



Project Summary Report 1882-5
Project O-1882: Dynamic Message Sign System Operations
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Improving Dynamic Message Sign Operations

A series of laboratory studies conducted using Texas motorists has yielded several specific recommendations about how dynamic message signs (DMSs) can be better utilized statewide. These recommendations cover issues such as how to best abbreviate terms within a DMS message, how to best indicate when future roadwork will begin and end, and whether or not it is advantageous to flash or “blink” all or parts of DMS messages. Researchers have

combined the recommendations from this project with those of past studies in a set of DMS operating guidelines for use in traffic management centers throughout Texas.

What We Did . . .

Researchers convened a TxDOT project advisory panel to select specific questions about DMS operations to be answered through this project. TTI researchers then recruited Texas motorists from across the state to

participate in laboratory sessions designed to answer these questions. Laptop computers were used to simulate DMS message displays in order to answer many of the questions; for the other questions, researchers relied on pen-and-paper surveys. The laboratory sessions were designed to determine the level of recall and comprehension of the information contained in each message. Reading times and message formatting preferences were also collected in some instances.



Dynamic message signs (DMSs)



What We Found . . .

As an example of results obtained from this research, [Figure 1](#) illustrates the percent of Texas motorists who correctly understood DMS messages that displayed information about when future roadwork was scheduled. In some messages, calendar dates were displayed; in other messages, the days of the week were presented. As the figure shows, fewer than one-fourth of the Texas motorists were able to understand when future roadwork was to occur when calendar dates were used in the message. On the other hand, more than three-fourths of the motorists understood a DMS message that used the days of the week. Consequently, TTI researchers recommend displaying the actual days of upcoming events rather than displaying calendar dates to convey this information.

Researchers also examined several techniques intended to “enhance” the appearance of messages (i.e., flashing one or more lines of text, keeping two lines of text constant and changing the information on the third line, etc.). The effect of one of these techniques, flashing all lines of a one-frame message, is shown in

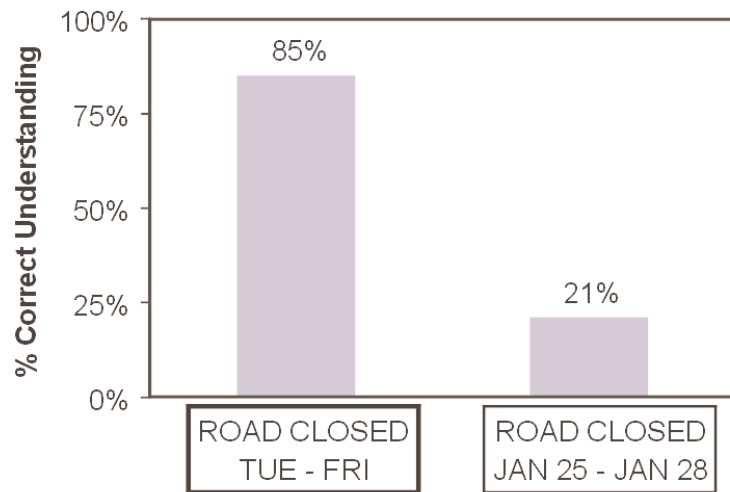


Figure 1. Motorists understand days of the week but not calendar dates

