flow might require a greater minimum distance between vehicles in order to maintain the speed-dependent safety distance. |
| To slower lane if collision time is above (s) | 10.00 | | | 0 to 0.5 | No | Defines the minimum distance to a vehicle in front, in seconds, which must be present on the slower lane, so that an overtaking vehicle switches to the slower lane. Only applicable for Slow lane rule or Fast lane rule . |
| Safety distance reduction factor | 0.60 | | | 0.1 to 1.0 | No | This factor is taken into account for each lane change. During the lane change, Vissim reduces the safety distance to the value that results from the following multiplication: Original safety distance * safety distance reduction factor . The default value of 0.6 reduces the safety distance by 40%. Once a lane change is completed, the original safety distance is taken into account again. |
| Maximum deceleration for cooperative braking (ft/s ²) | -9.84 | | | -32.3 to -3 | No | Specifies to what extent the trailing vehicle is braking cooperatively, so as to allow a preceding vehicle to change lanes into the same lane they are traveling in. The higher the value, the stronger the braking and the greater the probability of changing lanes. |
| Overtake reduced speed areas | Not Selected | | | Typically not modified | No | If this option is selected, vehicles immediately upstream of a reduced speed area may perform a free lane change. The vehicle will acknowledge any reduced speed area of the lane they changed into and adjust their speed accordingly. If the option is not selected (default), vehicles never start a free lane change directly upstream of a reduced speed area and they completely ignore the reduced speed areas on the new lane. |
| Advanced merging | Selected | | | Adjust to match field conditions | Yes | If this option is selected, more vehicles can change lanes earlier, therefore capacity increases |
| Consider subsequent static routing decisions | Selected | Typically not modified | No | If this option is selected, vehicles leaving the route identify new routing decisions on the same link in advance and take them into account when choosing the lane. This option must be checked to allow vehicles to identify, in advance, routing decision further downstream. | | |

VISSIM Calibration Settings

Last Updated: 11-27-2017
Source: PTV Vissim 9 User Manual

| Type of Setting | Parameter Grouping | Parameter Name | Default Settings (per Vissim v. 9.00-04) | Recommended Parameter Range | Typical Parameters Adjusted during Calibration | Parameter Description | |
|----------------------------------|--------------------|--|---|--|---|--|--|
| LOCAL (CONT) | Lane Change (Cont) | Cooperative lane change | Not Selected | Adjust to match field conditions | Yes | If this option is selected, trailing vehicles will make necessary lane change to facilitate the lane change of a leading vehicle | |
| | | > Maximum speed difference (mph) | 6.71 | Typically not modified | No | Applicable only if Cooperative lane change has been selected. Identifies the maximum possible speed difference. | |
| | | > Maximum collision time (s) | 10.00 | Typically not modified | No | Applicable only if Cooperative lane change has been selected. Identifies the maximum collision time (time a vehicle can travel before reaching a preceding vehicle or network object that has an impact on its desired speed) | |
| | | Lateral correction of rear end position | Not Selected | Typically not modified | No | This causes the vehicle to be aligned to the middle of the lane at the end of the lane change, instead of at an angle in the original lane. This can affect the capacity. Only performed if the Keep lateral distance to vehicles on next lane(s) option is selected under "Lateral" behavior. | |
| | | > Maximum speed (mph) | 1.86 | Typically not modified | No | Speed up to which the correction of the rear end position should take place. Lateral correction of the rear end position is not performed for faster vehicles. | |
| | | > Active during time period from "x sec" until "x sec" after lane change start | 1.00 until 10.00 | Typically not modified | No | Time after the start of the lane change at which the lateral movement of the rear end position should start until time after the start of the lane change at which the lateral movement of the rear end position should end. | |
| | Lateral | Desired position at free flow | Middle of lane | Typically not modified | No | Lateral orientation of a vehicle within its lane while it is in free traffic flow | |
| | | Keep lateral distance to vehicles on next lane(s) | Not Selected | Typically not modified | No | If this option is selected, the vehicles consider the position and therefore the lateral orientation of vehicles on adjacent lanes and keep the Lateral min. distance . For this purpose, vehicles even adjust their lateral orientation on their own lane and swerve out of the way. If this option is not selected, vehicles on adjacent lanes are ignored even if they are wider than their lanes, except when they perform a lane change. Note: using this option can reduce the simulation speed significantly. | |
| | | Diamond shaped queuing | Not Selected | Typically not modified | No | If this option is selected, queues take into account a realistic shape of vehicles with vehicles positioned offset, such as bikes. Vehicles are internally represented not as a rectangle, but as a rhombus. | |
| | | Consider next turning direction | Not Selected | Typically not modified | No | Enables more intelligent lateral behavior in case of non-lane-bound traffic. If the option has been selected, a vehicle with this driving behavior does not pass another vehicle on the same lane if this might cause a collision at the next turning connector. To achieve this, attributes that enable passing on the same lane must be selected. Note the option Consider next turning direction has precedence over option Desired position at free flow . | |
| | | Collision time gain (s); | 2.00 | Typically not modified | No | Minimum value of the collision time gain for the next vehicle or signal head, which must be reached so that a change of the lateral position on the lane is worthwhile and will be performed. Calculated based on the desired speed of the vehicle. Smaller values lead to a livelier lateral behavior, since vehicles also have to dodge sideways for minor improvements. | |
| | | Minimum longitudinal speed (mph): | 2.24 | Typically not modified | No | Minimum longitudinal speed which still allows for lateral movements. The default value (2.24 mph) ensures that vehicles can also move laterally if they have almost come to a halt already. | |
| | | Time between direction changes (s): | 0.00 | Typically not modified | No | Defines the minimum simulation time which must pass between the start of a lateral movement in one direction and the start of a lateral movement in the reverse direction. The higher this value, the smaller the lateral movements of vehicles. These lateral movements only take place if overtaking on the same lane is permitted. (Does not affect the lateral movement for a lane change.) | |
| | | Default behavior when overtaking vehicles on the same lane | Overtake on same lane | On left - Not Selected On right - Not Selected | Typically not modified | No | When modeling traffic that is not lane-bound, you can allow vehicles to overtake within a lane. Left: vehicles are allowed to overtake on a lane to the left; Right: vehicles are allowed to overtake on a lane to the right. |
| | | | Minimum lateral distance (ft) at 0 mph and 30 mph | Distance standing at 0 mph: 0.66 ft Distance driving at 30 mph: 3.28 ft | Typically not modified | No | Minimum distance between vehicles when overtaking within the lane and keeping the distance to vehicles in the adjacent lanes. Distance Standing at 0 mph is the lateral distance of the passing vehicle; Distance driving at 30 mph is the lateral distance of the passing vehicles. |
| | | Exceptions for overtaking vehicles of the following vehicle classes | | No exceptions listed | Typically not modified | No | Behavior for specific vehicle classes that deviates from the default behavior when overtaking vehicles on the same lane. When modeling traffic that is not lane-bound, you can select vehicle classes which may be overtaken within a lane by vehicles of the defined driving behavior set. |
| | Signal Control | Reaction to amber signal | Decision model | Continuous Check | Not typically modified | No | Defines the behavior of vehicles when they approach an amber light. Continuous check: driver of vehicle continuously decides whether to continue driving or whether to stop. Vehicles assume that the amber light will only be visible for another two seconds. A vehicle will not brake, if its maximum deceleration does not allow it to stop at the stop line, or if it would have to brake for more than 15 ft/s ² . The vehicle will brake, if at its current speed, it cannot drive past the signal head with two seconds. One decision: The decision made is maintained until the vehicle crosses the stop line. Calculated using the probability factors. |
| | | | Probability Factors | Alpha: 1.59 Beta 1: -0.26 Beta 2: 0.27 | Only applicable is One decision model is selected, Not typically modified | No | Used to calculate the probability (i.e., whether a driver stops at an amber light or not). $p = \frac{1}{1 + e^{-\alpha - \beta_1 v - \beta_2 d}}$ The following settings make a vehicle continue driving for longer when there is an amber light and occasionally even make it run a red light: The One decision option is selected, Alpha is greater than the default value 1.59; Beta1 is greater than the default value 0.27; and Beta2 is greater than the default -0.26 but less than 0.00. |
| | | Behavior at red/amber signal | | Go (same as green) | Not typically modified | No | Used to define country-specific or regional behavior at red/amber signal. Options are Stop (same as red) or Go (same as green) ; where Stop (same as red) means the Go signal is green and the Go (same as green) means the Go signal is red-amber. |
| | | Reduced safety distance close to a stop line | Factor | 0.60 | 0.60 | Yes | Higher value reduces the safety distance between vehicles close to the signal stop bar |
| | | | Start upstream of stop line (ft) | 328.08 | Not typically modified | No | Distance upstream of the signal head |
| End downstream of stop line (ft) | | | 328.08 | Not typically modified | No | Distance downstream of the signal head | |
| Reaction time distribution | | Blank | Typically not modified | No | Reaction time of a vehicle to the Go signal. It causes a time delay between the time step when the signal switches to Go and the time step when the first vehicle upstream of the corresponding stop line starts to move. If no time distribution is selected, the default time is 0 seconds. | | |

VISSIM Calibration Settings

Last Updated: 11-27-2017
Source: PTV Vissim 9 User Manual

| Type of Setting | Parameter Grouping | Parameter Name | Default Settings (per Vissim v. 9.00-04) | Recommended Parameter Range | Typical Parameters Adjusted during Calibration | Parameter Description |
|-----------------|------------------------|---------------------------|--|--|--|--|
| LOCAL (CONT) | Connector-level | Emergency Stop (feet) | 16.40 | Adjust to match field conditions | Yes | Distance before the downstream connector where vehicles can make last chance lane changes |
| | | Lane change (feet) | 656.20 | >656.20 | Yes | Distance before the downstream connector where vehicles begin to make lane changes |
| | | Lane change per lane | Not Selected | Adjust to match field conditions | Yes | If this option is selected, the entered lane change attribute value is multiplied by the number of lane changes which a vehicle requires to reach the connector |
| | Point-level | Speed distributions (mph) | Linear distributions | Adjust to represent the field conditions | Yes | The distribution function of desired speeds is a particularly important parameter, as it has an impact on link capacity and achievable travel times. If not hindered by other vehicles or network objects (e.g., signal controls), a driver will travel at his desired speed. Desired speed distributions are defined independently of vehicle or pedestrian type. |
| | | Time distributions (mph) | Linear distributions | Not typically modified | No | You can use dwell time distributions for: 1) standstill time on parking lots 2) waiting times at toll counters through stop signs or 3) for PT stops to allow adequate time for passengers to board and alight the bus/transit vehicle. |



16-25-1 Introduction

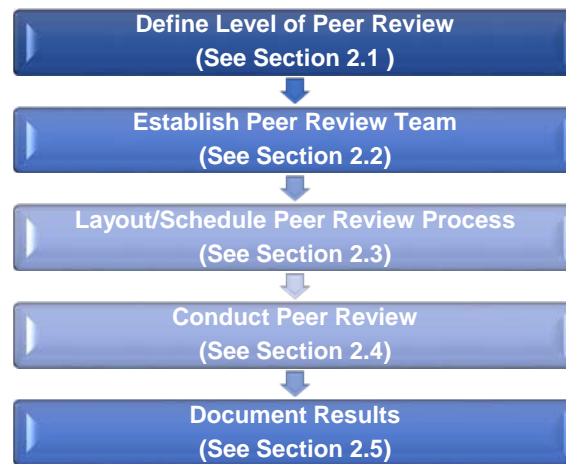
January 2018

This policy addresses the peer review process for traffic models utilized to conduct traffic operations analysis for the evaluation and design of all transportation improvement projects. For this policy, traffic models refer to both the Highway Capacity Manual (HCM)-based traffic analyses and microscopic simulation (microsimulation) analyses. This policy does not cover the travel demand models (TDMs) utilized to generate traffic forecasts. Refer to the [Transportation Planning Manual \(TPM\), Chapter 9](#) for additional details regarding traffic forecasting protocols. The Traffic Model Peer Review Policy provided within this document is required for all projects that initiated traffic modeling on or after January 1, 2016. For projects initiated prior to January 1, 2016, the project team should coordinate with region traffic operations and (as needed) with the Bureau of Traffic Operations (BTO) to determine how this policy should be implemented.

1.1 Overview

A peer review is a structured process for reviewing a traffic model to ensure the use of sound engineering judgment. The primary goal of the peer review process is to protect the department's and public's interests by verifying the integrity of the traffic model by assuring that it provides a reasonably accurate representation of traffic conditions that exist in the field. There are four levels of peer review, which are dependent on the complexity of the traffic model. It can take anywhere from six weeks to over four months to conduct a peer review of the traffic model for one analysis scenario. This may significantly affect the overall schedule and budget for a project and, should thus, be considered early on during project scoping. [Figure 1.1](#) highlights the key steps of the peer review process for HCM and microsimulation traffic models.

Figure 1.1. Traffic Model Peer Review Process Overview



1.2 Background

The Wisconsin Department of Transportation's (WisDOT or the department) Traffic Simulation Modeling Process Lean Initiative led by the Bureau of Planning and Economic Development (BPED) - Traffic Forecasting Section (TFS) with input from BTO – Traffic Analysis and Safety Unit (TASU) and the Bureau of State Highway Programs (BSHP) – Program Development and Analysis Section (PDAS) outlined a process for the development and review of HCM and microsimulation traffic models (does not include TDMs). [TEOpS 16-1-1, Attachment 1.1](#) provides an illustration (flow chart) of the process defined through the lean initiative.

The lean initiative identified that historically there was a lack of consistency in when and how the department reviews the HCM and microsimulation traffic models. To improve consistency across the state concerning the review of these traffic models, BTO-TASU developed the Traffic Model Peer Review policy, focusing on steps 6 and 11 of the overall traffic model development and review process (see [TEOpS 16-1-1, Attachment 1.1](#)).

16-25-2 Process

January 2018

2.1 Define Level of Peer Review

It is the responsibility of the project manager to ensure that the traffic model is peer reviewed, while it is up to region traffic operations to define the peer review requirements. To assist with defining the peer review

requirements, this policy defines four levels of peer review for traffic models:

1. Project team level review – The WisDOT project team leads the peer review process, providing a high-level (e.g., spot-check) and independent (i.e., the reviewer cannot be part of the team developing the traffic model) review of the traffic model. The region traffic modeler (if available) and/or region traffic operations will provide an in-depth review of the traffic model as needed. If the region does not have the available knowledge and/or resources, they *may* contact BTO-TASU for assistance with the in-depth review.
2. Region level review – The region traffic modeler and/or region traffic operations lead the peer review process. The WisDOT project team will provide oversight of the peer review process and BTO-TASU, BSHP –PDAS, BPED –TFS, the Southeast (SE) region – TFS, and other statewide bureaus (SWBs) will assist in the peer review as needed. The region will provide an in-depth review of the traffic model. If the region does not have the available knowledge and/or resources, they *may* contract with an independent consultant (one that is not a member of the consultant team developing the traffic model) to assist as necessary.
3. Independent consultant level review – An independent consultant typically leads the peer review process, but works closely with the region traffic modeler and/or region traffic operations on all aspects of the review. The WisDOT project team will provide oversight of the consultant's peer review and BTO-TASU, BSHP-PDAS, BPED-TFS, SE-TFS and other SWBs will assist in the peer review as needed. The independent consultant will provide an in-depth review of the traffic model while the region traffic modeler and/or region traffic operations will typically provide a high-level review. In cases where the region has the knowledge and resources available, they *may* choose to forego the use of an independent consultant.
4. SWB level review with Federal Highway Administration (FHWA) oversight - An independent consultant typically leads the peer review process, but works closely with the region traffic modeler, region traffic operations, BTO-TASU, BSHP-PDAS, BPED-TFS, SE-TFS, and other SWBs on all aspects of the review. The independent consultant will provide an in-depth review of the traffic model while the region traffic modeler and/or region traffic operations and SWBs will typically provide a high-level review. In cases where the region has the knowledge and resources available, they may choose to forego the use of an independent consultant.

For projects constructed with federal funds, FHWA oversight of the peer review process will be required to ensure that the traffic model adheres to federal guidelines. The extent of FHWA involvement will vary depending on the specifics of the proposed project.

Note: See [TPM, Chapter 9](#) for details on the traffic forecasting section's involvement with traffic model peer reviews.

The level of peer review will vary depending on the complexity of the traffic model, which is dependent on the project type (mega/major project, high profile project, routine improvement project, etc.), project scope, corridor type, traffic control, roadway congestion level, and traffic analysis tool(s) utilized. However, a project team or region level review is typically sufficient for most HCM-based traffic models. The SWBs, specifically BTO-TASU and BPED-TFS, will be involved on high-profile projects, mega/major projects, and those projects that have potential for FHWA involvement.

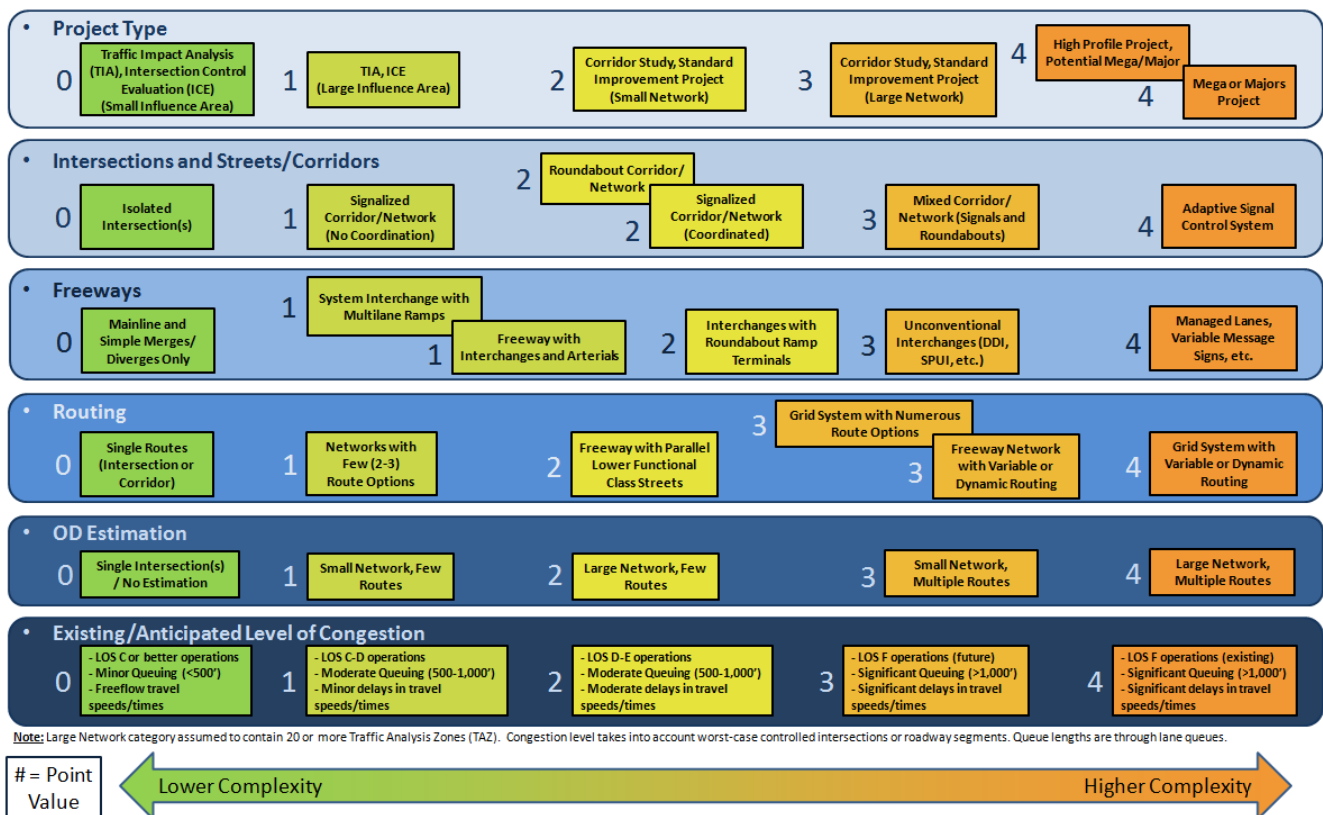
The level of peer review *may* significantly impact the overall schedule and budget for a project, and *should* be determined early on during project scoping. However, the project team often must wait for the initiation of the traffic analysis to define the level of peer review required. Therefore, the project team *should* assume the highest potential peer review level will be required when defining the schedule and budget for a project.

To quantify the level of complexity associated with building and reviewing a traffic model (specifically a microsimulation traffic model), the department worked with a consultant to establish a scoring system. The scoring system defines the level of complexity and the level of peer review required by assigning points within the following categories:

1. Project type
 - a. Arterial corridor
 - b. Freeway corridor
2. Geometric conditions
 - a. Arterial corridor
 - b. Freeway corridor
3. Traffic pattern/conditions
 - a. Routing options
 - b. Origin-destination (O-D) matrix development
 - c. Level of congestion (existing and future)

Within the geometric conditions category there are two subcategories to define the type of corridor included in the analysis: arterial corridor (includes individual intersections, streets or corridor segments) and freeway corridor. The traffic pattern/conditions category contains three subcategories: routing options, O-D matrix development and existing/anticipated level of congestion. [Figure 2.1](#) provides an illustration of the traffic model level of complexity scoring system.

Figure 2.1. Traffic Model Complexity Scoring Diagram



As illustrated in [Figure 2.1](#), there are several factors within each category and subcategory that define the complexity of a traffic model. For example, the complexity of a traffic model for an arterial corridor is dependent on whether the traffic model is an isolated intersection, an uncoordinated signalized corridor, a coordinated signalized corridor, a roundabout corridor, a mixed traffic control corridor (e.g., a corridor with signals and roundabouts), or an adaptive signal control system. Every factor has an associated level of complexity based on a scale of 0 to 4 (an isolated intersection has a complexity score of 0 while an adaptive signal control system has a complexity score of 4). If multiple factors are applicable, the score associated with the highest level of complexity dictates the overall score for that category or subcategory. For example, a Traffic Impact Analysis (TIA) project with a small influence area by itself has a complexity score of 0; however, if the TIA is a high profile project the score used in the “project type” category would be 4. The highest score within each category/subcategory is then summed to determine an overall complexity score for the traffic model (maximum score of 24). The higher the overall complexity score, the more likely it is that microsimulation traffic models will be necessary. Please refer to [Attachment 2.1](#), a Microsoft® Excel® based template, for assistance with

developing the overall complexity score for the traffic model. In coordination with region traffic operations, the project team's traffic lead or project manager *should* complete the traffic model complexity-scoring template.

The overall traffic model-complexity-score defines the minimum peer review requirements for the project. It is possible for a higher (more intense) level of peer review to be completed. Ultimately, it is up to region traffic operations to define the final peer review requirements. Refer to [Table 2.1](#) for the complexity score associated with each peer review level.

Due to modified roadway geometry, increased traffic volumes, reduced levels of congestion, etc., it is possible for the traffic model-complexity-score to be different under future alternative scenarios than it is under existing conditions. Therefore, it is critical to consider both existing conditions and potential future alternatives (including levels of service) when defining the traffic model complexity score and the associated level of peer review required. The highest traffic model-complexity-score across all the scenarios (existing and future alternatives) dictates the minimum peer review requirements.

Table 2.1. Peer Review Level Requirements

| Total Complexity Score ^(a) | Minimum Required Peer Review | Notes |
|--|---|--|
| 0-3 | Project Team Level Review ^(b) | <ul style="list-style-type: none"> Project team leads peer review Region provides in-depth review as needed |
| 4-7 | Region Level Review ^(b) | <ul style="list-style-type: none"> Region provides in-depth review, SWBs provide assistance as needed Independent consultant review as needed |
| 8-10 | Independent Consultant Level Review | <ul style="list-style-type: none"> Independent consultant leads review ^(c) Region provides high-level review SWBs provide assistance as needed |
| 11+ | SWB Level Review with FHWA Oversight ^(d) | <ul style="list-style-type: none"> Independent consultant leads review ^(c) Region and SWBs provide high-level review FHWA oversight <i>may</i> be needed |
| <p>(a) The scoring system identified within this table shall act as a guide and not as a rigid requirement. Ultimately, professional judgment will be required to determine the level of peer review needed.</p> <p>(b) A project team or region level review is sufficient for most HCM-based traffic models.</p> <p>(c) If the region has the required knowledge and resources, they <i>may</i> choose to forego the use of an independent consultant.</p> <p>(d) This indicates when there is a high probability that FHWA oversight will be required. Prior to developing the traffic models, the project team <i>should</i> coordinate with FHWA to determine their level of involvement (if any).</p> | | |

2.2 Establish Peer Review Team

Upon defining the peer review requirements, the project team *should* meet with region traffic operations to identify the peer review participants and establish all internal and external stakeholders. This meeting *should* occur as early as possible, but **shall** occur prior to the initiation of the traffic analysis.

[Table 2.2](#) provides a summary of the stakeholders to consider for inclusion on the peer review team. The peer review process will vary slightly from one project to another, thus [Table 2.2](#) *should* serve as a guide (not a rigid requirement) when establishing the peer review team.

Although [Table 2.2](#) provides insight into when the SWBs and/or FHWA *should* be involved with the peer review, unique situations not covered in the table *may* also trigger the need to involve a SWB or FHWA. Thus, the project team *should* coordinate with the SWBs and FHWA during project scoping to verify their level of involvement (if any) in the peer review process. In general, the SWBs (specifically BTO-TASU) will be involved on all mega/major projects and projects where FHWA participation in the peer review process is desired or required.

If the region does not have the knowledge and/or resources available to conduct the peer review of the traffic model, the project manager will most likely need to select and procure an independent consultant to complete the peer review, regardless of the traffic model complexity. If desired, the region *may* contact BTO-TASU for support, or possibly, to conduct the peer review of the simpler traffic models (traffic model-complexity-score of 0-7).

Table 2.2. Potential Peer Review Participants

| Stakeholder ^(a) | Level of Involvement | Notes |
|---|--|--|
| Region | | |
| <ul style="list-style-type: none"> Region Traffic Operations Region Traffic Modeler (if available) | <ul style="list-style-type: none"> All levels of peer review | Roles/responsibilities will vary based on level of review required |
| Statewide Bureaus | | |
| <ul style="list-style-type: none"> BTO-TASU and BSHP – PDAS | <ul style="list-style-type: none"> SWB with FHWA oversight level review | Provides assistance as needed on all levels of peer review Provides high-level review of all projects with potential for FHWA involvement |
| <ul style="list-style-type: none"> BPED-TFS and/or SE-TFS | <ul style="list-style-type: none"> All levels of peer review | See TPM, Chapter 9 for details on TFS involvement with traffic model reviews |
| External Stakeholders | | |
| <ul style="list-style-type: none"> Independent Consultant | <ul style="list-style-type: none"> Independent consultant level review SWB with FHWA oversight level review | May get involved on lower level reviews if region staff do not have the necessary resources ^(b) |
| <ul style="list-style-type: none"> FHWA | <ul style="list-style-type: none"> FHWA oversight review | Typically involved on mega/major projects and Interstate Access Justification Reports (IAJRs) being federally funded |
| <ul style="list-style-type: none"> Local Municipalities, Regional Planning Commissions (RPCs), Metropolitan Planning Organizations (MPOs) | Typically, will not review the traffic model, but <i>may</i> participate in peer review discussions to ensure that local concerns are addressed ^(c) | |
| <p>(a) The peer review team established for a specific project <i>may</i> include more or fewer members than those listed above.</p> <p>(b) Region traffic operations <i>should</i> assess whether they have the knowledge and resources to complete the peer review; if not BTO-TASU may be able to help with the peer review for models with a complexity score of 7 or less. If neither region staff nor BTO-TASU has the capability to conduct the peer review, an independent consultant shall be selected/procured to complete the peer review regardless of the traffic model complexity.</p> <p>(c) Early coordination with the Southeastern Wisconsin Regional Planning Commission (SEWRPC) for mega/major projects located in the SE region is highly recommended.</p> | | |

If there is a need for an independent consultant, the project team *should* follow the process outlined in the department's Facilities Development Manual Chapter 8, Section 5 ([FDM 8-5](#)) to select and procure a consultant team to perform the necessary peer review. The Statewide Master Contract for Traffic Analysis and Modeling (BTO 03) and the Statewide Master Contract for Traffic Engineering Services (BTO 01) identifies the consultants that have been previously selected and authorized to conduct traffic engineering services (including traffic model peer reviews). The list of consultants on the master contracts are updated every two-years and are available through the [Contract Administration Reporting System \(CARS\)](#) application or through BTO-TASU. If desired, BTO-TASU can provide assistance with the selection of the independent peer review consultant.

To ensure a truly independent peer review, it is critical that the consultant chosen to conduct the peer review does not have any affiliation or conflict of interest with the consultant team selected to perform the traffic analysis.

2.3 Layout/Schedule Peer Review Process

Once the peer review team has been established, the project manager **shall** coordinate with the peer review team (typically via a coordination meeting) to identify the following components of the peer review process:

1. Project milestones which will trigger the need for a peer review
2. Roles of the individual peer review members
3. Data requirements
4. Schedule for conducting the peer review(s)
5. Transfer process for traffic model(s) and peer review comments

The following provides additional discussion on each of these components.

2.3.1 Identify Project Milestones

There are typically three major project milestones for a peer review: (1) completion of the existing year traffic model, (2) completion of the design year no-build traffic model and (3) completion of each design year build/project alternative traffic model. Complex traffic models *may* warrant the need for peer reviews at additional project milestones, such as after the initial coding of the traffic model but prior to the full calibration of the traffic model. At the completion of the coordination meeting, both the project team and peer review team *should* have a clear understanding of where the peer review(s) *should* fall within the overall project timeline.

With HCM-based traffic models, the review of the existing year, design year no-build, and design year build/project alternative traffic models can occur simultaneously. However, due to the complexity of microsimulation traffic models, a peer review will typically be required at each of the three milestones described above. Consecutive review of the existing year, the design year no-build and the design year build/project alternative traffic models is strongly encouraged.

In other words, only after calibrating and validating the existing conditions and only after completing the peer review process of the existing conditions model, *should* the analyst proceed with the development of other modeling scenarios (e.g., design year no build, design year build, etc.). If the analyst chooses to develop the model alternatives prior to calibrating and validating the existing conditions model and/or prior to having the model go through the peer review process, they take the risk that they must go back and revise not only the alternatives model but the existing conditions model as well. This can lead to potential inconsistencies in the modeling scenarios and could result in the need for additional time to calibrate and perform the peer review(s) of the alternatives model. Although it may be tempting, especially when the project has a compressed schedule, to skip or delay the calibration, validation and/or peer review process of the existing conditions model, it may end up being counterproductive and is strongly discouraged.

The subsequent text provides a description of the three major milestones.

Milestone 1: Completion of Existing Year Traffic Model

The existing year traffic model replicates existing field conditions. Existing year traffic conditions *should* reflect the year that is as close to the original start of the traffic analysis as possible. Whenever possible, traffic data *should* be no more than three years old and ideally, all traffic data *should* be from the same year. Ongoing construction or other special circumstances may dictate the need to use older data or data from multiple years.

A peer review is required at this project milestone to ensure that the traffic model provides an accurate representation of field conditions based on data collected by the project team and/or peer review team. At this milestone, BPED-TFS or SE-TFS *should* verify that the traffic model and traffic forecasts utilize a consistent existing volume data set.

Milestone 2: Completion of Design Year No-Build (FEC) Traffic Model

The design year no-build traffic model reflects design year conditions absent of the proposed project. It will reflect design year traffic volumes and existing geometry or existing geometry with other planned and enumerated (or committed) improvement projects and may include signal timing modification. As such, another name for this scenario is the future with existing plus committed (FEC) scenario. The planned improvement projects need to occur after the existing year but prior to the proposed project's design year to be included in the FEC model. Note that the FEC conditions for a specific project may not match the no-build conditions reflected in a travel demand model (TDM) used in forecasting traffic. Thus BPED-TFS or SE-TFS *should* verify that the same assumptions (e.g., number of travel lanes) is reflected in both the traffic model and traffic forecasts.

For the traffic model to function with the design year traffic volumes, it *may* be necessary to include minor geometric improvements (e.g., the extension of an existing right or left turn lane or channelization optimizations such as the removal of shared lane movements within the FEC right-of-way, etc.) beyond the committed projects. In these cases, the traffic model represents future with existing plus committed plus minor improvements (FEC+) conditions. The project team *should* clearly document these minor improvements within the modeling methodology report and/or other project memoranda as appropriate.

A peer review is required at this project milestone to confirm that the traffic model accurately depicts design year traffic volumes and to verify that the basic structure of the model is consistent with the existing year traffic model. If the analyst properly addresses and carries forward comments from the existing year model, the peer review process at the FEC project milestone *should* be less intensive than

the initial peer review.

Milestone 3: Completion of Each Design Year Build/Project Alternative Traffic Model

The design year build traffic models capture design year conditions with the proposed project improvements. The build traffic models may reflect “constrained” or “unconstrained” conditions. Typically, the analyst will need to develop a traffic model for more than one project alternative.

A peer review is required for each project alternative. Peer reviews are necessary at this project milestone to ensure that the traffic model is consistent with the previous traffic models and to verify that it accurately captures the proposed improvements. Checking for geometric improvements, changes in travel demand/traffic patterns, and consistency against the existing and no-build traffic models *should* be the focus of the design year alternative model reviews. BPED-TFS or SE-TFS *should* verify that the same assumptions (e.g., number of travel lanes) is reflected in the design year build traffic models and traffic forecasts.

2.3.2 Outline Roles/Responsibilities

[Table 2.1](#) and [Table 2.2](#) (shown previously) *may* be able to assist in the assessment of the general roles (e.g., high-level review, assistance as needed, etc.) for each peer review team member. The specific team member responsibilities (e.g., responsible for reviewing model network, responsible for reviewing traffic volume data, etc.), however, *should* be clarified during the coordination meeting.

2.3.3 Define Data Requirements

In an ideal world, all the traffic data needed to validate that the traffic model is properly calibrated (i.e., provides an accurate representation of real-world conditions) will be collected during the development of the traffic model. In some instances, however, it *may* be necessary for the peer review team to gather additional data as part of the peer review process. If additional data is required, during the initial coordination meeting, the project team *should* define the data collection plan (e.g., how to obtain the data, when to collect the data, and who will collect the data).

Additionally, the peer review team *should* discuss whether there are any previously developed traffic models (specifically microsimulation traffic models) that could serve as a resource for the development, calibration, validation and peer review of the proposed traffic model.

2.3.4 Define Preliminary Schedule

The schedule for the peer review is highly dependent on the complexity of the traffic model and level of peer review required. The peer review of a highly complex traffic model that requires FHWA oversight will take longer to complete than the peer review of a relatively simple traffic model that only requires a project team level review. Since the peer review schedule impacts the overall schedule of the project, it is critical for the project team to define the peer review timeline as early in the project as possible, preferably during project scoping. The project team can utilize [Table 2.3](#) to approximate the amount of time within the overall project schedule to allow for the peer review process. The timelines provided in [Table 2.3](#) assume that BPED-TFS or SE-TFS have already generated and/or reviewed and approved the traffic forecasts utilized within the traffic model.

Except for FHWA, all members of the peer review team *may* conduct their review of the traffic model(s) simultaneously. With concurrent reviews, the peer review member should coordinate often during the review process to avoid unnecessary duplication of review efforts. WisDOT *should* complete all internal department peer reviews (project team, region, independent consultant, statewide bureau reviews) prior to FHWA reviewing the traffic model(s). FHWA, however, *may* be available to answer questions and to provide suggestions for items to consider during internal department reviews.

Table 2.3. Peer Review Time Requirements

| Level of Peer Review | Approximate Time Required to Complete Initial Peer Review (Including data collection, coordination, etc.) |
|--|--|
| Project Team Level Review | <ul style="list-style-type: none"> • 1-2 weeks for existing conditions • 1-2 weeks for each additional project milestone/alternative |
| Region Level Review | <ul style="list-style-type: none"> • 3-4 weeks for existing conditions • 3-4 weeks for each additional project milestone/alternative |
| Independent Consultant Level Review | <ul style="list-style-type: none"> • 4-8 weeks for existing conditions • 4-8 weeks for each additional project milestone/alternative |
| SWB Level Review <i>Without FHWA Oversight</i> | <ul style="list-style-type: none"> • 4-8 weeks for existing conditions • 4-8 weeks for each additional project milestone/alternative |
| <i>With FHWA Oversight</i> | <ul style="list-style-type: none"> • 12-16 weeks for existing conditions • 12-16 weeks for each additional project milestone/alternative |
| <p>Notes:</p> <ul style="list-style-type: none"> • The time ranges shown here are approximate, thus the project team <i>should</i> only utilize these timelines to approximate the amount of time within the overall project schedule to allow for the peer review process. Actual timelines are dependent on individual project details such as the amount of data collection and the complexity of the future models. • All timelines shown here are associated with the review of a microsimulation traffic model. The review time required for HCM-based traffic models is dependent on the region resources. • The peer review schedule <i>may</i> assume concurrent review by all internal WisDOT peer review team members (project team, region, independent consultant, SWB). However, the schedule <i>should</i> assume that FHWA peer reviews will only occur after the completion of WisDOT's review. • If an independent consultant is required, add extra time to the schedule to account for scoping/contracting the independent consultant's work. • Add additional time (a minimum of 6 weeks per milestone/alternative) to account for BPED-TFS and/or SE-TFS review of the traffic volume demand utilized in the traffic models. See TPM, Chapter 9 and DT2340 for additional details on TFS role in the review of microsimulation traffic models. | |

2.3.5 Detail Traffic Model/Peer Review Comment Transfer Process

During the initial coordination meeting, the peer review team *should* layout the process for handing off the data (traffic model, peer review comments, etc.) between the analyst and the peer review team. It *may* be helpful for the project manager to set up a schedule for check-in-meetings or conference calls over the course of the peer review to help facilitate the exchange of data. The number and timing of these meetings will vary depending on the complexity of the traffic model, but could include the following:

- A hand-off meeting when the traffic model is ready to go to the reviewer(s),
- A preliminary findings meeting when the reviewer(s) has completed the initial review and developed their first thoughts and questions on the model,
- An ultimate findings meeting when the reviewer(s) has completed the peer review and
- A response meeting when the analyst has addressed the comments raised by the review team.

2.4 Conduct Peer Review

A key concept of the peer review process is to assess whether the traffic model has been implemented in a way that is suitable for meeting the goals and objectives of the study for which it is being built without violating current WisDOT policies (i.e., is the traffic model fit-for-purpose?). To assist the reviewer with making this decision, the project manager *should* provide the peer review team with a summary of the project scope, project goals, and intended purpose of the traffic model prior to initiating the peer review. It is important to affirm that the project scope is stable and unambiguous, as it will be difficult for the reviewer to assess the traffic model's fitness-for-purpose if the purpose itself is subject to change over the duration of the project. The project manager *should* also emphasize that the role of the reviewer is to identify problems and/or make suggestions to improve the quality of the traffic model, but not fix problems associated with the traffic model.

The following provides specific details on how to conduct a peer review for both HCM-based and

microsimulation traffic models.

2.4.1 HCM Traffic Model Peer Review

A project team or region-level review will be sufficient for most HCM traffic models, although SWB involvement will be required for mega/major projects. The region traffic modeler and/or region traffic operations **shall** conduct, at a minimum, a high-level review of the HCM traffic model(s) to verify that the analyst has followed standard protocols. To ensure consistency with the review of the traffic models, the reviewer (typically region traffic operations) *should* complete [DT1887 – HCM Analysis Review Checklist](#) while conducting their review. The reviewer, as appropriate, *should* insert “not reviewed” on DT1887 to denote which components of the traffic model were not addressed during their review. [Attachment 2.2](#) provides a copy of [DT1887](#).

The primary purpose of [DT1887](#) is to provide a coversheet that summarizes the major concerns/issues the reviewer has on the traffic model. The reviewer *should* document the specific/detailed comments on the traffic model in a separate memorandum and attach it to [DT1887](#).

[DT1887](#) provides a mechanism for the reviewer to easily identify whether the specific parameters within the traffic model (e.g., lane geometry, signal timings, etc.) and overall traffic model is acceptable, conditionally acceptable or unacceptable. These terms are defined as follows:

- Acceptable - The traffic model is acceptable as is without any revisions,
- Conditionally acceptable - The traffic model is acceptable based on the condition that the traffic analyst addresses a few (no more than 5) specific issues or concerns either by revising the traffic model or providing additional justification as to why no additional revisions are necessary,
- Unacceptable – The traffic model needs major revisions.

As illustrated in [DT1887](#), the typical components of the HCM traffic model that *should* be reviewed include:

Traffic Analysis Tool/Version

Prior to developing the traffic model, region traffic operations and the analyst *should* have agreed upon the appropriate analysis tool to utilize. The reviewer *should* confirm that the traffic model was developed using the agreed upon analysis tool, specifically that the correct software, software version and software build (e.g., Synchro 10.1.2.20, Sidra 7.0.8.6853, etc.) have been utilized. The traffic models *should* only utilize the department-supported software packages. [FDM 11-5-3.7](#) identifies the explicit software packages that the department supports.

The reviewer *should* note any differences in the version and/or build of the software package utilized during the development and review of the traffic model.

Lane Geometry

The reviewer *should* confirm that the traffic model depicts the proper lane geometry, including lane configurations, turn bay lengths, lane widths, right-turn channelization, and distance between intersections. In some situations, the HCM methodology *may not* allow the coding of the actual lane geometrics (e.g., the HCM methodology limits the number of approaches/lanes). In these cases, it *may* be necessary to utilize an alternative tool for the analysis. The analyst **shall** obtain prior approval from region traffic operations prior to utilizing modified lane geometry within the HCM traffic model. The agreed upon modifications to actual lane geometries should be noted on [DT1887](#) or in the accompanying comment memorandum.

Traffic Volumes/Percent Trucks/Peak Hour Factor (PHF)

The reviewer should verify that the appropriate traffic volumes for the defined analysis year and time period have been accurately coded into the traffic model. Design year traffic volumes should reflect official WisDOT traffic forecasts (i.e., forecasts prepared or reviewed and approved by BPED-TFS or SE-TFS).

If applicable, the analyst should provide documentation on the process completed to develop design hour volumes (K30, K100, K250, weekday AM/PM peak, etc.), to produce O-D matrices, and/or balance the traffic volumes along the corridor. The reviewer should look at the documentation and check the volume adjustments for reasonableness.

The reviewer should verify that the appropriate percentage of trucks or heavy vehicles have been included in the analysis. Unless there is one movement that is predominately trucks (e.g., the movement

goes into a truck parking facility), as prescribed in the HCM, the traffic model should include the percent of trucks/heavy vehicles based on intersection approach and not by the individual turning movement.

Per [FDM 11-5-3](#), in most cases, the analysis should utilize a PHF based on data collected in the field, and is typically calculated for the intersection rather than approach or turning movement. If the existing field-derived PHF is less than 0.92 (the recommended HCM default), however, it may be appropriate to utilize a higher PHF for the analyses of design year conditions. Use of any value other than the field-derived PHF requires approval from the WisDOT regional traffic engineer.

Signal Timing Parameters

At a minimum, the reviewer should verify that all traffic models that involve traffic signals utilize appropriate signal timing and phasing plans, saturation flow rates and right-turn-on red (RTOR) volumes. The reviewer should refer to the Traffic Signal Design Manual ([TSDM 3-2-2](#)) and [TEOpS 16-15-5](#) for guidance on the recommended traffic signal timing parameters, where [TEOpS 16-15-5](#) is the controlling policy for saturation flow rates and right-turn-on-red (RTOR) usage. Region traffic operations *may* have additional guidance on the signal timing parameters.

Stop-Control/Roundabout Parameters

The reviewer should verify that all traffic models that involve stop-controlled intersections utilize appropriate and reasonable critical gap, follow-up times, saturation flow rates, vehicle storage in the median and the presence of an upstream traffic signal. Unless justified otherwise by a field study, default values should be utilized for most parameters.

WisDOT has established Wisconsin specific critical and follow-up headway values for the analysis of roundabouts (see [FDM 11-26-20.4, Table 20.3](#)). The reviewer should check for proper usage of these headway values for traffic models that include roundabouts.

Freeway/Highway Parameters

For freeway weaving analysis, the reviewer should look at the source of the weaving volumes and verify that the assumptions made to determine the volumes are in accordance with the previously agreed upon methodology. Additionally, the reviewer should check the weaving segment length, number of maneuver lanes and the minimum number of lane changes utilized in the analysis.

For freeway merge or diverge analysis, the reviewer should inspect the basic number of lanes, acceleration or deceleration lengths and volume inputs for accuracy.

For basic highway segments, the reviewer should examine the road classification, access density, no-passing zone inputs and free-flow speed for accuracy.

Measures of Effectiveness (MOEs)

The reviewer should look at the key MOEs that are applicable to the proposed project to verify their acceptability in terms of operation. Some of the key MOEs include level of service (LOS), 95th percentile back-of-queue length, delay and density. Additional MOEs *may* include volume-to-capacity ratio (v/c), travel time, and travel time reliability.

Other

The reviewer should note any other aspects of the traffic model (e.g., growth rates, gap acceptance, lane utilization, link speeds, etc.) that they checked during their evaluation. Additionally, the reviewer should provide any general comments they have regarding the overall performance of the traffic model.

Upon completion of their evaluation, the reviewer should provide a copy of the completed [DT1887](#) to the project team and/or analyst for their response. The reviewer only needs to complete one [DT1887](#) for an entire corridor; there is no need to complete [DT1887](#) for every intersection along the corridor.

The analyst should note on the [DT1887](#) form how they propose to respond to any comments on the traffic model (e.g., revise the traffic model or provide justification for their original assumptions). Section 2.5 provides additional detail on how to document this correspondence.

2.4.2 Microsimulation Traffic Model Peer Review Overview

Due to their complexity, microsimulation traffic models typically require an independent consultant and/or SWB level of review. Each member of the peer review team should complete [DT2291 – Microsimulation Peer Review Report](#) to document their findings, comments, and concerns related to the traffic model. The TFS will document

their review in [DT2340 – Traffic Forecasting Section Microsimulation Checklist](#) (see [TPM, Chapter 9](#) for additional details). The reviewer, as appropriate, should insert “not reviewed” on [DT2291](#) to denote which components of the traffic model were not addressed during their review. The reviewer shall complete a peer review after each project milestone; however, they *may* combine their comments from each milestone onto one form. [Attachment 2.3](#) provides a copy of [DT2291](#).

The first page of [DT2291](#) is where information regarding the peer review and traffic model is denoted (e.g., review date, reviewer and analyst contact information, model completion/revision date, etc.).

The heart of the [DT2291](#) form (pages 2 through 8) is where the reviewer documents their observations regarding the traffic model features and characteristics. This section of the form uses a three-column format. The left side of the form is where the reviewer identifies the overall acceptability of the traffic model component (acceptable, conditionally acceptable or unacceptable) and notes the extent of the revisions required (no revisions, minor revisions, moderate revisions, or major revisions).

The center of the form provides space for detailed technical comments including reviewer-to-analyst communications. The reviewer should attach or insert additional sketches, screen shots, calculations, or other information that will assist the analyst in understanding the problems identified in the traffic model. Where relevant, [DT2291](#) *may* include suggested techniques for improving the traffic model.

The right side of the form provides an area for the analyst to address the reviewer’s comments. This is where the analyst should identify if and how they will revise the traffic model. If the analyst feels that no revisions to the traffic model are necessary, they should provide justification for their original assumptions.

The final section of [DT2291](#) is the reviewer’s sign-off. In this section, the reviewer should unequivocally inform the analyst and project team whether the model is (or is not) suitable for the intended purpose. If the traffic model is deemed unacceptable, the reviewer summarizes the number and severity of the revisions required (e.g., 2 minor and 1 major revision to the traffic model are required).

While [DT2291](#) provides documentation of the overall peer review process, it should not serve as the sole means of communication between the reviewer and the analyst. The reviewer should document all communications with the analyst and attach them to [DT2291](#) for future reference. Ultimately, it is the responsibility of the project manager to monitor the peer review process to ensure efficient communication between the peer review team and the analyst.

2.4.3 Conducting the Peer Review

Regardless of the software program utilized to develop the traffic model, a good first step is to open the traffic model and observe the simulation. This allows for a visual inspection of the traffic model to identify if there is anything that just does not look right (e.g., vehicles make dramatic movements, vehicles suddenly drop off the network, vehicles are turning left from an exclusive right-turn lane, etc.). The visual inspection can help the reviewer identify which portions of the traffic model they should concentrate their review efforts.

As illustrated in [DT2291](#), the typical features and characteristics of a microsimulation traffic model that should be reviewed include:

- Network Coding
- Intersection Traffic Control and Ramp Metering
- Closures, Restrictions, and Incidents
- Entrance Ramps
- Lane Use Parameters
- Zone Structure/Vehicle Inputs
- O-D Matrices, Demand Profiles, and Time Periods
- Core Simulation Parameters
- Routing Parameters/Vehicle Routes
- Vehicle Types and Proportions
- Stuck/Stalled Vehicles
- Special Features
- Consistency with Related Traffic Models
- Calibration/Validation
- Documentation

This list is not all-inclusive and should only serve as a starting point for the peer review. It is possible for a traffic model to be deemed acceptable based on all features listed above and yet still not be fit-for-purpose. The reviewer should keep a clear understanding of the project scope, goals, and intended purpose of the traffic

model in mind while conducting the peer review. Additionally, the peer review process should always take into consideration the current capabilities and limitations of the software package and version utilized in development of the traffic model as new software features are seldom foolproof. The following text provides details on the key parameters of the traffic model that the reviewer should assess during their evaluation. Currently the department supports the use of SimTraffic, Paramics and Vissim for microsimulation although WisDOT will stop supporting Paramics effective January 1, 2018. Projects that initiated the microsimulation traffic analysis using Paramics prior to January 1, 2018 may continue to use Paramics for the duration of the project. However, if the traffic mode requires major revisions (e.g., the analyst must update the traffic model to reflect different existing conditions), or if the traffic model is more than three years old, the analyst *should* consider switching the traffic models over to Vissim. The guidance below is specific for SimTraffic, Paramics and Vissim; however, the general principles are applicable for all microsimulation software packages.

Refer to Exhibit 2.1 for additional information about how to evaluate each key feature of the traffic model.

Network Coding

Network coding establishes the horizontal and vertical geometry of the roadway network, including intersection spacing and roadway curvature. Network coding also includes appropriate use of settings such as link free-flow speed and turning speeds.

Intersection Traffic Control and Ramp Metering

Intersection controls are devices that regulate traffic flow at intersections (e.g., signals, roundabouts, stop control and ramp meters). Elements of the signals/ramp meters *may* include the controller type, detector placement, signal heads, signal groups, coordination between signals, signal phasing and/or signal/ramp meter-timing plans.

Closures, Restrictions and Incidents

Closures represent temporary or permanent roadway segment, link, or lane closures (i.e., traffic is restricted from using that roadway segment, link, or lane). Restrictions represent links or lanes where travel is restricted, either temporarily or permanently, to specific vehicle types (e.g., lanes designated for high-occupancy-vehicles (HOV) or lanes restricting truck use). Incidents include simulated vehicle breakdowns, crashes, etc.

Entrance Ramps

Entrance ramps or freeway merge areas typically require careful coding in microsimulation. This section generally refers to parallel freeway entrance ramps, although there are instances where this feature is appropriate for arterials as well. The reviewer should review the lane utilization upstream of the entrance ramp, the aggressiveness of the merging vehicles (e.g., minimum time on entrance ramp, driver headway factors), and the length of the acceleration lane and/or taper parallel to the entrance ramp.

Lane Use Parameters

Lane use parameters control the amount and/or destination of the traffic using each lane. A typical application of these parameters is to pre-position vehicles in advance of a fork in the road.

Zone Structure/Vehicle Inputs

Zone structure and vehicle inputs define where and how traffic is loaded into the network.

O-D Matrices, Demand Profiles & Time Periods

O-D matrices contain the network demand patterns (number of trips traveling between each pair of zones). Time periods and demand profiles control the timing for the release of vehicles into the network (e.g., are the vehicles released at a steady rate or at a gradually increasing/decreasing rate). In some cases, it is necessary to use multiple O-D matrices and/or demand profiles (e.g., there *may* be one matrix for cars and a second matrix for trucks). The reviewer should evaluate the source of the demand profile and time selection. BSHP-PDAS, BPED-TFS and/or SE-TFS should weigh in on the appropriate use of these features within the traffic model and *may* provide suggestions for source data (e.g., annual traffic recorders [ATR] data).

Core Simulation Parameters

Core simulation parameters affect fundamental aspects of vehicle behavior in the network, such as driver aggressiveness and the willingness to merge into small gaps. Default values are acceptable for some parameters, but other parameters require project-or-area-specific values. Thus, the reviewer should check all core simulation values for reasonableness.

Routing Parameters/Vehicle Routes

Routing parameters influence the way vehicles travel through the network. If coded improperly, these controls can cause unrealistic or erratic routing.

Vehicle Types and Proportions

The proportion and types of vehicles (such as trucks, buses and high-occupancy-vehicles) influences the overall performance of each part of the network. The reviewer should verify that the traffic model utilizes actual field data to the best extent possible.

Stuck/Stalled Vehicles

Stuck or stalled vehicles are vehicles that unexpectedly slow or stop partway through their route. They can cause backups that do not exist in the field. The reviewer should note any problems with stuck or stalled vehicles, including intermittent problems.

Special Features

Special features include site or study-specific items such as the use of detectors, car parks, variable message signs, special purpose lanes, speed harmonization, public transit routes, toll lanes, toll plazas, pedestrian modeling, special graphics, Application Programming Interfaces (APIs), among others.

Consistency with Related Traffic Models

Complex projects often involve a series of related traffic models (existing, future no-build, future build alternatives, different times of day, etc.). To assure the integrity of the study, these traffic models must be consistent. Additionally, adjacent and overlapping model areas should utilize consistent analysis methodologies. The results of the traffic model should not contradict the results of the TDM.

Calibration/Validation

Calibration refers to the process where the analyst adjusts selected input parameters within the traffic model (typically driver behavior elements such as headway and reaction times, driver aggressiveness, etc. and roadway elements such as sign posting) such that the traffic model represents field conditions. See [TEOpS 16-20-5](#) for additional details on the calibration process.

Validation is the independent process where the analyst checks the traffic model outputs against field measured data including traffic volumes, travel speeds, travel times, intersection queuing and trip-making patterns (e.g., weaving volumes). See [TEOpS 16-20-8](#) for additional details on the validation process.

A properly calibrated and validated traffic model should accurately reflect real-world traffic conditions and should meet the purpose and need of the project. The analyst should document the methodology and assumptions utilized to calibrate and validate the traffic model and submit the modeling methodology report along with the traffic model for review by the peer review team.

The reviewer should spot-check the traffic model outputs and compare them to the results documented in the modeling methodology report. If the reviewer cannot produce similar outputs, it *may* indicate an issue with the traffic model's calibration. See [TEOpS 16-20](#) for additional details on model calibration and validation.

Documentation

Proper documentation of modeling methods and assumptions establishes accountability and facilitates efficient revision, updating, and follow-up. The review team should verify proper documentation of the modeling methods.

2.5 Document Results

It is critical to document any correspondence between the peer review team and traffic analyst regarding the peer review process. The correspondence should be documented within or attached to the appropriate review form ([DT1887](#) and/or [DT2291](#)), and **shall** include how the traffic analyst revised the traffic model to address the peer review comments or provide justification as to why no revisions to the traffic model were made. On projects where the peer review team and traffic analyst interact frequently, it *may* be necessary to provide a separate document to detail all the correspondences. [Attachment 2.4](#) provides examples of ways to document the communication between the project team and traffic analyst. The project manager **shall** include the additional documentation along with all completed [DT1887](#) and/or [DT2291](#) forms within the project's records file.

The region **shall** provide a summary of the peer review process for all microsimulation traffic models (including

all SimTraffic models used for project or study decisions, especially any related to critical aspects of the design) to BTO-TASU for information and tracking purposes. The summary **shall** identify the following aspects associated with the peer review process:

1. Project information (project identification number, project name, study area, study limits)
2. Name of analyst who constructed the traffic model
3. Name of lead peer reviewer
4. Summary of peer review results ([DT1887](#), [DT2291](#), correspondence documentation)
5. Copy of all FHWA comments on the traffic model

Even if BTO-TASU is not involved with the peer review process, it is generally advantageous for the project team to inform BTO-TASU of any pending peer reviews, specifically those for a microsimulation traffic model. This allows BTO-TASU to assess whether there are any potential overlapping peer reviews that *may* impact the project's schedule.

The project manager or region traffic operations **shall** email a copy of all interim and final [DT2291](#) forms, including FHWA comments, to BTO-TASU via the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox. Region traffic operations **shall** also include a copy of the relevant [DT1887](#) and/or [DT2291](#) forms with the submittal of all Phase II – Alternative Selection Intersection Capacity Evaluation (ICE) reports.

LIST OF ATTACHMENTS

[Attachment 2.1 Traffic Model Complexity Scoring Template](#)

[Attachment 2.2 DT1887 HCM Analysis Review Checklist](#)

[Attachment 2.3 DT2291 Microsimulation Peer Review Report](#)

[Attachment 2.4 Sample Correspondence](#)

Attachment 2.1 Traffic Model Complexity - Scoring Template

WisDOT Traffic Model Complexity - Scoring Template

Last Updated: 07-19-17

Applicable for determining the number of MOEs required for model validation and for determining the required level of peer review

Instructions: Fill in gray boxes to determine the model complexity, the number of MOEs needed for validation, and the level of traffic model peer review effort required. Choose appropriate project category in **Table 1: Project type**. Choose primary network type in **Table 2: Geometrics Scoring** and mark applicable categories in **Table 3: Traffic Pattern and Congestion Scoring**. Final scoring reflects the highest point value in each table (maximum of 24 points). **Table 4** shows the overall model complexity score. **Table 5** shows recommended procedure for identifying the type/number of MOEs to use for model validations and scoring the traffic model peer review. Consider existing conditions and potential future alternatives that the project/study is anticipated to cover.

| | |
|----------------------|--------------------------------------|
| WisDOT Region: | Ex: SE, SW, NE |
| Project: | Ex: STH __ Corridor Study |
| Project ID: | Ex: 1234-56-7890 |
| Project Description: | Ex: City - City |
| Highway: | Ex: STH __ |
| County: | Ex: Dane County |
| Traffic Conditions: | Ex: Base (Existing), Base and Future |
| Modeling Software: | Ex: Paramics, Vissim, SimTraffic |

| | |
|--|--|
| General Project Description: | |
| Ex: Limits of project (Size of Network, # of TAZs), other software used for analysis, anticipated O-D data source, assumptions on future scenarios, etc. | |

Table 1: Project Type

| Complete (1): | Check all that apply: | | | | | | |
|------------------|-----------------------|---|---|--|--|---|------------------------|
| (1) Project Type | Category | Traffic Impact Analysis (TIA), Intersection Control Evaluation (ICE), or similar (Small Influence Area) | Traffic Impact Analysis (TIA), Intersection Control Evaluation (ICE), or similar (Large Influence Area) | Corridor Study/Operational Needs Study or Standard Improvement Project (Small Network) | Corridor Study/Operational Needs Study or Standard Improvement Project (Large Network) | High Profile Project, Potential Mega/Major Project (EA, PEL, EIS) | Mega or Majors Project |
| | Point Total | 0 | 1 | 2 | 3 | 4 | 4 |
| | Applicable? | 0 | 0 | 0 | 0 | 0 | 0 |

Note: Large Network category assumed to contain 20 or more Traffic Analysis Zones (TAZs).

Table 2: Geometrics Scoring

| Choose (1) or (2): | Check all that apply: | | | | | | |
|---|-----------------------|--|---|---|---|--|---|
| (1) Intersections and Streets/Corridors | Category | Isolated Intersection(s) | Signalized Corridor / Network (No Coordination) | Roundabout Corridor / Network | Signalized Corridor / Network (Coordinated) | Mixed Corridor / Network (Signals and Roundabouts) | Adaptive Signal Control System |
| | Point Total | 0 | 1 | 2 | 2 | 3 | 4 |
| | Applicable? | 0 | 0 | 0 | 0 | 0 | 0 |
| Or | | | | | | | |
| (2) Freeways | Category | Mainline and Simple Merges/Diverges Only | System Interchange with Multilane Ramps | Freeway with Interchanges and Arterials | Interchanges with Roundabout Ramp Terminals | Unconventional Interchanges (DDI, Echelon, SPUI, etc.) | Managed Lanes, Variable Message Signs, etc. |
| | Point Total | 0 | 1 | 1 | 2 | 3 | 4 |
| | Applicable? | 0 | 0 | 0 | 0 | 0 | 0 |

Table 3: Traffic Pattern and Congestion Scoring

| Complete (1), (2), and (3): | Check all that apply: | | | | | | |
|--|-----------------------|--|--|---|---|---|---|
| (1) Routing | Category | All-or-Nothing Routing Assignment | | | | Dynamic/Variable Routing | |
| | | Single Routes (Intersection or Corridor) | Networks with Few (2-3) Route Options | Freeway with Parallel Lower Functional Class Streets | Grid System with Numerous Route Options | Freeway Network with Parallel Route Options | Grid System with Numerous Route Options |
| | Point Total | 0 | 1 | 2 | 3 | 3 | 4 |
| | Applicable? | 0 | 0 | 0 | 0 | 0 | 0 |
| (2) OD Estimation | Category | Single Intersection(s) / No Estimation | Small Network, Few Routes | Large Network, Few Routes | Small Network, Multiple Routes | Large Network, Multiple Routes | |
| | Point Total | 0 | 1 | 2 | 3 | 4 | |
| | Applicable? | 0 | 0 | 0 | 0 | 0 | |
| (3) Existing/Anticipated Level of Congestion | Category | - LOS C or better operations - Minor queuing (<500') - Free flow travel speeds/times | - LOS C-D operations - Moderate queuing (500-1,000') - Minor delays in travel speeds/times | - LOS D-E operations - Moderate queuing (500-1,000') - Moderate delays in travel speeds/times | - LOS F operations (future) - Significant queuing (>1,000') - Significant delays in travel speeds/times | - LOS F operations (existing) - Significant queuing (>1,000') - Significant delays in travel speeds/times | |
| | Point Total | 0 | 1 | 2 | 3 | 4 | |
| | Applicable? | 0 | 0 | 0 | 0 | 0 | |

Note: Large Network category assumed to contain 20 or more TAZs. Congestion level takes into account worst-case controlled intersections or roadway segments. Queue lengths are through lane queues.

Table 4: Scoring Results

| Project Type | Total | 0 |
|---|-----------------------------|----------|
| Geometrics Subtotal | Intersections and Corridors | 0 |
| | Freeways | 0 |
| | Total | 0 |
| Traffic Pattern and Congestion Subtotal | Routing | 0 |
| | OD Estimation | 0 |
| | Level of Congestion | 0 |
| Total | 0 | 0 |

Table 5: Recommendations

| Point Scale | Minimum # of MOEs Required for Validation | Level of Peer Review Recommendations | |
|-------------|--|--|--|
| | | Recommendation Type | Estimated Schedule for Initial Review (including data collection, coordination, etc.) |
| 0 - 3 | 1 to 2 Primary MOEs | High-level WisDOT Region review. | 1-2 weeks existing conditions 1-2 weeks per alternative |
| 4 - 7 | 1 to 2 Primary MOEs 1 Secondary MOE | WisDOT Region conducts peer review with assistance from independent consultant or BTO as necessary. | 3-4 weeks existing conditions 3-4 weeks per alternative |
| 8 - 10 | 2 to 3 Primary MOEs 1 Secondary MOE | Independent consultant conducts peer review with WisDOT Region input and BTO assistance as necessary. | 4-8 weeks existing conditions 4-8 weeks per alternative |
| 11+ | 2 to 3 Primary MOEs 1 to 2 Secondary MOEs | Independent consultant conducts peer review with WisDOT Region, BTO, other WisDOT Bureau involvement and FHWA oversight. | 2-4 months existing conditions (no FHWA) 2-4 months per alternative (no FHWA) 3-4 months existing conditions (with FHWA) 3-4 months per alternative (with FHWA) |

*Note: A minimum of 6 weeks should be allowed for Traffic Forecasting to review the existing/future volumes for all levels of peer review



HCM ANALYSIS REVIEW CHECKLIST

Wisconsin Department of Transportation (WisDOT)
 DT1887 8/2015

Attachment 2.2 DT1887 HCM Analysis Review Checklist

| | | | | | | |
|--------------------------|------------------------------|--------------|------------------------------|--------------------------|------------------------------|------------------------|
| Project ID(s) | | Region: | | Date Reviewed (m/d/yyyy) | | |
| | | | | 1 st Review | 2 nd Review | 3 rd Review |
| Project Name/Description | | Highway(s) | | Reviewed By: | | |
| Lead Reviewer | Name (First, MI, Last) | Lead Analyst | Name (First, MI, Last) | Region Contact | Name (First, MI, Last) | |
| | Organization/Firm | | Organization/Firm | | Region/Bureau | |
| | (Area Code) Telephone Number | | (Area Code) Telephone Number | | (Area Code) Telephone Number | |
| | Email Address | | Email Address | | Email Address | |

TRAFFIC MODEL DESCRIPTION

| | | |
|---|------------------|-------------------------------|
| Model Completion/Revision Date (m/d/yyyy) | Analysis Year(s) | Analysis Scenario/Alternative |
|---|------------------|-------------------------------|

Scope of Model (intersections, ramps, corridors, etc. being reviewed)

Analysis Time Period (s)

Weekday AM Peak
 Weekday Midday Peak
 Weekday PM Peak
 Fri Peak
 Sat Peak
 Sun Peak
 Other: _____
 Hours: _____
 Hours: _____
 Hours: _____
 Hours: _____
 Hours: _____
 Hours: _____
 Hours: _____

Analysis Tool(s) Utilized

HCS - Version: _____
 Synchro - Version/Build: _____
 Sidra - Version: _____
 Other: _____ - Version: _____

SUMMARY OF REVIEW

| Item Reviewed | Overall Model Acceptability | Revision Required | Reviewer Comment(s) | Analyst Response(s) |
|---|---|---|---------------------|---------------------|
| Traffic Analysis Tool/Version | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |
| Lane Geometry | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |
| Traffic Volumes, % Trucks, Peak Hour Factor (PHF) | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |

(continued on reverse side)

HCM ANALYSIS REVIEW CHECKLIST *(continued)*

Wisconsin Department of Transportation (WisDOT) **DT1887**

| SUMMARY OF REVIEW <i>(continued)</i> | | | | | |
|--------------------------------------|--|---|---|---------------------|---------------------|
| Item Reviewed | Overall Model Acceptability | | Revision Required | Reviewer Comment(s) | Analyst Response(s) |
| Signal Parameters (including RTOR) | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> N/A | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |
| Stop-Control/Roundabout Parameters | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> N/A | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |
| Freeway/Highway Parameters | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> N/A | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |
| Measures of Effectiveness (MOEs) | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> N/A | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |
| Other: | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |
| Overall Model | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | | |



MICROSIMULATION PEER REVIEW REPORT

Wisconsin Department of Transportation (WisDOT)
DT2291 9/2015

Attachment 2.3 DT2291 Microsimulation Peer Review Report

Reviewer, please email completed form to:

To: Project Manager & Region Contact
CC: [DOT Traffic Model Peer Review](#)
Subject: DT2291 for Project ID; Traffic Model Name

| | | | |
|---|------------------------|------------------------|------------------------|
| Date Reviewed (m/d/yyyy): | 1 st Review | 2 nd Review | 3 rd Review |
| Reviewed By: | | | |
| Model Completion/Revision Date(m/d/yyyy): | | | |

CONTACT INFORMATION

| | | | | | |
|----------------------|------------------------------|---------------------|------------------------------|-----------------------|------------------------------|
| Lead Reviewer | Name (First, MI, Last) | Lead Analyst | Name (First, MI, Last) | Region Contact | Name (First, MI, Last) |
| | Organization/Firm | | Organization/Firm | | Region/Bureau |
| | (Area Code) Telephone Number | | (Area Code) Telephone Number | | (Area Code) Telephone Number |
| | Email Address | | Email Address | | Email Address |

TRAFFIC MODEL DESCRIPTION

| | | | |
|--------------------------------|-------------------------------|------------------|------------|
| Project ID(s) | Project Name/Description | Region: | Highway(s) |
| Traffic Model Name/Description | Analysis Scenario/Alternative | Analysis Year(s) | |

Analysis Time Period (s)

Weekday AM Peak
 Weekday Midday Peak
 Weekday PM Peak
 Fri Peak
 Sat Peak
 Sun Peak
 Other:

Hours: Hours: Hours: Hours: Hours: Hours: Hours:

Analysis Tool(s) Utilized

SimTraffic- Version:
 Paramics - Version:
 Vissim - Version:
 Other: - Version:

SCOPE AND EXTENT OF PEER REVIEW

Purpose & Scope of Review

Description/Limit of Model

Configuration Settings

| | | | |
|-----------------------------------|-----------------------|------------------|--------------------------------|
| Number of Zones: | Number of Time Steps: | Speed Memory: | Assignment Type: |
| Mean Target Headway: | Mean Reaction Time | Matrix Structure | Vehicle Classifications/Splits |
| Seed Values Used for Calibration: | | | |
| Seed Values Used for Review: | | | |
| Other: | | | |

Were any changes to the model made by the review team? If yes, please describe.

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation (WisDOT) DT2291

DIRECTIONS

This form is applicable for the review of all microsimulation traffic models, regardless of the traffic software program utilized to develop the traffic model. However, this form focuses on the SimTraffic, Paramics and Vissim microsimulation software packages.

When noting problems or concerns, identify the severity of the issue and the revisions recommended using the following scale: Minor, Moderate, or Major. Check the appropriate box associated with each review (the blue box for the 1st review, the green box for the 2nd review and the purple box for the 3rd review).

If more than one review of the traffic model is required, use different color text to distinguish the comments associated with each review (e.g., *comments from the 1st review should be in blue text, comments from the 2nd review should be in green text, and comments from the 3rd review should be in purple text*). Provide any supporting tables, screenshots, or additional images in a separate attachment to this form.

OBSERVATIONS, MODEL FEATURES AND CHARACTERISTICS

| | | | |
|-----------------------------|--|--|--|
| Geometrics /Traffic Control | Network Coding | <p>Network Coding establishes the horizontal and vertical geometry of the network. It also includes the appropriate use of settings such as link free-flow speed.</p> <ul style="list-style-type: none"> For SimTraffic, this is coded within the Synchro module and includes placement and interconnection of nodes and links, number of lanes, lane widths, lane configurations, roadway curvature, storage lengths, and other intersection and network geometry. For Paramics this includes placement and interconnection of nodes, links and link categories, curb points, curves, turn lanes, merge points, stop bars, signposts, and other network infrastructure. For VISSIM this includes the placement and interconnection of links, connectors, desired speed decisions, reduced speed areas, conflict areas, and priority rules. | |
| | As a whole, network coding is: | Observations/Comments: | Analyst Response |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | 1 st Review 2 nd Review 3 rd Review | 1 st Review 2 nd Review 3 rd Review |
| | Intersection Traffic Control & Ramp Metering | <p>Intersection Controls are devices that regulate traffic flow at intersections, such as signals, roundabouts, and stop-controlled intersections. Elements of the signals may include the controller type, detector placement, signal heads, signal groups, and/or coordination between signals. Ramp meters control the rate of entry to a freeway. Comments on signal and ramp meter timing plans may be included in this section.</p> | |
| | As a whole, intersection controls are: | Observations/Comments: | Analyst Response |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | 1 st Review 2 nd Review 3 rd Review | 1 st Review 2 nd Review 3 rd Review |

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation (WisDOT) DT2291

| | | | |
|------------------------------|--|--|---|
| Geometrics / Traffic Control | Closures, Restrictions, & Incidents | | <p><i>Closures represent links or lanes that are temporarily or permanently closed to traffic. Restrictions represent links or lanes that are temporarily or permanently closed to specific types of vehicles (such as lanes designated for High Occupancy Vehicles or lanes restricting truck use). Incidents include simulated vehicle break-downs, etc.</i></p> <ul style="list-style-type: none"> This feature is not applicable for SimTraffic |
| | As a whole closures, restrictions & incidents are: | | Observations/Comments: |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | | 1 st Review 2 nd Review 3 rd Review |
| | Entrance Ramps | | <p><i>Driver behavior and lane utilization approaching entrance ramps should be reviewed in this section.</i></p> <ul style="list-style-type: none"> For SimTraffic, modifications to the default mandatory distance and positioning distance settings should be reviewed. For Paramics, modifications to default ramp headway, minimum ramp time, and ramp aware distance should be reviewed. The minimum ramp time setting specifies how long a driver will stay on the parallel entrance ramp before beginning to look for a gap to merge onto the freeway. For VISSIM, the effective merging area defined by the positions of the links and connectors should be reviewed. |
| | As a whole, the vehicle behavior approaching entrance ramps is: | | Observations/Comments: |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | | 1 st Review 2 nd Review 3 rd Review |
| | Lane Use Parameters | | <p><i>Lane use parameters control the amount and/or destination of the traffic using each lane. A typical application of these parameters is to pre-position vehicles in advance of a fork in the road</i></p> |
| | As a whole, lane use parameters are: | | Observations/Comments: |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | | 1 st Review 2 nd Review 3 rd Review |
| | | | Analyst Response |
| | | 1 st Review 2 nd Review 3 rd Review | |

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation (WisDOT) **DT2291**

| | | | |
|-----------------------|---|--|---|
| Traffic/Global | <p>Zone Structure/Vehicle Inputs</p> | <p><i>Zone structure and vehicle inputs define where and how traffic is loaded into the network.</i></p> <ul style="list-style-type: none"> For SimTraffic, the intersection turning movement volumes from the Synchro module determine how the traffic is loaded into the network. If volumes are imbalanced in the Synchro network, SimTraffic will assume a traffic source or sink between nodes (such as driveways). Reviewer should note imbalances that may not be realistic or representative of the network. For Paramics, zone structure relates to the placement of the zones representing the locations where traffic enters or leaves the network. Observations related to sectors and zone connectors should be included in this section. If the microsimulation model zones are derived from a travel demand model, reviewers should use this section to note any issues related to the consistency of the Paramics input data with respect to the travel demand model data. For VISSIM, vehicle inputs control where traffic is loaded into the network and how much is loaded. Reviewer should use this section to note any issues related to the consistency of input data related to the sources. | |
| | <p>As a whole, zone structure and vehicle inputs are:</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable</p> <p>Extent of Revisions Required:</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required</p> | <p>Observations/Comments:</p> <p>1st Review</p> <p>2nd Review</p> <p>3rd Review</p> | <p>Analyst Response</p> <p>1st Review</p> <p>2nd Review</p> <p>3rd Review</p> |
| | <p>O-D Matrices, Demand Profiles, & Time Periods</p> | <p><i>Origin-Destination (O-D) matrices contain the network demand patterns (number of trips between each pair of zones). Time Periods and Demand Profiles control the timing of the release of the trips into the network. In some cases multiple matrices are used (for example separate matrices for cars and heavy trucks). The reviewer should evaluate the source of the demand profile and time period selection.</i></p> <ul style="list-style-type: none"> For SimTraffic, network-wide O-D Matrices and demand profiles are not applicable. The intersection turning movement volumes, rather than network-wide O-D matrices, determines the origin and destination of the traffic. The Link O-D volumes setting can be modified within Synchro to model the weaving interaction between 2 adjacent intersections (such as zeroing out an off-ramp left-turn to on-ramp left-turn movement at a diamond interchange). Volume adjustment factors, rather than demand profiles, dictate the percentage of peak hour traffic to load into the network for each analysis period. Thus the intersection turning movement volumes, Link O-D volumes, volume adjustment factors (such as growth factor and PHF adjust settings), and the time and duration of the seeding (i.e., warm-up period) and recording (i.e., analysis period) periods should be reviewed. | |
| | <p>As a whole, O-D matrices, demand profiles, & time periods are:</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable</p> <p>Extent of Revisions Required:</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required</p> | <p>Observations/Comments:</p> <p>1st Review</p> <p>2nd Review</p> <p>3rd Review</p> | <p>Analyst Response</p> <p>1st Review</p> <p>2nd Review</p> <p>3rd Review</p> |

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation (WisDOT) DT2291

| | | | |
|--|--|---|--|
| Traffic/Global | Core Simulation Parameters | <p>Core simulation parameters affect fundamental aspects of vehicle behavior in the network, such as driver aggressiveness and the willingness to merge into small gaps. Modifications to default software values should be reviewed.</p> <ul style="list-style-type: none"> For SimTraffic, examples of core simulation parameters to review include driver and vehicle characteristics and behaviors. For Paramics, examples of core simulation parameters to review include mean target headway, mean target reaction time, perturbation, global routing cost coefficients, driver familiarity, time steps, speed memory, allowing heavy vehicles to use all lanes, and matrix tuning. For VISSIM, examples of core simulation parameters to review include Driving Behaviors, Simulation Resolution, and Speed Distributions. | |
| | As a whole, core simulation parameters are: | Observations/Comments: | Analyst Response |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | 1 st Review 2 nd Review 3 rd Review | 1 st Review 2 nd Review 3 rd Review |
| | Routing Parameters/ Vehicle Routes | <p>Routing parameters or vehicle routes influence the way vehicles travel through the network. If coded improperly, these controls can cause unrealistic or erratic routing.</p> <ul style="list-style-type: none"> This feature is not applicable for SimTraffic. However, interaction between intersections can be checked as noted with the Link O-D feature in the O-D Matrices, Demand Profiles, & Time Periods section. For Paramics, routing parameters (such as cost factors, turn penalties, modification of the link type hierarchy, and waypoints) override the default routing behavior and profoundly influence the route choice in the network. They are occasionally used to increase or decrease the traffic volume on specific links. For VISSIM, vehicle routes and vehicle routing decisions control the flow of traffic from the entrance points through the network. They can be coded using either actual vehicle flows or percentages. | |
| As a whole, traffic routing parameters are: | Observations/Comments: | Analyst Response | |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | 1 st Review 2 nd Review 3 rd Review | 1 st Review 2 nd Review 3 rd Review | |

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation (WisDOT) DT2291

| | | | | |
|--|--|---|--|--|
| Traffic/Global | Vehicle Types & Proportions | | <i>The proportion of vehicles (such as trucks, buses, and High Occupancy Vehicles) influences the overall performance of each part of the network. Vehicle lengths (such as heavy truck lengths) should be reviewed.</i> | |
| | As a whole, vehicle types & proportions are: | | Observations/Comments: | |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: | | 1 st Review | |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | | 2 nd Review | |
| | | | 3 rd Review | |
| | | | 2 nd Review | |
| | | | 3 rd Review | |
| | | | | |
| | Stuck/Stalled Vehicles | | <i>This section should be used to note any problems with stuck or stalled vehicles (including intermittent problems). These are vehicles that unexpectedly slow or stop partway through their route (which can cause backups that do not exist in the field).</i> <ul style="list-style-type: none"> For Paramics, this section should also be used for comments on the use of blockage removal tools, if used. For SimTraffic, this section should be used to comment on if short links may be resulting in stuck or stalled vehicles within the network. | |
| | As a whole, stuck/stalled vehicle occurrence is : | | Observations/Comments: | |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: | | 1 st Review | | |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | | 2 nd Review | | |
| | | 3 rd Review | | |
| | | 2 nd Review | | |
| | | 3 rd Review | | |
| Special Features | | <i>Special features include site- or study-specific items such as the use of detectors, car parks, variable message signs, special purpose lanes, speed harmonization, public transit routes, toll lanes, toll plazas, pedestrian modeling, special graphics, Application Programming Interfaces (APIs), etc</i> <ul style="list-style-type: none"> At present, SimTraffic will not model bus stops, bus routes, bus and carpool lanes, light rail, on-street parking, or short term event; thus, the use of special features is typically not applicable in SimTraffic. | | |
| As a whole, use of special features is : | | Observations/Comments: | | |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: | | 1 st Review | | |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | | 2 nd Review | | |
| | | 3 rd Review | | |
| | | 2 nd Review | | |
| | | 3 rd Review | | |

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation (WisDOT) DT2291

| | | | |
|--|--|---|--|
| Traffic/Global | Consistency with Related Traffic Models | <i>Modeling studies often involve a series of related models (base model, future no-build, and build alternatives, different times of day, etc.). To assure the integrity of the study as a whole, these models must be consistent.</i> | |
| | As a whole, model consistency is : | Observations/Comments: | Analyst Response |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | 1 st Review 2 nd Review 3 rd Review | 1 st Review 2 nd Review 3 rd Review |
| | Calibration/Validation | <i>Calibration refers to the process where the analyst adjusts selected parameters within the traffic model (e.g., global and local headway and reaction times, driver aggressiveness, etc.) in order to get the traffic model to reproduce conditions observed in the field. Validation refers to the process where the analyst checks the traffic model outputs against field measured data including traffic volumes, travel speeds, travel times, intersection queuing and trip-making patterns (e.g., weaving volumes). The reviewer should spot-check the traffic model outputs and compare them to the results documented in the calibration/validation report. If the reviewer cannot produce similar outputs, it may indicate an issue with the traffic model's calibration.</i> | |
| Calibration/Validation/Documentation | As a whole, model calibration is : | Observations/Comments: | Analyst Response |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | 1 st Review 2 nd Review 3 rd Review | 1 st Review 2 nd Review 3 rd Review |
| | Documentation | <i>Proper documentation of modeling methods and assumptions establishes accountability and facilitates efficient revision, updating, and follow-up. Review team should verify that proper documentation has been provided.</i> | |
| | As a whole, model documentation is : | Observations/Comments: | Analyst Response |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable Extent of Revisions Required: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | 1 st Review 2 nd Review 3 rd Review | 1 st Review 2 nd Review 3 rd Review | |

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation (WisDOT) DT2291

| SUMMARY OF REVIEW | | |
|------------------------------|--|--|
| Overall Traffic Model | As a whole, the traffic model is : | Summary of the review team's findings and recommendations |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable | 1 st Review |
| | Extent of Revisions Required: | 2 nd Review |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minor Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moderate Revisions Required <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Major Revisions Required | 3 rd Review |

REVIEWER'S CONCLUSION (Check One)

- It is the opinion of the review team that the model as reviewed and tested is an accurate and reasonable representation of the traffic conditions in the study area for the analysis year, time period, and scenario/alternative indicated in the title block of this document.*
- It is the opinion of the review team that the model as reviewed and tested requires correction of _____ errors before it can be regarded as a reasonable representation of the traffic conditions in the study area for the analysis year, time period, and scenario/alternative indicated in the title block of this document. (Indicate number and severity of errors: Minor, Moderate, or Major).*

| | | |
|--------------------------------|---|---|
| Prepared By (Signature) | Date <i>Click here to enter a date.</i> | Contact Information Phone: Email: |
| Prepared By (Signature) | Date <i>Click here to enter a date.</i> | Contact Information (Phone, Email) Phone: Email: |
| Prepared By (Signature) | Date <i>Click here to enter a date.</i> | Contact Information (Phone, Email) Phone: Email: |

Attachment 2.4 Sample Correspondence



| | | | | |
|----------------------------|---------------|-------------------------------------|-------------------------------------|------------------------|
| Project ID(s) 86-75-309 | Region: NE | Date Reviewed (m/d/yyyy) | | |
| | | 1 st Review 2/29/2016 | 2 nd Review 3/17/2016 | 3 rd Review |

TRAFFIC MODEL DESCRIPTION

| | | | | |
|--|--------------------------|---|--|--|
| Model Completion/Revision Date (m/d/yyyy) 9/12/2015 | Analysis Year(s) 2040 | Analysis Scenario/Alternative Future AM and PM peaks, Enhanced Signal (Alternative #2) | | |
| Scope of Model (intersections, ramps, corridors, etc. being reviewed) Intersection of USH 888 (N/S) and STH 747 (E/W), Blue Moose, WI | | | | |
| Analysis Time Period (s) <input checked="" type="checkbox"/> Weekday AM Peak <input type="checkbox"/> Weekday Midday Peak <input checked="" type="checkbox"/> Weekday PM Peak <input type="checkbox"/> Fri Peak <input type="checkbox"/> Sat Peak <input type="checkbox"/> Sun Peak <input type="checkbox"/> Other: _____ Hours: 7:00-9:00 Hours: _____ Hours: 3:30-5:30 Hours: _____ Hours: _____ Hours: _____ Hours: _____ | | | | |
| Analysis Tool(s) Utilized <input type="checkbox"/> HCS - Version: _____ <input checked="" type="checkbox"/> Synchro - Version/Build: 8.0.806.61 <input type="checkbox"/> Sidra - Version: _____ <input type="checkbox"/> Other: _____ - Version: _____ | | | | |

SUMMARY OF REVIEW

| Item Reviewed | Overall Model Acceptability | Revision Required | Reviewer Comment(s) | Analyst Response(s) |
|---|---|---|---|---|
| Traffic Analysis Tool/Version | <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | The most recent build of Synchro is used. This is acceptable. | |
| Lane Geometry | <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> No <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | WB right turn lane is channelized in the plans but not the model. Please correct. WBR is now shown as channelized in the model | WBR should be channelized. This has been corrected. |
| Traffic Volumes, % Trucks, Peak Hour Factor (PHF) | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> No <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | Heavy vehicle (HV) percentage set to 2% for all approaches. From the 2012 turning movement count, the NB AM has 8% HV and NB PM has 13% HV. Other approaches should also be examined in both peak periods. Truck percentages are now acceptable. | Saturated Flow Rate (RTOR) has been set to 60 vph. All other RTOR volumes were checked and are in compliance with TSDM 3-2-2-2. |

(continued on reverse side)

SUMMARY OF REVIEW (continued)

| Item Reviewed | Overall Model Acceptability | Revision Required | Reviewer Comment(s) | Analyst Response(s) |
|------------------------------------|--|---|--|--|
| Signal Parameters (including RTOR) | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> N/A | <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> No <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | While the EBR Saturated Flow Rate (RTOR) is set to 90 vph, or half of the 180 vph AM demand, it should be set to 60 vph per TSDM 3-2-2-2 since the cycle length is 120 seconds. EBR Saturated Flow Rate (RTOR) was corrected to 60 vph. | Saturated Flow Rate (RTOR) has been set to 60 vph. All other RTOR volumes were checked and are in compliance with TSDM 3-2-2-2. |
| Measures of Effectiveness (MOEs) | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> N/A | <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> No <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | EBL movement has LOS E in the PM while the NBT/STB have LOS B. Can signal timing be adjusted to make green time more equitable? The adjusted signal timing results in acceptable LOS for all approaches. | Signal timing has been adjusted to allocate more green time to the EBL movement. Now EBL is LOS C, NBT is LOS B, and STB is LOS C, all of which are acceptable. |
| Other: Pedestrian movements | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> No <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | NB pedestrian traffic was included in the base year analysis - why is this not included here? Given the construction of the path, it is acceptable to not consider pedestrian impacts here. | Though not documented here, an off-road paved path will be constructed to the west as part of this alternative. This will serve NB pedestrian traffic destinations and remove almost all NB pedestrian traffic. Please confirm that it is acceptable to not include any NB pedestrian traffic in analysis. |
| Overall Model | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Acceptable <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unacceptable <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Conditionally Acceptable | <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> No <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes | See comments from above. Overall model is now acceptable. | |



| | | | | | | |
|--|---|---|----------------------|------------------------|------------------------|------------------------|
| Reviewer, please email completed form to: <input type="text"/> | | | | 1 st Review | 2 nd Review | 3 rd Review |
| To: | Project Manager & Region Contact | Date Reviewed (m/d/yyyy) | <input type="text"/> | 2/29/2016 | 3/17/2016 | 4/20/2016 |
| CC: | DOT Traffic Model Peer Review | Reviewed By: | <input type="text"/> | RIAWD | RIAWD | RIAWD |
| Subject: | DT2291 for Project ID: Traffic Model Name | Model Completion/Revision Date (m/d/yyyy) | <input type="text"/> | 2/15/2016 | 3/14/2016 | 4/18/2016 |

TRAFFIC MODEL DESCRIPTION

| | | | |
|---|--|---|--|
| Project ID(s) | Project Name/Description | Region | Highway(s) |
| 0-11-23-68 | Cold Corridor - STH 999 & IH-O, Red Bayou, WI | NW | STH 999 & IH-O |
| Traffic Model Name/Description | Analysis Scenario/Alternative | Analysis Year(s) | |
| Params Base Condition Model | AM, PM, FRI, SUN | 2013 | |
| Analysis Time Period (s) | | | |
| <input checked="" type="checkbox"/> Weekday AM Peak | <input type="checkbox"/> Weekday Midday Peak | <input checked="" type="checkbox"/> Weekday PM Peak | <input checked="" type="checkbox"/> Fri Peak |
| → Hours: 6:30-8:30 | Hours: 0:00-0:00 | → Hours: 3:15-5:15 | → Hours: 4:30-6:30 |
| <input type="checkbox"/> Sat Peak | <input checked="" type="checkbox"/> Sun Peak | <input type="checkbox"/> Other: 0:00-0:00 | |
| → Hours: 0:00-0:00 | → Hours: 3:00-5:00 | → Hours: 0:00-0:00 | |
| Analysis Tool(s) Utilized | | | |
| <input type="checkbox"/> SimTraffic - Version: 0:0000 | <input checked="" type="checkbox"/> Paramics - Version: 7.01 | <input type="checkbox"/> Vissim - Version: 0:0000 | <input type="checkbox"/> Other: 0:0000 - Version: 0:0000 |

SCOPE AND EXTENT OF PEER REVIEW

Purpose & Scope of Review
 Provide a detailed review of the base condition model coding and calibration

Description/Limit of Models
 STH 999 & IH-O, 0.5 miles south of Random Road north to the West River Bridge

Configuration Settings

| | | | |
|----------------------------------|--|---|--------------------------------|
| # Zones | # Time Steps | Speed Memory | Assignment Type |
| 25 | 5 | 8 | All-or-nothing |
| Mean Target Headway | Mean Reaction Time | Matrix Structure | Vehicle Classifications/Splits |
| 0.87 | 0.93 | 2-O-D matrices, 1 for passenger vehicles & 1 for heavy vehicles | Separate matrices |
| Seed Values Used for Calibration | 113, 683, 23, 149, 593, 1039, 28567 | | |
| Seed Values Used for Review | 23, 28567 | | |
| Other: Variable Speed Limit | Variable speed limit (VSL) applied on IH-O | | |

Were any changes to the model made by the review team? If yes, please describe.
 No

OBSERVATIONS, MODEL FEATURES AND CHARACTERISTICS

| | | | |
|----------------------------------|---|---|--|
| metrics / Traffic Control | Network Coding | <p>Network Coding establishes the horizontal and vertical geometry of the network. It also includes the appropriate use of settings such as link free-flow speed.</p> <ul style="list-style-type: none"> → For SimTraffic, this is coded within the Synchro module and includes placement and interconnection of nodes and links, number of lanes, lane widths, lane configurations, roadway curvature, storage lengths, and other intersection and network geometry. → For Paramics, this includes placement and interconnection of nodes, links and link categories, curb points, curves, turn lanes, merge points, stop bars, signposts, and other network infrastructure. → For VISSIM this includes the placement and interconnection of links, connectors, desired speed decisions, reduced speed areas, conflict areas, and priority rules. | |
| | <p>As a whole, network coding is:</p> <p><input type="checkbox"/> Acceptable</p> <p><input checked="" type="checkbox"/> Conditionally Acceptable</p> <p><input type="checkbox"/> Unacceptable</p> <p>Extent of Revisions Required:</p> <p><input type="checkbox"/> No Revisions Required</p> <p><input checked="" type="checkbox"/> Minor Revisions Required</p> <p><input type="checkbox"/> Moderate Revisions Required</p> <p><input type="checkbox"/> Major Revisions Required</p> | <p>Observations/Comments:</p> <p>1st Review</p> <p>Intersection of This Rd. and That Dr. - the EB approach currently has an exclusive right turn lane, which is not coded in the model (Link 523:524). It is possible that this exclusive right turn lane was added after the model base year.</p> <p>2nd Review</p> <p>An EB exclusive right turn lane was added on link 523:524. This is used only by buses and right turns, since bicycles are not included in this model.</p> <p>3rd Review</p> | <p>Analyst Response:</p> <p>1st Review</p> <p>Lane appears to have been in place prior to 2012 and is marked for buses, bicycles, and right turns only. An exclusive EB right turn lane has been added that extends back to the WB ramp terminal intersection. This change is not expected to affect the results.</p> <p>2nd Review</p> <p>3rd Review</p> |

| | | | |
|----------------------------------|--|--|--|
| metrics / Traffic Control | Routing Parameters/Vehicle Routes | <p>Routing parameters or vehicle routes influence the way vehicles travel through the network. If coded improperly, these controls can cause unrealistic or erratic routing.</p> <ul style="list-style-type: none"> → This feature is not applicable for SimTraffic. However, interaction between intersections can be checked as noted with the Link O-D feature in the O-D Matrices, Demand Profiles, & Time Periods section. → For Paramics, routing parameters (such as cost factors, turn penalties, modification of the link type hierarchy, and waypoints) override the default routing behavior and profoundly influence the route choice in the network. They are occasionally used to increase or decrease the traffic volume on specific links. → For VISSIM, vehicle routes and vehicle routing decisions control the flow of traffic from the entrance points through the network. They can be coded using either actual vehicle flows or percentages. | |
| | <p>As a whole, traffic routing parameters are:</p> <p><input type="checkbox"/> Acceptable</p> <p><input checked="" type="checkbox"/> Conditionally Acceptable</p> <p><input type="checkbox"/> Unacceptable</p> <p>Extent of Revisions Required:</p> <p><input type="checkbox"/> No Revisions Required</p> <p><input checked="" type="checkbox"/> Minor Revisions Required</p> <p><input type="checkbox"/> Moderate Revisions Required</p> <p><input type="checkbox"/> Major Revisions Required</p> | <p>Observations/Comments:</p> <p>1st Review</p> <p>Link cost factors are applied in 13 locations. It was noted that link 709:708 has an exceptionally high cost factor of 1000. Why is this so high? This link is located on STH 999 between the Random Rd. ramp terminal intersections.</p> <p>2nd Review</p> <p>This is an acceptable approach.</p> <p>3rd Review</p> <p>The cost factor for link 709:708 was changed to 1 which is acceptable.</p> | <p>Analyst Response:</p> <p>1st Review</p> <p>Link 709:708 cost factor will be adjusted. Other cost factors were generally used for routing purposes at interchanges to prevent vehicles from exiting then re-entering the freeway. No additional changes are proposed - please confirm.</p> <p>2nd Review</p> <p>Update completed.</p> <p>3rd Review</p> |

Microsimulation Peer Review Form Responses

Date of Last Response: February 29, 2016

Project: 0-11-23-58
Cold Corridor – STH 999 & IH-O
Up North

Analyst: Traffic Models 'R Us (TMRU)

Traffic Model Name/Description: Future Year (2040) AM Model

| Analyst's Response Code |
|---|
| A = Agree completely; will revise (no written response required) |
| RFS = Requires further study in next phase (no written response required) |
| P = Agree partially; will revise to some degree (see written response) |
| D = Disagree; will not revise (see written response) |

1st Review: 2nd Review: 3rd Review:

Model Completion/Revision Date(m/d/yyyy): 01/07/16

Reviewer 1: **An Employee of the State (EOS)** 02/04/16

Reviewer 2: **Review is All We Do (RIAWD)** 02/11/16

Reviewer 3: **FHWA** 02/14/16

| Category | Reviewer | | Analyst | | |
|-----------------------|----------|---|---------------|--|--------------------|
| | Initials | Review Comments | Response Code | Response | Markup Complete |
| Network Coding | EOS | #1(Link 422:413) # 2 (Link 1109:209 kerb points) #3 (Link 344:229 stopline rotation) | A A A | #1 Link adjusted to provide two lanes | TMRU – 3/02/15 |
| | RIAWD | #1 (Model weave lengths) #2 (Ramp at node 447) | P A | #1 The study team has modified the upstream lane choice rules associated with the mainline weaves between Fake Rd. and False Dr. While there is always a degree of early or late lane changing within the model due to randomly assigned degrees of aggressiveness, awareness, etc., this issue has been mitigated to the greatest extent possible. #2 Ramp parameters modified to mitigate this issue as much as possible. The future AM model should now match the draft PM model, as this issue was more prominent during the future PM peak period. | TMRU – 03/02/15 |
| | FHWA | #1 (Link 29:30 and 29:31) #2 (81 st St./St. Peter Ave geometry) | D RFS | #1 The left turn lane here (Link 29:31) has been modeled as separate to prevent vehicles from attempting to move over, therefore blocking the lane and causing a queue. No change is proposed. #2 The design team has indicated that while the DXF does not indicate an allowable movement from SB 81 st St to the IH-0 EB entrance ramp, this access could be provided as the team continues to work on design refinements. Movement from SB 81 st to IH-0 EB will be modeled, and results of this will help inform the final design decision. | TMRU – 03/02/15 |



INTRODUCTION

This document outlines the policies and procedures for the operation of WisDOT's State Traffic Operations Center's (STOC) Dynamic Message Signs (DMS), and was created for personnel in state, regional, and local transportation agencies that have responsibility for the operation of and/or message design for permanent DMS.

DYNAMIC MESSAGE SIGN OVERVIEW

Dynamic Message Signs (DMS) are the most visible manifestation of traveler information systems. They are electronic message boards placed in close proximity to roadways that allow traffic system operators to inform drivers on changing traffic conditions. DMS are commonly used for congestion warnings, lane and ramp closure information, alternate route information, and traffic flow diversion. The ability to quickly alert motorists of a problem ahead and provide an alternate route through a DMS is a successful strategy for minimizing the impact of an incident on traffic flow. DMS have demonstrated to provide the following benefits:

- Reduction of speeds as vehicles approach congested areas, resulting in fewer accidents;
- Increased diversion to alternate routes during incidents, resulting in better traffic network performance;
- Increased lane changes away from lanes that are closed downstream, resulting in safer merging operations; and
- Improved traffic operations during special events.

As soon as STOC Control Room Operators verify incidents, they can create and display messages on the appropriate DMS in order to provide drivers with real-time information on traffic conditions, either as advisories or as proactive route guidance. DMS messages aid drivers to make more informed decisions on congestion avoidance and en route diversion.

*"Paramount to the message design and display, [DMS] must provide timely, reliable, accurate and relevant information and they must be operated properly to be effective. Credibility is an extremely important consideration in properly operating a [DMS] system. Regardless of how well a message is designed, motorists will eventually come to distrust the signing system if the messages are not changed at the correct times and updated to reflect correct traffic conditions."*¹

The policies and guidelines presented in this chapter have been developed to support these goals. Discrepancies between the acquired information and the travel experience *may* lead drivers to rely less on information over time.

NATIONAL DYNAMIC MESSAGE SIGN OPERATIONAL POLICIES

There are no written DMS operations policies at the national level. However, policies, standards, and guidance are embodied in the MUTCD and in FHWA guidance documents and policy memorandums.

The primary chapters and sections addressing DMS in the MUTCD are:

- Chapter [2L](#). Changeable Message Signs
- Section [6F.60](#). Portable Changeable Message Signs

The MUTCD states that,

*"...CMS **shall** display only traffic operational, regulatory, warning, and guidance information. Advertising messages **shall not** be displayed..."*

Additionally, FHWA published a document that includes specific guidance for DMS messaging (Guidelines for Disseminating Road Weather Advisory & Control Information) in June 2012. This document includes, but is not limited to road weather information; it includes guidance on DMS content structure, length, phrasing, phase timing, and effective ways to communicate travel times, delay, event locations, degrees of urgency, and degrees of certainty.

(http://ntl.bts.gov/lib/45000/45600/45623/FinalPackage_JPO-12-046_V1.pdf)

¹ FHWA's Guidelines for Changeable Message Sign Messages, Page 2-7

WISDOT DYNAMIC MESSAGE SIGN OPERATIONAL POLICIES

- 1) WisDOT's DMS *may* be used for the following situations as they apply to freeways, ramps, and approved surface streets:
- Traffic incident management
 - Emergency situations requiring diversion
 - AMBER Alerts and Silver Alerts
 - Recurrent traffic congestion
 - Current roadwork – including lane, ramp and roadway control
 - Future roadwork (up to 10 days in advance)
 - Special event (See [TEOpS 17-2-1](#) for attendance thresholds)

In addition, DMS *may* be used to display:

- Current travel times
 - Static travel times
 - Adverse weather conditions
 - Warning of adverse road weather conditions
 - Transportation safety messages
 - Fire prevention purposes in high fire risk areas
 - Other approved transportation-related messages.
- 2) DMS *should not* be used to display the following information:
- Advertising products or slogans, whether WisDOT related or not
 - General rules of the road messages that drivers *should* already adhere to (i.e. “Be prepared to stop”)
 - Non-threatening weather reports or temperature
 - Time of day or date
 - Directions for specific user groups

Note: As an alternative to displaying such of any non-approved messages listed above, the traffic media can be contacted by the STOC to broadcast a “Media Alert” at their discretion.

- 3) DMS messages for the approved applications *should* be posted in accordance with the prioritized hierarchy listed in Section 3, “Hierarchy for Displaying Messages”, in the Operational Guidelines of this chapter.
- 4) DMS signing *should* only be done after the operator confirms the conditions/incidents with a reliable source.
- 5) References to PARK AND RIDE lots *should* only be made when in relation to another approved signing application such as special events.
- 6) Alternate routes *should* only be signed for, or in the event of, a freeway closure or major incident.
- 7) Only alternate routes approved by Department staff or the Control Room Shift Supervisor *should* be referenced when using DMS to sign for alternate routes (off the freeway).
- 8) Arterial DMS (ADMS) *should* primarily be used to inform motorists of conditions on freeways or approved alternate routes.
- 9) Signs *should* display current Travel Time messages as default messages. Blank signs are allowed at locations where there is little or no reoccurring congestion or commuter traffic (i.e. rural areas). Hybrid DMS *may* be blank when travel time data is unavailable.
- 10) Message format and content *should* follow guidelines set forth in the Operational Guidelines of this Procedure.
- 11) Use of DMS for fire prevention purposes is further defined in the Memorandum of Understanding between the Wisconsin DNR and WisDOT in the Fire Prevention Memorandum of this Procedure. Message activation *should* adhere to the guidance provided in the Control Room Operations Manual Red Flag Warning section 8.N.

DYNAMIC MESSAGE SIGN OPERATIONAL GUIDELINES

1) Situations that warrant the use of DMS

a) Current and Future Situations:

i) Current Situations

(1) Planned Situations

- Roadwork (construction and maintenance)
 - Special events (See [TEOpS 17-2-1](#) for attendance thresholds)
- (2) Unplanned Situations
- Recurrent traffic congestion
 - Incidents affecting traffic
 - Emergency situations requiring diversion
 - AMBER Alerts and Silver Alerts
 - Warning of adverse road weather conditions during adverse weather events
- (3) In addition, DMS *may* be used to display
- Current travel times
 - Static travel times
 - Confirmed or imminent adverse or severe weather conditions
 - Transportation safety messages
 - Other transportation-related messages
- ii) Future Situations (up to 10 days in advance)
- (1) Future special events
- (2) Future roadwork (construction and maintenance)
- b) Transit and Park-and-Ride Lots
- Messages referencing transit or park-and-ride lots *should* only be displayed during special events such as Summerfest or State Fair to help mitigate congestion resulting from attendees. For example:

| |
|--|
| SUMMERFEST TRAFFIC USE BARKER RD PARK/RIDE LOT |
|--|

| |
|--|
| STATE FAIR TRAFFIC USE WATERTOWN PLANK PARK/RIDE LOT |
|--|

- c) Signing for Alternate Routes
- i) Freeways as alternate routes – The freeway system is the preferred alternate route, if practical. An alternate freeway route *should* only be signed for when incidents or roadwork on the primary route cause delays above 30 minutes. For example:
- | | |
|---|--|
| I-43 NB CLOSED AT MARQUETTE INT FOLLOW DETOUR | GREEN BAY TRAFFIC USE I-894 BYPASS TO US 45 NB |
|---|--|
- ii) Arterial streets as alternate routes – Only pre-approved surface streets *should* be referenced when traffic diversion or detouring is necessary. If diverting or detouring traffic off the freeway is necessary and no pre-approved routes are available, the phrase USE ALTERNATE ROUTE *should* be used.

2) Verifying Conditions and Events that will Utilize DMS

No message *should* be put on a sign until the message information has been verified by a reliable source. CCTV camera images will provide the most common source for verification. Other sources include, but are not limited to, WisDOT staff, or law enforcement.

3) Hierarchy for Displaying Messages

Messages for DMS *should* be displayed in accordance with the guidelines listed below. This section lists the message priority during all times.

- a) Incident/Weather/Emergency - Incidents that cause freeway lane closures for at least 15 minutes or conditions lasting at least 15 minutes that are hazardous to motorists and requiring active diversion. Events that block all traffic lanes or cause hazardous conditions *should* be given priority over all other messages. Hazardous conditions include stopped or slowed traffic where sight distance is limited or

weather-related hazard conditions exist. Refer to part 6) g) vi) of this section of the policy for information regarding the placement of adverse conditions messages on DMS requested by law enforcement.

- b) Amber Alert or Silver Alert – The STOC will utilize the Dynamic Message Signs (DMS) to notify the traveling public of the Amber Alert or Silver Alert.

| |
|--|
| <p>AMBER ALERT INFO TUNE TO 1610 OR CALL 511</p> |
|--|

| |
|--|
| <p>SILVER ALERT MISSING PERSON CALL 511 FOR INFO</p> |
|--|

In the event that a major incident and an Amber or Silver Alert occur simultaneously, WisDOT will make every effort to display information for the incident and the Amber Alert through a two-phase DMS message

- c) Roadwork (construction and maintenance) – Priority *should* be given to events that have the greatest negative impact on traffic and that are expected to last the longest.
- d) General traffic flow conditions – General traffic flow information such as levels of congestion or delays.
- e) Current travel times.
- f) Current special events – During special events, route guidance, exit information, and park-and-ride information *may* be provided to motorists.
- g) Future occurrences (according to chronological date) – Priority *should* be given to whichever event is expected to occur first, has the greater impact on traffic, or is expected to last the longest.
- h) Transportation-related messages – Other transportation-related messages, including safety messages, *may* be scheduled and provided to motorists.

4) DMS Status

Monitoring messages on DMS – Messages on DMS *should* be continually monitored to ensure that the information presented on each sign is current.

5) DMS Use for Arterial Streets

- a) Arterial DMS (ADMS) – All policies and guidelines contained in this chapter apply to Arterial DMS. Arterial DMS *should* only be used for the same applications as freeway DMS. Arterial DMS *should not* be used to provide information for any other routes, incidents, conditions, or events that freeway DMS does not support, with the exception of freeway on-ramp closure information.
- b) Signing for arterial conditions – DMS messages on freeway or arterial signs *should not* present information pertaining exclusively to surface street routes. Surface street information *should* only be presented as supplementary information for freeway conditions to allow motorists to make decisions regarding route selection, with the exception of freeway on-ramp closure information.

6) Message Design

a) General

- i) Standard Terminology – Messages *should* be designed using standard terminology as defined in the “Message Design Dictionary”. All words in the Message Design Dictionary *should* be stored in the TIS (Traveler Information System) dictionary. Words not found in the Message Design Dictionary *may* be used when necessary. New words *should* be approved and included in the Message Design Dictionary before they are included in the TIS dictionary. MUTCD approved shields, symbols, and graphics *may* be used while following all other applicable operations guidelines. Contact the Statewide Freeway Traffic Operations Engineer or the Control Room Shift Supervisor for the message library.

- ii) Message Length Limitations – Messages *should* be kept as short and concise as possible.

Messages *should* generally be no more than 8 words in length (4-8 characters per word) excluding prepositions (to, at, for, etc.).

Messages *should* use no more than two information units per line, three information units per phase, four information units per message read at speeds of 35 mph or more, and five information units per message read at speeds less than 35 mph. Messages *may* reference other sources containing additional information (e.g., 511, Highway Advisory Radio).

An information unit can be defined as the answer to a basic question about the subject of the message. For example, in the bullets below, each answer to the question is a single information unit each.

- What is the problem?
 - FLOODING, SLICK IN SPOTS, BLOWING SNOW
- Where is the problem?
 - AT US 41, PAST WIS 151, MADISON AREA
- Who is affected?
 - BELOIT, ALL TRAFFIC, WEST BOUND TRAFFIC
- What *should* they do?
 - USE I-894 EAST, REDUCE SPEED, TRAVEL NOT ADVISED

iii) Message Phasing – When possible messages *should* be displayed in one phase. Messages *should* be displayed in no more than two phases. If two phases are used, each phase *should* be distinct and understandable by itself. When dividing messages between two phases, compatible information units *should* be kept in the same phase. One line *should not* contain parts of two information units, but *may* contain two whole information units.

Minimum message display time *should* be determined according to posted speeds and units of information to ensure that motorists will be able to read the entire message. The display time should be determined by the lesser of one second per word or two seconds per unit of information. A minimum displaying time of 2 seconds per line per phase *should* be used for speeds of 55 mph. The maximum cycle time of a two-phase message should be eight seconds. When speeds are below 30 mph, a minimum displaying time of 1 second per line per phase *may* be used.

Graphic messages are limited to one phase.

iv) Flashing Messages – Flashing messages **shall not** be used.

v) Indication of Lanes

(1) For messages pertaining to three or fewer lanes, the terms “LEFT,” “CENTER” or “RIGHT” *should* be used to describe the affected lanes.

(2) For messages pertaining to four or more lanes, the following format is recommended:

(a) [n] [LEFT/RIGHT/CENTER] LANE(S) CLOSED where:

LEFT – represents the left lane only

RIGHT – represents the right lane only

CENTER – represents any center lane exclusively

LANES – to be used when the number of affected lanes is not known

n – number of affected lanes

For example:

| |
|--|
| LEFT LANES CLOSED AT HAWLEY RD MERGE RIGHT |
|--|

| |
|---|
| 2 RIGHT LANES CLOSED AT 35TH ST USE ALT ROUTE |
|---|

vi) Shoulders – The phrases “LEFT SHOULDER,” “RIGHT SHOULDER” and “BOTH SHOULDERS” can be used in cases where shoulders are closed.

vii) Freeway Exit Designation – Exit designations *should* be consistent with those specified on static signs in the area.

viii) Use of Local and General Terminology

- (1) Local Terminology – Local terminology refers to names or places that are typically recognized only by motorists that frequently drive in the area.
 - (2) General Terminology – General terminology uses generic terms including distances and abbreviated jurisdictional freeway designations to describe locations that most drivers *should* understand. This section gives examples of situations when common local and general terms *should* be used.
 - (3) Target Audience – The use of local or general terminology is dependent on target audience. The target audience can be commuter/local traffic, through traffic, special event traffic, or all traffic. Commuter/local traffic *should* be addressed using local terminology. Through/all traffic *should* be addressed using general terminology. The AM (6:00am-9:00am) and PM (3:00pm-6:00pm) peak periods *should* address commuter/local traffic. All other periods *should* address all traffic. During days which special events are being held (Summerfest, State Fair), only general terminology *should* be used throughout the entire day.
 - (4) Interchanges – The use of local interchange names (Marquette, Zoo, etc.) *may* be used when commuter/local traffic is the target audience. Otherwise, interchanges *should* be referenced to by the abbreviated jurisdictional designation (I-94, US 45, etc.) of the highways and streets that compose the interchange.
 - (5) Freeways – The use of local freeway names (East-West, Rock, etc.) *should not* be used. Freeways *should* be referenced to by their abbreviated jurisdictional designation (I-94, US 45, etc.). An acceptable exception is the use of Airport Spur instead of STH 119
 - (6) Streets – Streets *should* be referenced to by their local street name, not by their jurisdictional designation (e.g. use GREENFIELD AVE, not WIS 59) unless the jurisdictional designation is more commonly known (e.g. WIS 100 between Edgerton Ave. and Silver Spring Drive in Milwaukee). In either case, static signing *should* be in place for the referenced street. Names *should* be followed by facility descriptors (Rd, Ave, St, etc.) for clarity. If space on the text line is not available, the descriptor *may* be omitted. Street names that could be confused with directions (North Ave) or cities (Beloit Rd) *should* always be listed with their descriptors.
- ix) Abbreviations – Abbreviations *should* be used only when no other formatting or terminology can be used to convey the message. The length of the abbreviation *should not* exceed two-thirds the length of the word.
- x) Text Alignment – Text on all signs **shall** be centered, except graphic messages and for travel times, when justified alignment *may* be used.
- xi) Font – All the text *should* be displayed in capital letters, using only one font size and only one font type.
- xii) Letter Size – For roadways with posted speeds of 45 mph or higher, the minimum letter height *should* be 18". For roadways with posted speeds of less than 45 mph, the minimum letter height *should* be 12 ".
- xiii) Character Spacing – Proportional spacing *should* be used as much as possible. Fixed spacing *may* be used.
- xiv) Graphics, Symbols, and Animation – DMS *may* use standard Highway sign and route shield symbols provided they meet the requirements of the MUTCD, Section [2L.04](#). DMS **shall not** display graphics, symbols, or animation other than those approved by the MUTCD.
- xv) Brightness – Operators *should not* change the brightness, unless directed by Department staff or the Control Room Shift Supervisor. Brightness is auto-adjustable and fluctuates during the day to adapt to natural conditions.
- b) Messages for Incidents/Current Roadwork/Congestion/Emergency
- i) Message Content – Messages about incidents, roadwork, or congestion *should* contain the following minimum information:
 - Problem
 - Location
 - Action

These messages *may* also contain the following additional information:

- Effect on Travel
- Audience for Action
- Good Reason for Following the Action

| |
|-------------------------------------|
| [Problem] [Location] [Action] |
|-------------------------------------|

ii) Message Format – Each piece of information *should* be presented in the order shown below:

iii) Problem – This information refers to the reason for posting a message and provides information about the situation that the driver will encounter. Examples include DELAYS AHEAD, LANE CLOSED, and RAMP CLOSED.

- (1) Lane/Ramp Closures – Lanes/Ramps *may* be closed due to roadwork or incidents. When roadwork is the cause of a lane/ramp closure, the term CLOSED *should* be used. When incidents are the cause of the lane closure, the term CLOSED *should* be used. The phrases “ALL LANES CLOSED” or “ALL LANES CLOSED” *should* be used when all travel lanes are closed.
- (2) General Traffic Flow Conditions – During periods of recurrent congestion, traffic conditions *should* be described as:
 - REDUCED SPEEDS – speeds of 36 to 50 mph (yellow on map)
 - DELAYS – speeds of 21 to 35 mph (pink on map)
 - SEVERE DELAYS – speeds of 0 to 20 mph (red on map)

iv) Location – Describes the location or distance to the situation or the approximate area of the event. The location *should* be specified using cross streets or distances downstream of the DMS.

- (1) Local Terminology – Local terminology *should* reference the closest cross street(s) that apply to the event when common cross streets are close together. For example, use AT LOCUST ST, or NEAR HWY 83.
- (2) General Terminology – General terminology *should* reference a distance downstream of the DMS to the nearest half mile when common cross streets are far apart. For example, use # MILES AHEAD.
- (3) Landmarks and Areas – Landmarks and areas *should not* be used as location references. Exceptions include DOWNTOWN and AIRPORT.
- (4) Locations on DMS Upstream of Congestion – When utilizing DMS that are located upstream of the event, the location of the event *may* be specified at one point, or between two points. For

| | |
|----------------------------|------------------------------------|
| DELAYS AT 35TH ST | DELAYS AHEAD 35TH ST TO 84TH ST |
| DELAYS CLEAR AT 84TH ST | |

example:

- (5) Locations of DMS in congestion – When utilizing DMS that are located in areas that are congested, messages *should* inform drivers where the congestion clears. For example:
- (6) Route Designation – The freeway/highway designation *should* be included as part of the location if the event is located beyond or spans a freeway-to-freeway interchange.

| |
|------------------------------|
| DELAYS I-94 EB AT 84TH ST |
|------------------------------|

For example, if traveling on I-94 EB the sign at Elm Grove Rd. *should* read:

Because motorists could travel on I-894 eastbound or US 45 northbound, the highway must be identified in the message. Phased messages *may* be used to inform motorist of conditions on multiple highways.

- v) Action – This refers to what action the motorist *should* take in response to the problem and location information. Examples include USE ALTERNATE ROUTE, EXIT NOW, or MERGE RIGHT. Action statements *should* be used when the tactics prescribe an active response. BE PREPARED TO STOP/SLOW **shall not** be used.
 - vi) Audience (optional) – This information refers to a specific group of drivers rather than everyone passing the DMS. Examples include TRUCKS, DOWNTOWN TRAFFIC, and NORTHBOUND TRAFFIC. If an audience statement is used, an action statement *should* be included.
 - vii) Effect on Travel (optional) – Informs the traveler of the severity of the situation by using delay or travel time and helps the traveler form expectations about their trip or decide to change their travel plans. Examples include DELAYS AHEAD or # MIN DELAY.
 - viii) Good Reason for Following the Action (optional) – Gives a traveler confidence that following the advice on the DMS will result in safer travel and/or significant savings in time. Examples include BEST ROUTE TO AIRPORT or AVOID DELAY.
- c) Messages Displaying Travel Times
- Current Travel Times *should* only be displayed when the system is accurately calculating travel times. Travel Times less than the static travel times *should not* be displayed. Travel Times *may* be used to display travel time comparisons between alternate routes. For example:

| | |
|-------------------------|--------|
| FREEWAY TIME TO AIRPORT | |
| VIA I-894 | 15 MIN |
| VIA I-94 | 18 MIN |

Freeway, arterial and hybrid static-dynamic message signs *may* be used to display travel times.

- d) Messages during Special Events
- i) General – Directions for specific user groups will not be provided on DMS.
 - ii) State Fair/Summerfest – DMS *should* be used to provide motorists with park-and-ride information during State Fair/Summerfest. A TMP (Traffic Management Plan) is created for each year's State Fair and Summerfest events. The TMP includes DMS messages that operators *should* use during State Fair and Summerfest events.
 - iii) Miller Park Events
 - (1) DMS *should* be used to provide motorists with information regarding traffic conditions around the I-94/US 41 Interchange during Miller Park events. A TMP has been created for Miller Park events. The TMP includes DMS messages that operators *should* use during Miller Park events.
 - (2) Line DMS (LDMS 50 & 51) *should* be used to inform motorists about Miller Park Events. LDMS *should not* convey traffic or any other related information that is not Miller Park-event related. Unless otherwise determined by the Department staff or the Control Room Shift Supervisor, messages on LDMS *should* warn drivers to tune their radios to the Miller Park HAR frequency (1180 AM), where complete messages will be broadcast.
- e) Messages for Future Roadwork
- DMS *should* be used only for future roadwork that involve lane/ramp closures and that will start within 10 days or less. DMS *may* be used in support of traveler information to notify drivers of changes to closures/detours affecting drivers' route choice. DMS message plans are not generated from closure information entered into LCS (Lane Closure System). WisLCS Advance Notification Guidelines *should* be referenced for notification minimums. Message requests *may* be altered to conform to the message design format described in Part 6 of this policy.
- Messages for future roadwork *should* follow the general guidelines roadwork scheduled to begin in the next 7 days:
- i) Message *should* include the date and time the roadwork will start.

- ii) Message *should* use the day of the week rather than the calendar dates. For example, “TUES – THURS”
- iii) Message *should not* use the phrase “FOR 1 WEEK” because the start and end dates are ambiguous.
- iv) Message *may* use the term “WEEKEND” if the event begins on Saturday morning and ends on Sunday evening.

| |
|----------------------------------|
| RAMP CLOSED THUR 9AM – 3PM |
|----------------------------------|

Example:

Messages for future roadwork *should* follow the general guidelines roadwork scheduled to begin in more than 7 days, but within 10 days or less:

- i) Message *should* use a 3-letter month abbreviation rather than a numerical month representation. For example, “FEB 22.”
- ii) Message *should* only state the month once if both dates in a range are in the same month. For example, “FEB 22 – 28”
- iii) Message *should not* include day, date, and time information.

| |
|------------------------------|
| RAMP TO CLOSE FEB 22 - 28 |
|------------------------------|

Example:

f) Messages for Future Special Events

DMS *should* be used only for future special events that are expected to have a negative impact on traffic and that will start within 10 days or less. Messages for future events *should* follow the general guidelines for current special event. In addition, message *should* include the date and time the special event will start.

g) Messages for Adverse Weather Conditions

- i) General – DMS *should* only be used to inform drivers of adverse weather conditions that are currently affecting travel. Reliable weather reports of imminent severe weather *may* be displayed. Examples include winter warnings related to ice, storms and blizzards. General weather reports or forecasts **shall not** be displayed.
- ii) Evaluating the need for adverse weather messaging – the following *should* be taken into consideration when evaluating the need to message for adverse weather conditions:
 - Is there a storm or weather warning in effect for county/area? If so, use the warning’s expiration time as a guide for how long to place the message on the DMS.
 - Is there a significant increase in the number of traffic incidents in the county/area? Is the number of incidents unusual for that time of day?
- iii) Format for Weather Condition Messages – Messages for severe weather conditions that affect traffic *should* follow the same format as messages for incidents, roadwork, and congestion. The problem statement *should* indicate the weather condition. Examples include ICY ROADS or POOR VISIBILITY.

DMS *should* be used to broadcast Winter Storm Warnings, Blizzard Warnings, Lake Effect Snow Warnings and Ice Storm Warnings issued by the National Weather Service (NWS). When a warning is issued by NWS, notify the Control Room Supervisor or On-Call BTO Management. On-Call BTO Management will provide approval for the warning messages to be deployed. The message *should* include the time frame of the warning, for example MON 6PM TO TUE 5AM. The message *should*

include a command for the driver, for example PLAN AHEAD prior to the warning taking effect and REDUCE SPEED during the warning.

Messages *may* provide additional details about the weather event—or its driving impact — to improve the specificity of the prediction and increase the certainty communicated by the message. These details can include information about the location, timing, or impacts of a road weather event.

- iv) Communicating Urgency – Messages *should* use command style messages when the situation is urgent and an immediate control action is required by the driver. Examples of command style messages include REDUCE SPEED or MOVE TO RIGHT LANE.

Messages *should* use notification style messages when an immediate control action is not required, or the situation is not urgent. Examples of notification style messages include “ICE AHEAD” “USE ALTERNATE ROUTE” or “STORM WARNING.”

Messages *should* reflect the current roadway conditions or warning status. Monitor the conditions hourly and update the messages when needed. The Control Room Supervisor *should* approve updated messages. Remove messages when not needed for the current conditions.

- v) Communicating Certainty – Messages *may* provide a qualitative description, such as CERTAIN, POSSIBLE, or A CHANCE, that will correspond to the likelihood of a road weather event.
- vi) Requests from law enforcement - STOC operators *may* consider requests from law enforcement to display spot specific messages. Messages not included in the TIS Library *should* be sent to the STOC Supervisor or On-Call BTO Management for approval before use.

h. Messages for Transportation Safety

Transportation related safety messages *may* be displayed on DMS in accordance with an agency developed safety message calendar. Safety messaging *may* supplement a local or statewide safety media campaign and be of the same topic to communicate timely and relevant information. Safety messages *may* be scheduled in accordance with the National Highway Traffic Safety Administration (NHTSA) campaign schedule. An annual safety message calendar will be developed with coordination among State agencies and Bureaus including but not limited to BOTS, DSP (includes the bureau of public security and communications), BHM, OPA and BTO. Safety messages are secondary priority and *may* be preempted by all other purposed messages at the discretion of the STOC Control Room operator.

- i. Schedule - The annual safety message calendar will identify the planned campaigns and their corresponding local or statewide safety media campaign. The safety message calendar will be developed for a 12-month period with approval by the Chief of Local Programs from the Bureau of Transportation Safety, the Director of the Office of Public Affairs and the Freeway operations engineer, Supervisor and Chief in the Bureau of Traffic Operations. Changes to the annual calendar will be minimized for scheduling purposes to allow message planning and sign scheduling. Sign and message selection will be made with consideration for alternate priority messages including but not limited to construction and conditions messaging. Individual safety campaigns *should* be reviewed by regional operations staff for work zone message priorities and comment.
- ii. Message Content – Safety messages *may not* repeat the campaign message in order to avoid resemblance to advertising. The message *should* be simple and brief and slogans **shall not** be used. The message *may* contain fatality information that is current. Failure to include current information reduces message credibility. Content will adhere to message format defined in this guidance. STOC staff will determine final message content in accordance with policy, sign size and sign functionality. Safety messages *should* consist of a single phase and *may* be displayed as a second phase with another priority message. Examples of safety messages are included in the Message Guidelines of the WisDOT STOC Control Room Operator’s Manual.
- iii. DMS selection – Sign locations **shall** be specified for each safety message plan included on the annual calendar. Locations *should* be selected with consideration for scheduled higher priority messages and construction zones. For example, a travel times should not be replaced by a safety message. Message displays *should* be consistent along a roadway corridor and adjacent corridors. Counties with higher rates of non-compliance per campaign topic *may* be emphasized.
- iv. Units of Information – A safety message with two or less units of information *may* be displayed as a second phase with travel times. DMS with travel time messages with five or more units of information on a single phase *should not* be used for safety messaging.

Message content and sign locations **shall** be reviewed by the Statewide Freeway Traffic Operations Engineer for conformance with these guidelines prior to the display of safety messages.

i. Consistency and Credibility

Consistency in message design is a key factor in providing understandable messages. Before displaying a message, operators *should* check the event status, all message elements, and all message attributes in order to ensure that the message is accurate and useful. Inaccurate messages *may* mislead motorists, cause confusion, or reduce public trustworthiness in DMS messages.

Message credibility is also enhanced when messages are updated appropriately and removed promptly as conditions change.

The following message characteristics *should* be avoided because they can damage the credibility of a message:

- Information is inaccurate or not current and can be easily checked by travelers and disproved.
- Information is irrelevant to most travelers.
- Information is obvious, and thus redundant to travelers' visual inspection.
- Information is repetitive, i.e., the same information is presented over a long period of time.
- Information is trivial with regard to the driving task.
- Information is poorly presented and thus difficult to comprehend or confusing.

Message Library - The TIS Library of common messages *should* be maintained and updated as needed. Department staff or the Control Room Shift Supervisor *should* approve any words or abbreviations that are not in the TIS Library before their use. Graphic messages will be maintained in a separate directory. Graphic messages are sign specific by size and content. Contact the Statewide Freeway Traffic Operations Engineer or the Control Room Shift Supervisor for the message library.

Coordination with Other Traveler Information Systems - Care *should* be taken to coordinate all traveler information systems. PCMS guidelines ([17-2-1](#)) and use should be considered when DMS messaging supports the same situation. Other traveler information systems include portable changeable message signs, The Wisconsin 511 App, highway advisory radio, the Wisconsin 511 Traveler Information system, the WisDOT main web site, and social media platforms (Facebook, Twitter, etc). The general concepts related to driver expectations and driver comprehension of the different phrases applies to all dissemination tools. Continual monitoring and updating of each system is required.

Note:

The following changes are being submitted for the Fire Safety MOU included on the next page.

Section D part 1, include “DNR will notify DOT of areas under watch with high probability of becoming a high fire risk area leading to a safety messaging request”.

And,

Section D part 6, include “DOT will provide expense records to DNR of costs for message board use”.

Memorandum of Understanding
by and between the
WISCONSIN DEPARTMENT OF NATURAL RESOURCES
and the
WISCONSIN DEPARTMENT OF TRANSPORTATION
on

**Information needs and liaison procedures for installation and maintenance of
DNR Smokey Bear fire danger signs and use of DOT Electronic Message Boards**

This Memorandum of Understanding (“MOU”) by and between the Wisconsin Department of Natural Resources (“DNR”) and the Wisconsin Department of Transportation (“DOT”) defines the liaison procedures for the review and concurrence on the installation and maintenance of DNR Smokey Bear Fire Danger signs (“Smokey Bear Signs”) and use of DOT Electronic Message Boards.

A. Purpose

The purpose of this MOU is to provide mutual departmental procedures for the review of the installation and maintenance of DNR Smokey Bear Fire Danger Signs and use of DOT Electronic Message Boards for fire prevention purposes in high fire risk areas of the state. Both Parties recognize the need for Smokey Bear Signs located directly adjacent to DNR Forest Ranger Stations, DNR facilities, and fire departments, for the safety of DNR staff, partners, and motorists, as well as the need to inform motorists of the dangers of forest fires on roads in the areas to which they are travelling. Both Parties also recognize the need for a safe, aesthetically pleasing and minimally distracting driving experience. Both Parties further recognize DOT’s need to control signs adjacent to interstates, federal aid primary highways and the Great River Road as required by 23 USC Part 750 and implemented under Wis. Stats. s. 94.30 and ch. TRANS 201, Wis. Adm. Code. Both Parties believe the following terms achieve these purposes.

B. Applicability

This MOU applies to the installation and maintenance of approved DNR Smokey Bear Fire Danger Signs and use of DOT Electronic Message Boards for fire prevention purposes in high fire risk areas of the state, including but not limited to Red Flag Days, Emergency Burning Restrictions, prolonged drought leading to increased fire danger, Federal or Gubernatorial declared states of emergency, or any other situation where there is a significant risk of fire related danger that threatens life, property and natural resources of the State.

C. Coordination on Smokey Bear Signs

This section defines the process for all interactions between DOT and DNR regarding the installation, maintenance, approval, and identification of Smokey Bear Signs. This process does not include requirements for other state, local or federal permits or approvals that may be required for a project.

1. By March 31, 2013, DNR shall provide DOT with detailed information on the locations and numbers of all Smokey Bear Signs in the state. DOT and DNR will work together to identify which signs are located within the highway right-of-way. DOT and DNR will further work to identify which Smokey Bear signs are adjacent to interstates, federal aid primary highways and the Great River Road. DNR will provide an annual update to the list from the DNR Bureau of Forest Protection central office to DOT central office.
2. Existing DNR Smokey Bear Sign locations shall remain in place at DNR's discretion, but all signs located within highway right-of-ways or new signs to be located within highway right-of-ways must be upgraded or installed in consultation with DOT to established Federal design standards and to meet DOT break-away requirements. Signs which are adjacent to interstates, federal aid primary highways and the Great River Road will further be upgraded in the event they do not meet the applicable legal requirements. DNR will work with DOT to upgrade these signs as funds are available.
3. For all new proposed signs, DNR shall provide the applicable DOT regional office 30 days written notice before erecting new Smokey Bear Signs "...which are visible from any place on the main-traveled way of any portion of an interstate highway or primary highway" (Wis. Stat. s. 84.30(2)(j)). DOT may request consultation for any sign that may be of concern and further may prohibit the initial construction of new Smokey Bear signs adjacent to interstates, federal aid primary highways and the Great River Road that do not meet the requirements of Wis. Stats. s. 84.30(3)(a) or those applicable to official signs in ch. TRANS 201, Wis. Adm. Code.

D. Coordination on DOT Electronic Message Boards for Fire Prevention Purposes in High Fire Risk Areas

This section defines the process for all interactions between DOT and DNR regarding the installation, maintenance, approval, and identification of DOT Electronic Message Boards for fire prevention purposes in high fire risk areas of the state, including but not limited to Red Flag Days, Emergency Burning Restrictions, prolonged drought leading to increased fire danger, Federal or Gubernatorial declared states of emergency, or any other situation where there is a significant risk of fire related danger that threatens life, property and natural resources of the State (Incident). This process does not include requirements for other state, local or federal permits or approvals that may be required for an Incident.

1. DNR will identify the specific Incident that the DOT Electronic Message Board(s) are proposed to be utilized for, including area affected, number and type of federal, state and local roads located within the area, critical DOT Electronic Message Board locations located outside of the area affected, estimated length of use of the DOT Electronic Message Board(s).

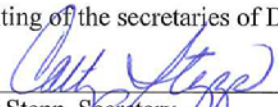
2. DNR and DOT will identify the appropriate DNR and DOT Incident Liaisons for coordinating the use of DOT Electronic Message Board(s) for that Incident.
3. DNR and DOT will coordinate their outreach and education regarding the Incident.
4. DOT and DNR will jointly review the information provided by DNR regarding the Incident and DOT will advise DNR as to the appropriate number, location, usage, messages, and length of time to be used of DOT Electronic Message Board(s) that would be necessary and available for the Incident based on that information. DOT will provide the DOT Electronic Message Board(s) necessary and available for the Incident based on that recommendation.
5. DOT has the discretion, at any time, to utilize or reprioritize any DOT Electronic Message Board subject to the terms of this MOU based on any use that DOT deems necessary for the purposes of furthering its mission and responsibilities to the citizen of the State of Wisconsin. Should DOT utilize or reprioritize any DOT Electronic Message Board subject to the term of this MOU, the DOT Liaison shall, as soon as is practicable and without delay, communicate that utilization or reprioritization to the DNR Liaison.
6. DNR agrees to assume any costs associated with the transportation, use or physical damage to the DOT Electronic Message Board(s) used in an Incident, except that DNR shall not indemnify, nor assume any liability beyond that prescribed by statute, and for which both DOT and DNR are protected by the State of Wisconsin.

E. Dispute Resolution

In the event a disagreement over an issue pertinent to this MOU occurs, the appropriate DOT and DNR program staff shall meet to resolve the issue. If necessary, the appropriate DOT and DNR bureau directors shall meet to resolve the issue. Next, if necessary, DOT and DNR Division Administrators will be notified of the times, dates, locations and issues to be resolved at dispute resolution meetings. In the event that the issue cannot be resolved, the division administrators of DOT and DNR will attempt to reach a mutual agreement. The Secretaries of each Department are the final arbiters of any dispute. Unresolved issues will be forwarded to the next level in a timely manner (typically within 30 days of a decision at the prior level). Within 30 days of the decision being made on the disputed issue, the lead agency will prepare a position paper on the specific decision for sign-off by both agencies.

F. Signatures

This MOU shall remain in effect until amended or rescinded by the mutual concurrence in writing of the secretaries of DNR and DOT.



Cathy Stepp, Secretary
Wisconsin Department of Natural Resources

Date 1/29/2014



Mark Gottlieb, Secretary
Wisconsin Department of Transportation

Date 2/13/14



Traffic Engineering, Operations & Safety Manual

Chapter 17 System Operations & Intelligent Transportation Systems

Section 2 Portable Changeable Message Signs (PCMS)

17-2-1 PCMS Policies & Procedures

August 2013

TYPES OF SIGNS

PCMS are available in various types, including fiber optic, light emitting display diodes (LED), bulb matrix and various hybrids of light source/disk technology. The standard for the industry is a 3-line sign with eight characters per line. The Bureau of Traffic Operations maintains current literature on various manufacturers and specifications for PCMS. Currently PCMS are available and deployed by Regions, typically through county highway departments and contractors, for various uses. The use of these signs **shall** conform to the following guidelines. PCMS are official traffic control devices and NOT a public information tool.

APPLICATIONS

Since they are dynamic signs, PCMS must only be used to display "real-time" or changing traffic condition or traffic control information. They are used for work zone temporary traffic control, incident management, special events, and unusual/hazardous road conditions due to weather. This could include expected delay times in queue situations, warning of stopped traffic, ramp or lane closures, advisory speeds and alternate route advisories. They *may* also be used to provide advance notice (up to 10 days) prior to projects or events expected to cause congestion or that will require drivers to use alternate routes.

PCMS *should not* be used to replace static warning or regulatory signs; they *may* be considered as a supplemental device to a required static sign. In the case of a ramp or lane closure, the PCMS would supplement the static warning signs informing motorists of the closure. It is at the discretion of the Region whether static or changeable message signs are more appropriate for specific applications. Refer to [TEOpS 2-10-3](#) for special event signing applications.

Nonstandard words such as "Danger," "Hazardous" or "Caution" **shall not** be used. These words do not contribute any information and *may* overly concern drivers as they approach the work zone.

Signs owned by the Department and Counties **shall** only be used for the purposes of temporary traffic control for maintenance work, incident management, Intelligent Transportation Systems (ITS) applications, and adverse weather road condition advisories. See [TEOpS 6-2-55](#) for use of PCMS in work zones. State-furnished PCMS given to the County Highway Departments **shall** be used on State-owned facilities.

If the State-owned PCMS are currently not being used on State-owned facilities, the Counties *may* contact the Regional PCMS representative for permission to use the PCMS on County roads for maintenance or construction activities being done by County forces. It will be up to the discretion of the Region whether or not to allow the usage of the State-owned PCMS. The Counties are responsible for pick-up, delivery, maintenance, and return of the PCMS. The Counties **shall** keep the Regional PCMS representative aware of where the PCMS are at all times on County roads. Regional Work Zone Engineers should document the location of the PCMS on the state system for rapid deployment in case of major incidents. The County **shall** review the word message with the Regional PCMS representative prior to deployment. If the Region needs the PCMS, the Counties will be required to move the PCMS to the appropriate State-owned facility. The Counties **shall** provide an emergency phone number to the Regional PCMS representative in case of emergency.

PCMS **shall not** be used to display generic safety messages or any other messages not necessary for specific drivers action at the site. Examples of generic messages not to be used are "Buckle Up," "Welcome to Wisconsin" or "Drive Safely." Use of these types of generic messages will tend to lead to motorist disregard of critical messages and unnecessarily distract driver attention from the roadway.

The Department reserves the right to use/deploy signs from its inventory on an improvement project to improve safety and optimize the operational efficiency of a construction work zone. Contractor provided signs *should* be used for aforementioned purposes if they could be made available and deployed expeditiously and cost effectively.

WEATHER

Where unusual/hazardous conditions are caused by snow, ice, fog or wind, and have been verified by pavement weather sensors, law enforcement or maintenance officials, PCMS *may* be used to warn drivers in advance. This applies especially if the condition is significantly different on certain features of the highway, such as structures compared to the roadway. PCMS **shall not** be used for this purpose if the conditions cannot be

verified every 30 minutes to keep the PCMS message current. Sample messages are located at the end of this document. Some Regions have reported sign malfunctions when temperatures drop below zero. In extreme cold conditions, frequent monitoring of sign reliability *may* be needed.

SPECIAL EVENTS

Local agencies *may* request to have special event messages displayed on the state highway system. They *may* request to have the Region supply the PCMS at the discretion of the Region or *may* request to station their own or contractor provided equipment on our system. Any of these options are acceptable, provided the following provisions are met:

1. The event will generate enough traffic to cause congestion and/or guidance problems;
2. The message will be made up of advisory traffic management content, not advertising for the event. A library of acceptable messages is provided in Section J of this policy.
 - a. The event **shall** be open to the public.
 - b. No commercial advertising is allowed on the signs. The inclusion of a brand name within the name of an event, such as “Brand X Racing Event” is not acceptable unless it provides better understanding for attendees. For example, use “Horse Show” rather than “Midwest Horse Show” or use “Golf Event” rather than “PGA Tour Event”.
 - c. The sign message *may* include the word “Event” or “Parking”.
 - d. Event names on signs *should* be as clear and concise as possible.
3. Certain attendance criteria *should* be met in order to justify use of PCMS. Due to population differences throughout the state, minimum special event attendance thresholds have been established. Refer to Table 1 for minimum attendance criteria. When the event involves more than one location, each signed location **shall** meet the minimum attendance required per day.

Table 1. Special Event Attendance Criteria vs. Location

| Location of Special Event | Population of Influence Area | Minimum Attendance (per day) |
|---------------------------|------------------------------|------------------------------|
| Major Metropolitan Area | Over 500,000 | 30,000 |
| Urbanized Area I | 50,000 – 500,000 | 15,000 |
| Urbanized Area II | 20,000 – 50,000 | 10,000 |
| Rural Area | Under 20,000 | 5,000 |

4. If attendance criteria are not met, PCMS *may* be used to address special traffic movements to inform motorists. Use of PCMS in this case, is at the discretion of the Regional Traffic Engineer for such events that *may* draw out of town traffic, have a large proportion of unfamiliar drivers or involve different types of large vehicles that require special directional information (i.e., horse trailers). It is also important that the Regional Traffic Engineer look at the capacity of the roadway system in case major congestion and delays are anticipated and PCMS will provide motorist information.
5. The state-owned devices are available and not being used elsewhere for incident management purposes;
6. The local agency has given the Region ample notice;
7. When the local agency is to supply the machines, the locations, messages, and other details are to be approved by the Region beforehand, and the PCMS **shall** be placed by the county highway department, approved traffic control contractor, or by WisDOT according to Section I., PCMS Usage, of this policy.
8. The content of the message **shall** be pre-approved by the Region office.
9. It is the Region’s discretion to charge for time spent establishing locations and other conditions of use.

See [TEOpS 2-10-3](#) for the guidelines on Special Event Signing. Any Region *may* elect not to allow this type of activity, for reasons such as lack of personnel to make arrangements, to monitor usage, etc.

INCIDENT MANAGEMENT

The signs *may* be used to advise travelers of alternate routes around construction or maintenance projects or incidents, or to notify of traffic stoppages, delays, closures or other conditions that *may* require certain driver actions. General rules of the road messages *should not* be used (i.e. “Be prepared to stop”); drivers *should* always be prepared for adverse driving conditions.

AMBER ALERT

WisDOT STOC will display Amber Alert information on the permanently placed PCMS throughout the state. A sample message is listed on page 10 of this policy. The message will be displayed for 5 hours from the time the Amber Alert is activated. Messages will be removed from the system at the direction of the Dane County Public Safety Communications Center if the alert is cancelled sooner.

EMERGENCY BURN RESTRICTIONS OR FIRE DANGER

Upon declaration of an emergency burn restriction or a gubernatorial executive order, PCMS *may* be placed on the highway right-of-way for the purpose of warning drivers of extreme fire danger. PCMS *may* be placed and *may* display messages to warn drivers of fire/smoke conditions affecting the roadway only at the time the fire/smoke conditions occur. The use of PCMS and the message **shall** be approved by the Director of Traffic Operations and **shall** be remotely accessible to the STOC and State Patrol communications center. See Section J for acceptable messages.

When operational issues occur due to low visibility caused by smoke/fire, a gubernatorial executive order is not needed in order to deploy messages warning drivers of possible traffic impacts. See Section J for acceptable messages.

In order to maintain efficacy, messages *should* be displayed for a limited duration (less than two weeks) and during high travel times.

PURCHASE

With limited exceptions, the temporary use of PCMS and portable ITS devices on Improvement Projects *should* always be included as a bid item in all construction projects when needed. This equipment *should* be contractor provided and the equipment **shall** meet all STOC specifications.

On an exception basis only, any purchase of capital equipment temporarily used on an improvement project, like PCMS, **shall never** be charged as a direct cost to that specific improvement project. "Temporarily used" means equipment whose useful life extends beyond the service period for a particular improvement project. Because this equipment will have a useful life extending beyond the service period of a particular project, it cannot be capitalized as part of the overall infrastructure cost of that initial project.

Instead, the device *should* be accounted for in the manner in which the Department accounts for acquisition of permanent personal property. For any assets to be used exclusively on highway improvement projects and purchased with highway improvement funds, these assets *should* be charged to a construction non-participating ID (e.g. 0657-xx-xx) using an object cost (e.g. 4321) for permanent property acquisition in excess of \$5,000.

Prior to this kind of acquisition, the purchasing Region or Bureau must also have budget authority on the contractual service line of its operating budget. When the procurement exceeds \$10,000, the DTSD Administrator's Office must approve it and the purchasing Region or Bureau *should* work with the DTSD budget office to secure the operating budget approval.

Furthermore, the acquisition of PCMS and portable ITS devices under a non-participating improvement ID *should* be a rare occurrence and it **shall**:

- (a) Be recognized as either a planned element of the TOIP or as a necessary extension of the TOIP;
- (b) Meet all the statewide network needs identified and managed by the STOC; and,
- (c) Be approved jointly by DTSD Bureau Director of Highway Maintenance and Bureau Director of Traffic Operations.

In the instance where PCMS or portable ITS device is already owned by WisDOT and is provided and employed on an improvement project, the cost of operating this equipment *may* be charged to the improvement project. However, the cost to maintain or repair this equipment, which extends its useful life, *should* be charged to a non-participating project ID.

Refer to Program Management Manual 6-10-45, ITS and the TOIP Project Setup for more information regarding the funding of ITS incidental items.

Specification and standards are to be developed by the Department to conform with Federal ITS Architecture requirements. All signs provided by contractors for various applications *should* also comply with this requirement, if warranted.

MAINTENANCE

An MOU **shall** be developed for any county highway department operating state-owned PCMS on the state highway system. A sample MOU is included at the end of this guideline.

PLACEMENT

PCMS must be placed to allow drivers enough time to comprehend the message and decide what action to take.

When the PCMS is used to warn of stopped or slowed traffic, place it far enough in advance of the longest anticipated queue of traffic so drivers have adequate distance to stop. If used to provide information on delays, current ramp closures or to inform of alternate routes, place the PCMS in advance of exits to alternate routes so drivers have adequate time to decide whether or not to exit without making erratic maneuvers.

When used to provide lane closure warning and there is an interchange between the sign and the lane closure, include enough information about location of the lane closure so exiting traffic is not encouraged to make unnecessary lane changes prior to the interchange.

It is possible to use multiple PCMS for adequate warning or if one PCMS cannot safely display enough information. When anticipated queue lengths vary, and queues could extend beyond an interchange, PCMS *may* be needed on each side of the interchange and *should* provide current information.

For advance notice (up to 10 days) of ramp or lane closures, PCMS *may* be placed at the actual closure location to give notice to repeat drivers.

LATERAL PLACEMENT

Signs *should* be placed as far away from the live traffic lanes as possible without hampering visibility. In advance of Interstate construction projects, the signs *should* be placed on the backslope beyond the ditch. The location selected *should* be at or slightly above the elevation of the roadway. This improves the visibility, minimizes the chance of a vehicle hit, and also improves safety for the sign maintenance worker. For intermittent work such as freeway lane closure, or where site conditions do not allow otherwise, the signs *may* be placed on the shoulder. The site *should* be visited to assure visibility, safety and maintenance considerations. A taper of reflectorized drums, cones or barricades *should* be placed ahead of PCMS placed on the shoulder if it is not shielded by a barrier.

CONTROL

Signs are capable of having manual on-site control or remote control. The manual on-site control allows a project engineer or maintenance supervisor to program the sign using the on-board computer keyboard. However, this does not supercede the requirements for compliance with message guidelines. There are two methods of remote control; (1) Utilizing a cellular telephone, and (2) utilizing a central base computer. The cellular telephone would be most applicable if the project engineer wanted control of the sign without having to travel to the sign location.

However, the cellular option is very restrictive since the programmer can only use the cellular number pad to program various functions. This limits the different features that can normally be used on the computer keyboard.

The central base computer remote control has been widely used in the state. The base computer is generally located at the local State Traffic Operations Center. Either hardwire telephone lines or cellular telephone services are used to communicate with the signs in the field using statewide ITS software. The base computer consists of personal computer and modem. A dedicated telephone number must be arranged for each sign. Hardwired telephone lines are preferred, if lines are available close to the sign locations. While cellular telephone provides savings in hardwire installation, the system is not entirely reliable. Near larger cities, peak hour business calls often over saturate the system, not allowing acceptance of further calls. Also, cellular service *may* not be available, particularly in rural areas. Users *should* consult with Bureau of Highway Operations Traffic regarding the availability of cellular phone services in specific locations.

TRAINING

Training for State Patrol operators, project engineers and maintenance staff is available. Provisions *may* be included in the purchase spec, which would require the supplier to provide a certain number of hours training during the warranty period. Beyond warranty period, the training would be available for a fixed fee.

PCMS USAGE

For PCMS placed on the State Highway System, the PCMS **shall** either be:

1. Owned and placed by WisDOT
2. Owned and placed by contractors under contract with WisDOT

3. Owned, rented, or borrowed and placed by county highway departments under contract or permit with WisDOT

County Sheriff's Departments and other local agencies **shall** work with the County Highway Departments to place the signs and display proper messages consistent with WisDOT policy. This includes any PCMS purchased by a County Sheriff's Department and other local agencies through funds received from Bureau of Transportation Safety (BOTS).

ACCEPTABLE MESSAGES FOR SPECIAL EVENTS, WEATHER, INCIDENTS AND AMBER ALERTS

The signs are generally capable of sequencing up to six frames. However, for driver comprehension, messages **shall** be limited to one or two frames (see MUTCD Section [6F.55](#)). Blank or other filler frames between the two frames of text **shall** not be used. It is desirable for the driver to be able to read the entire message sequence twice as they pass by the sign. For an Interstate highway application, the total viewing time is about seven seconds. Each frame is usually displayed for 2.0 seconds or less. Using more than two frames makes it difficult for drivers to read the entire message sequence twice. Do not flash any part of a message.

It is recommended that the first frame describe the traffic condition or problem ahead, which the motorist *may* encounter. The second frame would be used to advise the driver of an appropriate action. Examples are:

| <u>1st Frame</u> | <u>2nd Frame</u> |
|------------------|------------------|
| CRASH | LEFT |
| AHEAD | LANE |
| 1 MILE | CLOSED |
| TRAFFIC | NEXT |
| STOPPED | 3 |
| AHEAD | MILES |
| ROAD | USE |
| CLOSED | EXIT # |
| 2 MILES | 394 |

See the message list that follows for more examples.

When the State Patrol will be operating the signs for a specific project, a set of message guidelines *should* be prepared for use by the operators. This will provide consistency in the messages being displayed while various shifts of operators or troopers are working the project.

PROBLEM/DISTANCE

| | | | | | |
|---------------------|--------------------|----------------------|-----------------------|-----------------------|------------------------|
| ALL LANES BLOCKED | DELAYS | FLASH FLOODING AHEAD | ICY BRIDGES AHEAD | NO OVERSIZE LOADS | |
| BRIDGE CLOSED | DENSE FOG | FRESH OIL | LEFT 2 LANES CLOSED | RIGHT 2 LANES CLOSED | SINGLE LANE |
| BRIDGE SLIPPERY | DISABLED VEHICLE | GRASS FIRE | LEFT SHOULDER CLOSED | RIGHT LANE NARROWS | SLIPPERY ROAD |
| CENTER LANE CLOSED | DUST STORM | HIGH WINDS | MAJOR DELAYS | RIGHT SHOULDER CLOSED | STALLED VEHICLES AHEAD |
| COLBY ROAD CLOSED | EMER VEHICLES ONLY | ICE | NEXT EXIT CLOSED | ROAD CLOSED | TOW TRUCK AHEAD |
| CRASH-ROAD CLOSED | EVENT PARKING | ICE ON BRIDGES | ONE-WAY TRAFFIC AHEAD | ROAD CLOSED 6 MILES | VEHICLE FIRE |
| CRASH 4 MILES AHEAD | EXIT 45 CLOSED | INCIDENT AHEAD | RAMP CLOSED | ROAD FLOODED AHEAD | WATER ON ROAD |
| CRASH NEAR I-94 | FOG 3 MILES | LANE SHIFT | RAMP SLIPPERY | ROAD SLIPPERY | |
| DEBRIS AHEAD | FREEWAY CLOSED | LEFT LANE CLOSED | RIGHT LANE CLOSED | SHOULDER BLOCKED | |

ACTION

| | | | | |
|-----------------------|---------------------|-----------------|--------------------|-------------------|
| ALL TRAFFIC EXIT RT | DO NOT PASS | ONE-WAY TRAFFIC | STOP AHEAD | USE DETOUR ROUTE |
| ALT ROUTE EXIT 25 | FOLLOW ALT ROUTE | PASS TO LEFT | STOP 5 MILES | USE LEFT LANE |
| AVOID DELAYS USE US53 | FOLLOW DETOUR | PASS TO RIGHT | TUNE RADIO 1510 AM | USE NEXT EXIT |
| BEST ROUTE TO I-94 | FOLLOW SIGNS | STAY IN LANE | USE CENTER LANE | USE RIGHT LANE |
| DETOUR 2 MILES | MERGE RIGHT 2 MILES | STAY ON US 45 | USE COLBY ROAD | WATCH FOR FLAGGER |

| EVENT | PANEL 1 | PANEL 2 |
|-------------------|--|------------------------|
| Access | CRASH AHEAD | USE ACCS RD NEXT RIGHT |
| Blocked | RIGHT 2 LANES CLOSED | AHEAD X MILES |
| Center | N I-39 TRAF USE CNTR LN (USE 2 PHASES) | |
| Commercial | OVERSIZE TRUCKS | USE EXIT 120 |
| Congestion | MAJOR DELAY | NEXT 3 MILES |
| Emergency | EMER VEHICLES AHEAD | |
| Event Parking | EVENT PARKING AHEAD | USE NEXT RIGHT |
| Fire/Smoke Hazard | EXTREME FIRE HAZARD | NO OPEN BURNING |

| | | |
|---------------------|---------------------------------|--------------------------|
| | EXTREME FIRE HAZARD | BURN BAN IN EFFECT |
| | SMOKE OVER ROAD | REDUCE SPEED |
| | FOREST (GRASS) FIRE AHEAD | TRAFFIC STOPPED |
| Freeway Closed | I-90 CLOSED | DETOUR EXIT 10 |
| Hazmat | HAZMAT SPILL EXIT 130 | USE EXIT 125 |
| Traffic Information | TUNE TO 1240 AM | FOR TRAFFIC INFO |
| Oversize Vehicles | OVERSZ TRUCKS | MUST EXIT |
| Prepare | CRASH 3 MILES AHEAD | |
| Slippery | MUDSLIDE SLIP RD POSSIBLE | |
| Speed | REDUCED SPD ZONE AHEAD | |
| Amber Alert | CHILD ABDUCT ALERT | CALL 511 |

PORTABLE CHANGEABLE MESSAGE SIGNS (PCMSs) MEMORANDUM OF UNDERSTANDING

This MEMORANDUM OF UNDERSTANDING; issued _____ is designed to establish certain principles and procedures that the County of _____, (COUNTY) and the Wisconsin Department of Transportation (DEPARTMENT) agree to follow for the application, storage and maintenance of the PORTABLE CHANGEABLE MESSAGE SIGNS (PCMSs) owned by the DEPARTMENT.

PROVISIONS

- The COUNTY will follow the procedures and guidelines in the STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION TRAFFIC ENGINEERING, OPERATIONS & SAFETY MANUAL CHAPTER 6-2-55 AND THE FHWA MANUAL on UNIFORM TRAFFIC CONTROL DEVICES.
- The COUNTY will be responsible for maintenance, storage, repair and troubleshooting of the PCMSs. The PCMSs will be stored inside a secure location when not in use on the highway. Storage *should* provide cover and protection from the weather if at all possible. The DEPARTMENT will respond to functional problems that cannot be solved by the COUNTY during normal business hours.
- The DEPARTMENT **shall** have access to the PCMSs at all times. Keys to locks for any secure locations or sign **shall** be provided to the authorized DEPARTMENT personnel.
- The COUNTY will be reimbursed for all expenses related to the use of the PCMSs for the DEPARTMENT purposes through the Routine Maintenance Agreement, Traffic Control Activity Code 032.
- The COUNTY **shall** inform the DEPARTMENT contact person when and where the PCMSs are in use or scheduled to be used. When the PCMSs are in use a log **shall** be maintained with time and duration and message set recorded. The DEPARTMENT will supply the log.
- The DEPARTMENT will retain the authority to change messages on the PCMSs and move PCMSs. The DEPARTMENT will notify the COUNTY prior to the message change or move if time permits.
- The DEPARTMENT **shall** have access to the PCMSs by remote telecommunications whenever they are deployed.
- The DEPARTMENT **shall** provide training on use, maintenance, storage, hauling, setup and minor problem troubleshooting. The COUNTY **shall** send a minimum of TWO (2) representatives for training.
- The COUNTY will be responsible for emergency deployment. The DEPARTMENT will decide on emergency deployment if time permits.
- The COUNTY contact for coordination of the PCMSs is _____
- The DEPARTMENT contact for coordination of the PCMSs is _____

The parties agree to all provisions, which are made a part of this Memorandum of Understanding.

| | |
|----------------------------|-----------------------------|
| For the DEPARTMENT | For the COUNTY |
| By: _____ | By: _____ |
| Systems Operations Manager | _____ |
| ___ Region | County Highway Commissioner |



17-3-1 Real Time Data Sharing Procedures

May 2015

POLICY

The Wisconsin Department of Transportation shares freeway status and incident information with news media organizations and governmental and private agencies. WisDOT public records policy indicates that:

- WisDOT allows any agency access to real time traveler information.
- The requestor of the information **shall** pay for the costs of obtaining the information.
- The requestor of the information is required to complete a graphic or verbal acknowledgment to WisDOT. News agencies are contacted regularly to refresh an existing Media Usage Agreement.
- The requestor of the information is required an allocation of time for public service announcements.

WisDOT maintains a Closed Circuit Television (CCTV) network to verify traffic incidents, view traffic impacts as a result of incidents and/or events, and monitor traffic flow on the instrumented roadway segments. WisDOT's Statewide Traffic Operations Center (STOC) supports the dissemination of CCTV video footage through various partnerships with outside agencies, according to the following practices:

- CCTV video files are stored within STOC servers for 72 hours
- After 72 hours, the video files are automatically overwritten with new video and are no longer available
- STOC operators have the ability to extract specific video segments within the 72-hour timeframe
- Requests for video footage should be responded to within ten (10) business days
- Video segments with recorded incidents must be retained for a minimum of 120 days, or if a legal hold is in place, until the case is closed
- Requested footage will be put on an electronic storage device (CD, USB drive, etc.) and must be picked up by the recipient within 120 days

Retention and disposition information can be found in the Records Retention/Disposition Authorization for Traffic, System Operations and Electrical Engineering (see RDA 00255C) executed in December of 2007.

When using WisDOT provided video, the following policies and guidelines **shall** be adhered to:

- Any time WisDOT-provided video or data is broadcast the Department *should* be acknowledged as the source verbally or graphically. All WisDOT-provided video or data **shall** display a WisDOT logo. The WisDOT logo must be displayed in a prominent location, such as the upper left corner of the image, **shall not** be covered in any way by news banners or other graphics, and **shall** be clearly identifiable. If an agency chooses to develop their own graphics, the agency must contact the WisDOT to coordinate and to ensure that all displays will be consistent and understandable.
- WisDOT provides the video and travel times for the use of traveler information only, and WisDOT video *should not* be used for self-promotion.
- All data or video being broadcast *should* be the most recent and timely information provided, any non-current data **shall** be labeled with the time and date it was recorded. Data and video is intended only for traveler information.
- The Department *may* remove any picture from the video feed if the picture is determined by the Department to be unacceptable due to quality or content. Occasionally picture quality is degraded due to maintenance troubles, or the content of a picture is deemed inappropriate, such as a long-term study where a camera is focused on a single lane or ramp, or sensitive emergency situation.
- Video feeds will be provided to any requesting entity. Any cost associated with providing the video **shall** be the responsibility of the requesting entity.
- The information provided to the media and traffic information providers, including images from CCTV cameras, **shall** be traffic related only.
- Information regarding fatalities or the status of injured individuals **shall not** be provided to the media or other traffic information providers.

- Images showing fatalities, injured individuals or other details that could violate individual privacy **shall not** be released to the media or to any other traffic information providers.

For inquiries regarding video or travel time information, contact the Statewide Traffic Operations Center at statewide.toc@dot.state.wi.us or (414) 227-2166.

USING VIDEO FOR TRAFFIC ENGINEERING AND OPERATIONS

Archived video can also be used for analyzing new traffic flow patterns, intersection operations and work zone strategies. Prior to the implementation of a new pattern or strategy, the STOC Traffic Management Unit Supervisor *should* be notified of the study location within three days prior to implementation. Notification will provide Control Room operators or shift supervisors preparation time for archiving certain camera footage in such locations.

Cameras *should* be used for the highest value of activity (i.e., capture as much traffic operations related video information as possible rather than focusing on a single lane or movement). All WisDOT personnel have a responsibility to maintain, dispose of, communicate on and release video in line with this overall policy.



Wisconsin Department of Transportation

DATE

BUREAU OF TRAFFIC OPERATIONS

Statewide Traffic Operations Center

433 W. St. Paul Avenue, Suite 300

Milwaukee, WI 53203

Telephone: (414) 227-2166

Facsimile: (FAX): (414) 227-2165

The Wisconsin Department of Transportation (WisDOT) Traffic Operations Center (STOC) agrees to provide a feed from our CCTV system to your agency. By your acknowledgement below, you agree to abide by the WisDOT policies regarding the use of travel times, freeway camera images, and other travel information that goes out to the public that is provided by WisDOT.

This agreement (hereinafter "Agreement") is an Agreement between the Wisconsin Department of Transportation and _____ (hereinafter "USER"), to obtain access to the WisDOT Closed Circuit Television Camera System (hereinafter "CCTV").

This Agreement shall remain in effect until USER or WisDOT gives written notice to terminate the Agreement. Thereafter, access to the CCTV will be terminated, unless a new Agreement is signed by the USER and approved by WisDOT. WisDOT reserves the right to cancel this Agreement at any time and for any reason, upon the giving of 5 days notice to the USER.

The undersigned USER agrees to hold WisDOT harmless from and against any and all liability and expense caused by the omission of the USER, its agents, officers and employees, in the use, possession, or dissemination of information made available from the CCTV system. The obligations assumed by the USER pursuant to this Agreement shall survive the termination of the Agreement. The USER understands and agrees that it has no claim, right, cause of action, or right of recourse based upon WisDOT's election to terminate this Agreement.

"Access to Live Video" is defined as that video provided by the CCTV developed for traffic management and provided by the WisDOT STOC. This Agreement outlines the use of the CCTV system, which provides real-time traffic information to USERS. The following provisions and responsibilities are provided to ensure that the system is accessed and its information used for this purpose and this purpose alone:

- USERS are responsible for set-up of necessary equipment at the WisDOT STOC in order to obtain the video feed. The USER is exclusively responsible for any costs related to the purchase and installation of said equipment. WisDOT personnel have the exclusive right to determine at what location within the STOC a USER'S equipment may be placed, and reserve the right to inspect the installation of all USERS' equipment. Under no circumstances will the placement and installation of said equipment interfere with STOC equipment or the activities of the STOC. The service, maintenance, and upkeep of any and all of USER'S installed equipment, is exclusively the responsibility of USER. WisDOT personnel must be given at least 2 working days' advance notice of any maintenance or repair visits of USER, its employees, agents, or representatives.
- USERS must give proper recognition for the source of the data by displaying a recognizable version of the WisDOT logo on the screen. An authorized logo will be provided upon request.
- USERS of WisDOT provided video or data are required to provide a minimal amount of airtime to WisDOT for Public Service Announcements.
- USERS must refrain from selling, loaning or offering for sale, the video feed received under this Agreement to other persons or entities, not a party to this Agreement, unless expressly authorized in writing by WisDOT to do so.
- USERS must broadcast only the most recent and timely information available, and any non-current data must be labeled with the time and date it was recorded. Data and video is intended only for traveler information.

- USERS must maintain the security and integrity of the CCTV system by limiting use of and access to the system to trained and authorized individuals, and by insuring that the system is used for the specific purposes provided for by this Agreement.
- WisDOT agrees to maintain the CCTV system – although there is not any express or implied representation that WisDOT will continue to provide such data or images.
- WisDOT may remove any picture from the video feed if the picture is determined by the department to be unacceptable due to quality or content. Occasionally picture quality is degraded due to maintenance troubles, or the content of a picture is deemed inappropriate, such as a long-term study where a camera is focused on a single lane or ramp, or sensitive emergency situation.
- USER may not broadcast or otherwise utilize information contained in live video that is “not public record,” including, but not limited to, the names, addresses, phone numbers and/or vehicle/drivers license number. WisDOT will utilize reasonable efforts to prevent the transmission of the information deemed by law and/or agency policy as “not public record”. Using or broadcasting this information is expressly prohibited.
- WisDOT will maintain exclusive control of the information and images released from the CCTV system to each USER including but not limited to: determining whether and when to provide a CCTV system feed, from what location, and for what duration.
- WisDOT provides the video and travel times for the use of traveler information only, and WisDOT video should not be used for self-promotion.

WisDOT agrees to provide the services described in this Agreement and under the terms and provisions herein specified. WisDOT reserves the right to make changes to this Agreement at any time without prior notice to the USER. USERS must comply with all provisions of this Agreement. Violations of this Agreement will entitle WisDOT to cancel the service immediately and without prior notice to the USER.

Thank you for your effort to broadcast the WisDOT traffic data to the traveling public. If you have any questions or concerns please contact Anne Reshadi (414 227-2149, anne.reshadi@dot.wi.gov). If you have any technical questions or concerns, please contact Paul Keltner (414 227-2141, paul.keltner@dot.wi.gov).

Authorized WisDOT Representative

Name _____

Title _____

Signature _____ Date _____

Acknowledged (Authorized USER Representative)

Name _____

Title _____

Company/Firm Name _____

Signature _____ Date _____

17-3-2 Floodgate Messages**DEFINITION**

A Floodgate message is an announcement, created as a .wav file and uploaded through a web interface, which plays for a 511 caller prior to any traffic information. Floodgate messages can be placed by the STOC, and are used to notify 511 callers of incidents or events that significantly impact traffic. Floodgate messages can be placed at statewide, county, or roadway level. It is also possible to place floodgate messages for entities such as airports, buses, etc.

CRITERIA

The STOC will place both a county level and roadway level floodgate message for any unplanned incident or event that results in:

- A full road closure of one or both directions
- A detour or alternate route
- A traffic delay in excess of 30 minutes

The STOC will place both a county level and roadway level floodgate message for any planned full freeway closure in one or both directions.

The STOC will place a statewide level floodgate message for the following events:

- Amber alert
- Any unplanned incident or event that involves five or more counties or roadways, or spans across multiple regions

Before placing a statewide level floodgate message, the STOC Control Room Supervisor must authorize and review the message for approval.

Floodgate template

As of (time/date), (LE Agency) is reporting that (traffic incident, adverse road conditions, etc) is adversely impacting (directional) traffic on (roadway, location). Currently, (what lanes are affected). To avoid delays, (which direction of traffic) should (list detour)/there is no detour at this time.

Adverse Weather Conditions

An STOC operator *may* request a statewide or county level floodgate message on the 511 system if the following criteria are met:

- 1) A Winter Storm or Fog Warning has been issued for the identified area
- 2) The 511 Winter Road Conditions Map for the corresponding area indicates that a majority of the roadways are either snow covered, ice covered, or impassable.
- 3) On-site law enforcement can confirm adverse fog conditions
- 4) The message will provide travel-related information

Statewide floodgates will only be placed when the majority of a region meets the above criteria. The following template *should* be used for adverse conditions floodgate messages:

As of (time/date) Wisconsin State Patrol is reporting adverse road conditions in (much of the state, northern/southern part of the state). Motorists are encouraged to use caution, slow down, and avoid travel when possible.

Due to the frequency of Lake Effect Snow Warnings for Iron and Ashland counties, floodgate messages for these areas will be placed at the county level of all counties identified in the warning and shows poor road conditions on 511.

The audio and text floodgate *should* be removed when the Warning expires.



Traffic Engineering, Operations & Safety Manual

Chapter 17 System Operations & Intelligent Transportation Systems

Section 4 ITS Communications Network

17-4-1 Policies & Procedures

June 2010

PURPOSE

The purpose of this policy is to define the usage and management of the WisDOT optical fiber communications network, referred to as ITSNet. The chief objective of ITSNet is strategic and efficient deployment and management of a communications network that supports traffic operations, intelligent transportation systems (ITS), security, and emergency communications. This network shall be robust enough to accommodate real-time data, voice, and video transmission in emergency situations, and it is not to be used for traditional office automation functions.

ITSNET POLICY

The ITSNet use is for public agency, transportation-supportive purposes. This applies to fiber that WisDOT lights; it does not apply to dark fiber leased to others. Use is limited to statewide traffic management system monitoring and control; emergency transportation operations and response; and public safety communications and dispatch center connectivity for operations.

All requests for use, development, or impact to the ITSNet fiber optic network should be made through the Bureau of Traffic Operations Director. No other Bureaus or Sections in the Department have authority to provide this approval. Any permitted use is subject to available communication network capacity and is also subject to revocation at the discretion of the Bureau of Traffic Operations Director.

ITSNET DESCRIPTION

Shown here is a map of existing fiber and future fiber needs. Contact the STOC with any questions

WISDOT STAKEHOLDERS

DTSD – Bureau of Traffic Operations (BTO) is the home of the ITS program and is the steward of ITSNet. Each of the four sections has roles and responsibilities:

- Traffic Engineering Section guides policy, planning, development, and stakeholder and partner coordination.
- System Operations and Electrical Engineering Section leads all design, engineering, implementation, operations, monitoring, as-builts, local agency agreements, and maintenance, including activity associated with the Statewide Traffic Operations Center (STOC)
- Highway Maintenance & Roadside Management Section handles all utility and permitting issues, exchange agreements, construction coordination when done via permit, and the collection of fees for the longitudinal occupation of controlled-access right-of-way.
- Program Management Section has authority over revenue, expenditures, and federal grants

Ongoing coordination with and support from the following:

- Division of State Patrol – Bureau of Communications
- DTSD – Regions

RIGHT-OF-WAY FEES & PERMITS

This applies to highways WisDOT charges on when utilities (e.g., telecoms) want to longitudinally occupy any controlled-access highway, including:

- All interstates
- All freeways, e.g., US 41, the Madison Beltline, etc.
- All freeway/expressway combinations (hybrids), e.g., WIS 29, US 18/151, etc.

Refer to the Controlled-Access Highways and Occupation Fees list as published in WisDOT's Utility Accommodation Policy.

If work is in conjunction with a WisDOT contract, a work on highway right-of-way (ROW) or utility permit and corresponding occupation fee is not required. However, WisDOT needs to review each activity as if applying for a permit, including checks for:

- Location of the facility within the ROW
- Potential conflicts with other utilities

- Potential conflicts with maintenance or construction projects
- Potential conflicts with current or future ITS facilities
- Access locations, whether from private property or the shoulder
- Possible lane or shoulder closures needed
- Possible work-time restrictions (e.g., no work during Packer home football games)
- Proper erosion control, restoration, and environmental-related issues (e.g., construction in wetlands)
- Proper traffic control
- Proper handling of trees and other vegetation – especially if needed for snow drift control

This must be done through the Region Utility Permit Coordinator. If it involves controlled-access facilities, the State ROW Accommodation and Permits Engineer in BTO must also be involved, and there may be a fee or fiber exchange involved.

Maintenance and repair activity also requires no permit, but the Region must be informed about work on its ROW.



Traffic Engineering, Operations & Safety Manual

Chapter 17 System Operations & Intelligent Transportation Systems

Section 5 Funding Administration

17-5-1 Federal ITS Continuing Appropriations Process

March 2011

INTRODUCTION

The annual process described in this procedure pertains to the Great Lakes ITS appropriations and how federal money is applied for and managed at the Department level. Projects funded by Great Lakes appropriations are for traffic operations and ITS related Department initiatives.

APPLICATION PROCESS

1. FHWA Division office notifies BTO State Traffic Engineer of continuing appropriations funding level eligible for application typically between February and June of every year.
2. BTO completes application and describes prospective project concepts, high-level scope, funding requested and identified soft match. At this time, Operations Managers are solicited for project concepts. Projects identified in application need to be on the BTO Budget list. Sources of matching funds will also be identified at this time. Hard (monetary) match has not been used in recent years. Soft match is either in the form of labor contribution or ITSNet dark fiber asset value.
3. BTO State Traffic Engineer approves application and submits to FHWA Division.
4. FHWA reviews and approves application and notifies BTO when funds are allocated.
5. BTO contacts the BSHP Program Finance Section for project set-up in Financial Integrated Improvement Programming System (FIIPS). The WisDOT charge ID is established and BSHP posts a 15-day STIP notification period. WisDOT sets up one state project ID to one federal ID. Multiple work orders and purchase orders will exist under one state project ID, with different project names. Project IDs must show 100% federal funds in the amount applied for to avoid problems with match accounting.
6. Bureau of Business Services (BBS) Fiscal Services obligates approved federal funds in Fiscal Management Information System (FMIS). FHWA approves the funds requested for federal agreement in FMIS.
7. BBS Fiscal Services updates status in FIIPS indicating authorization and federal agreement has been approved and spending may commence. This process must be completed by the end of the current federal fiscal year in October. BTO and the Regions are notified when funds are available.

ONGOING AUTHORIZATION/MANAGEMENT OF FUNDS

Once the application process is complete and funds are issued, BHO develops contracts, work order scopes, or purchase orders. Approved work orders are routed to Expenditure Accounting for encumbering in EAPS. Spending requests are routed through BTO and the BTO State Traffic Engineer and Director authorize payment of invoices and route to Expenditure Accounting for payment.

BTO project managers manage funds and invoices for each of their assigned projects. Work orders and purchase orders must not be established in excess of appropriation ID. A quarterly bureau spending review of federal funding occurs and projects 75 percent encumbered or spent are flagged. **Project managers must ensure work orders or purchase orders are not overspent.** Expenditure Accounting will not pay invoices if exceeds work order or purchase order.

WRAPPING UP/CLOSING OUT PROJECT

Once an appropriation is exhausted or has ended, BBS liquidates remaining balances on all outstanding encumbrances and closes out all purchase orders prior to closing out project. Project status will then be updated in FIIPS to "7" and the project is held for completion of audit for consultant contracts. BBS processes the final federal voucher and updates FMIS to close out project.



Traffic Engineering, Operations & Safety Manual

Chapter 17 System Operations & Intelligent Transportation Systems

Section 6 Planning

17-6-1 TSM&O Traffic Infrastructure Process (TIP)

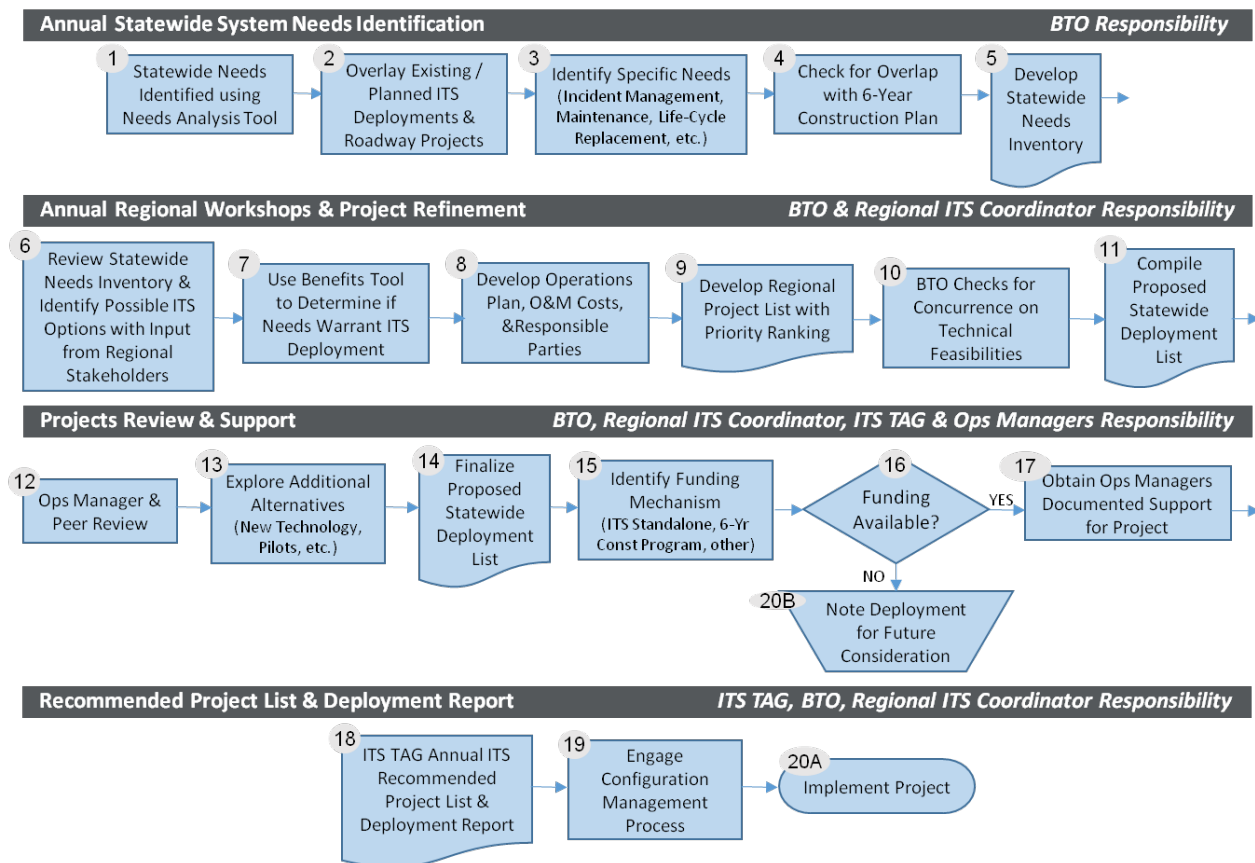
November 2016

Introduction

The TSMO-TIP process is an annual process to select relevant transportation systems management and operations (TSM&O) deployments for implementation in the next assessment year (AY). The process involves the collaboration and support of many different stakeholders within the Wisconsin Department of Transportation (WisDOT). These stakeholders include the Bureau of Traffic Operations (BTO), regional intelligent transportation system (ITS) coordinators, the operations managers, and the ITS Technical Advisory Group (ITS TAG).

To make the process more streamlined and well-defined, the process has been broken down into a series of 21 steps beginning with a statewide needs analysis and ending with either project implementation or marking a project for future consideration. To make sense of the process, a flowchart is available showing the flow of steps and responsibilities throughout the process.

Each step in the process chart is outlined below and detailed process steps are explained in the remaining document.



Process Task A

Goal: Develop Final Draft of Statewide Needs Inventory

Responsibility: BTO Traffic Systems Unit with stakeholder support

Task A was created to jumpstart the planning process for identifying areas for TSM&O deployments. Although other stakeholders are welcome to submit ideas during this task, the task itself is primarily the responsibility of the BTO Traffic Systems Unit. This group will begin the TSMO-TIP process by creating a draft of the Statewide Needs Inventory which will then be brought to the regions for review. During the first year or two of implementation or as needed, BTO will be a guiding hand through all tasks in this process.

Step 1: Statewide Needs Identified using Needs Analysis Tool

Timeframe: January to February

Result: Draft of the Statewide Needs Inventory with list by region of statewide area needs to be analyzed further

The Needs Analysis Tool is an online mapping tool displaying information about the current safety, mobility, service, and freight performance for most arterials in the state. The majority of this information is processed from MetaManager data, with the support of algorithms to include weather and special event data. The Needs Analysis Tool is available on the TSMO-TIP website (<http://www.topslab.wisc.edu/tsmo/tip/>) and was developed by the Wisconsin Traffic Operations and Safety (TOPS) Lab.

The tool includes many functions which support the identification of regional needs across the state. Although this tool identifies areas of need, it does not identify which TSM&O solution *should* be implemented to allay the need, assuming any TSM&O deployment will be able to help.

In this step, the BTO Traffic Systems Unit *should* run regional reports for each region using each preset. There are five regions and six presets, so this will result in thirty reports. At present, this task must be done manually, but future updates to the tool will streamline this process. Once all reports are generated, the top five areas identified in each of the reports *should* be marked for further investigation in step two.

Two short video tutorials are provided on the website. The first gives an overview of all capabilities of the needs tool. The second shows an example of generating the reports required for this step. The Needs Analysis Tool also includes internal documentation as well as a document describing all of the tool's data inputs.

Step 2: Overlay Existing / Planned ITS Deployments and Roadway Projects

Timeframe: January to February

Result: Map of each area needs location including existing / planned deployments

This step involves going back into the Needs Analysis Tool and looking precisely at each area of need on the map. To complete this step, existing and planned deployments *should* be overlaid on the area of interest. A copy of each map *should* be attached to the regional list of identified needs areas. An example is shown in a video tutorial on the website.

Step 3: Identify Specific Needs (Incident Management, Maintenance, Life-Cycle Replacement, etc.)

Timeframe: February to March

Result: Revised draft of the Statewide Needs Inventory including a list of specific needs for each need area

Working with BTO stakeholders, specific needs will be identified for the previously determined needs areas. These needs include incident management, maintenance, and life-cycle replacement, among other possibilities. Engineering judgement must be used to identify the specific need for each area.

This step may involve looking at the Needs Analysis Tool for support, although the only outcome of this step will be the appending to the list of specific needs for each needs area.

Step 4: Check for Overlap with 6-Year Construction Plan

Timeframe: February to March

Result: Revised draft of the Statewide Needs Inventory including list of projects overlapping with the 6-year construction plan

Consult with project designers for highway improvement projects in the six-year plan to investigate the possibility of including the installation of operations technologies in tandem with the highway improvement project, providing a cost-effective approach to deployment.

Mark all potential overlaps on the Statewide Needs Inventory document including needs that are fully addressed by construction projects, needs that could be integrated with construction projects, and needs that would need their own financial support to be implemented.

Step 5: Develop Statewide Needs Inventory

Timeframe: April

Result: Final Draft of the Statewide Needs Inventory

This is the final step completed by BTO before bringing the plan forth to the regions for further consideration and development. In this step, the BTO Traffic Systems Unit will pull together all of the resources in the previous steps and present a clean final draft of the Statewide Needs Inventory, presented by region.

Each regional needs area will include

- a sheet of pertinent data by segment, given by the needs tool,
- a map of the area with current and planned deployments shown,
- a specific need to focus the selection of TSM&O deployment(s),
- and a statement of overlap with the 6-year construction plan.

Process Task B

Goal: Develop Regional Project List with Priority Ranking

Responsibility: BTO and Regional ITS Coordinators

During this process, BTO will work directly with each of the five Regional ITS Coordinators to process the Statewide Needs Inventory into a Regional Project List with Priority Ranking. These project lists will be compiled in Task C.

For the first year or two of implementation or as needed, the BTO and each region will have a meeting walking through all steps of this process and specifically focusing on the steps in Task B. The goal of this meeting will be to allow the Regional ITS Coordinators to become comfortable with the Needs Analysis Tool and the overall process to ensure smooth implementation.

Step 6: Review Statewide Needs Inventory and Identify Possible ITS Options with Input from Regional Stakeholders

Timeframe: April-May

Result: Revision of each of the regional sections of the Statewide Needs Inventory to include possible TSM&O / ITS options for deployment

In a meeting between BTO staff involved in the development of the Statewide Needs Inventory and the Regional ITS Coordinator for the given region, the regional Statewide Needs Inventory will be analyzed and potential TSM&O / ITS deployments will be identified. Regions will be involved due to their involvement with the region including their interest in the region and expertise in regional highway issues. With the support of the TOPS Lab and others as needed for engineering judgement, potential TSM&O / ITS deployments will be determined for each area of need in the region.

As part of this step, all regional staff and stakeholders will be encouraged to provide input into better understanding the areas of identified need and ideas for types of deployments.

Step 7: Use Benefits Tool to Determine if Needs Warrant ITS Deployment

Timeframe: April-May

Result: Revision of each of the regional sections of the Statewide Needs Inventory to include warrant information for each possible TSM&O / ITS deployment option

Each Regional ITS Coordinator will be trained and use the Benefits Tool. The Benefits Tool was developed by Kimley-Horn, and is also available on the TSMO-TIP website.

The tool will be used to run a benefits-cost analysis on each of the potential TSM&O / ITS deployments for each needs area. Most of the inputs will come from regional knowledge of the area or the Needs Analysis Tool. There are some inputs into the Benefits Tool that will require engineering judgement and estimation.

Each of the deployments with a positive value for benefit-cost analysis (as determined by the tool) will be listed along with the needs area in a revised Statewide Needs Inventory for each region.

A tutorial of the Benefits Tool is provided for use of the tool on the TSMO-TIP website.

Step 8: Develop Operations Plan, O & M Costs, and Responsible Parties

Timeframe: April-May

Result: Draft of Regional Project List for each region

This step involves creation of an operations plan to document the operating procedure for each deployment, creation of a list of all operating and maintenance costs involved in deployment of the TSM&O solution, and a list of responsible parties for operation and maintenance of the TSM&O solution.

Step 9: Develop Regional Project List with Priority Ranking

Timeframe: May

Result: Regional Project List with Priority Ranking

This is the final step completed by each region with BTO support before merging the regional plans into a statewide list. In this step, each region will pull together all of the resources in the previous steps of this task and present a clean list of projects with priority rankings for their region.

Each project will include:

- all information on the project area as produced in the Statewide Needs Inventory for the region,
- a list of TSM&O solutions to be deployed,
- a benefits-cost analysis summary (from the Benefits tool) for each TSM&O solution,
- and an operations plan with O&M costs and responsible parties listed for each TSM&O solution.

Projects will then be ranked with a priority based on benefits-costs results as well as regional and BTO judgement.

Process Task C

Goal: Compile a Statewide Deployment List

Responsibility: BTO and Regional ITS Coordinators

This is a relatively quick task that involves BTO oversight of the Regional Project Lists. This task culminates with the merger of these lists into a Proposed Statewide Deployment List which will be passed on to the Operations Managers.

Step 10: BTO Operations Unit Checks for Concurrence on Technical Feasibilities

Timeframe: June

Result: Revised Regional Project Lists with projects marked for concurrence with technical feasibilities

In this step, the BTO Operations Unit will go through each of the five Regional Project Lists and verify that all proposed TSM&O deployments are feasible for deployment during the next AY.

Although the main process involved is verifying if deployments can be made given current technical expertise and availability at BTO, this step also offers BTO a chance to review materials before creating a final list to pass on to the Operations Managers.

BTO *should* work with the Regional ITS Coordinators at this point with any projects and/or deployments in question to resolve any issues.

Step 11: Compile Proposed Statewide Deployment List

Timeframe: June

Result: Proposed Statewide Deployment List

This is the final step completed by the BTO Operations Unit with support from the Regional ITS Coordinators. In this step, BTO will pull together the resources from Step 10 and the previous tasks to compile a proposed Statewide Deployment List.

Each deployment in the list will include

- all information on the project area as produced in the Statewide Needs Inventory for the region,
- all information on the specific projects and TSM&O deployments as produced in the Regional Project List including priority rankings,
- and a verification of deployment feasibility.

Process Task D

Goal: Finalize Statewide Deployment List

Responsibility: BTO and Operations Managers

This task allows for a review period to consider all deployments and offer any suggestions or criticisms. At this stage, new technologies will also be considered. This task culminates with the finalization of the Statewide Deployment List which will be passed on to the ITS TAG.

Step 13: Operations Manager and Peer Review

Timeframe: July

Result: Reviewed Statewide Deployment List

In this step, Operations Managers will review all suggested deployments and offer input, concerns, and criticism. Peers including other regions, MPOs, TOPS Lab, and other relevant bodies will also be asked to provide feedback at this stage.

All feedback at this stage *should* be documented and BTO *should* record all feedback and attach it to each proposed deployment's package on the Proposed Statewide Deployment List.

Step 14: Explore Additional Alternatives (New Technology, Pilot Possibilities, etc.) Timeframe: July

Result: Reviewed Statewide Deployment List with suggested alternatives

Using the TOPS Lab's annual evaluation of emerging and current TSM&O technologies, BTO will decide if new technologies *should* be deployed in place of or in addition to the suggested TSM&O deployments for each project.

If any significant changes are made at this point, Regional ITS Coordinators *should* be brought back into the discussion as necessary to provide feedback.

Any changes that are made to the Proposed Statewide Deployment List *should* be recorded and all relevant documentation (including benefits-cost analyses and changes to the operations plan, O&M costs, and responsible parties) *should* be attached to each proposed deployment's package on the Proposed Statewide Deployment List.

Step 15: Finalize Proposed Statewide Deployment List

Timeframe: July

Result: Finalized Statewide Deployment List

This is the final step completed by the BTO before the deployment plan is sent out for funding and support. In this step, BTO will pull together the resources from Steps 13 and 14 as well as the previous tasks to compile a finalized Statewide Deployment List.

Each deployment in the list will include

- all information on the project area as produced in the Statewide Needs Inventory for the region,
- all information on the specific projects and TSM&O deployments as produced in the Regional Project List including priority rankings,
- verification of deployment feasibility,
- and notes from all reviews.

Process Task E

Goal: Identify Funding Sources and Obtain Support Documentation for Statewide Deployments List

Responsibility: ITS TAG, BTO, and Regional ITS Coordinators with Operations Managers oversight

This task involves the selection of a funding mechanism for each project and allows for one final review before passing the list on to ITS TAG for their approval.

Steps 16/17: Identify Funding Mechanism – ITS Standalone, 6-Year Construction Program, Other Funding – Is Funding Available?

Timeframe: August

Result: Append funding mechanism to Final Statewide Deployment List

During this step, each of the projects listed in the Statewide Deployment List will be reviewed and funding mechanisms will be selected. Each deployment will fall be marked with one of the following:

- Funding from 6-Year Construction Program – specific program and timeline will be identified and listed with the deployment
- Funding from ITS Standalone
- Funding from other source – specific source must be identified with timeline
- Not Funded – Reason for lack of funding must be documented and deployment will be marked for future consideration

Step 18: Obtain Operations Managers Documented Support for Project

Timeframe: August

Result: Append Operations Managers Support to the Final Statewide Deployment List

During this step, the Operations Managers will review each project paying particular attention to verified funding sources. Any questions or concerns *should* be directed to all stakeholders.

Operations Managers *should* approve (or deny) all projects and these approvals **shall** be documented and included with Final Statewide Deployment List.

To summarize, this step will include attaching funding mechanisms and approvals to the Final Statewide Deployment List.

Process Task F

Goal: ITS TAG Final Review and Approval of Statewide Deployment List

Responsibility: ITS TAG

This task is the final chance for ITS TAG to review all deployments and place the deployments into the official list for the next AY (or future).

Step 19: ITS TAG Annual ITS Recommended Project List and Deployment (Decision Making / Justification Summary) Report

Timeframe: September

Result: ITS Recommended Project List and Deployment Report

In this step, ITS TAG will review the Statewide Deployment List and use this list to develop their ITS Recommended Project List and Deployment Report. This report will include a list of all deployments for the next AY (as well as any projects marked for future AYs). Each deployment *should* include a short decision making and justification summary.

Process Task G

Goal: Implement Projects

Responsibility: BTO and Regional ITS Coordinators

In this task, BTO will work with Regional ITS Coordinators to successfully implement the projects listed in ITS TAG's ITS Recommended Project List and Deployment Report.

Step 20: Engage Configuration Management Process

Timeframe: October/November

Result: Final Configuration Plan

In this step, the configuration management process *should* be used to determine exactly how the project will be deployed in the field. A configuration management process is one that manages changes to a system, to ensure that a system is operated as it is intended throughout its design life cycle. Configuration management includes documenting upgrades and modifications that are performed and other attributes related to this work, including the date and reasoning why the work was completed.

Step 21A: Implement Project

Timeframe: Next AY during Construction Season

Result: TSM&O solution successfully deployed

The project is implemented by whatever means determined in the previous steps and responsibility is passed on to the identified responsible parties for operations and maintenance.

Step 21B: Mark Deployment for Future Consideration

Timeframe: Any Time During Current AY

Result: List of Deployments for Future Consideration

Any deployment that was taken off the ITS Recommended Project List and Deployment Report at any point during this entire process *should* be moved into the next AY process cycle for consideration. To make this list easier to use, all deployments in this list *should* include all documentation that was created during this process.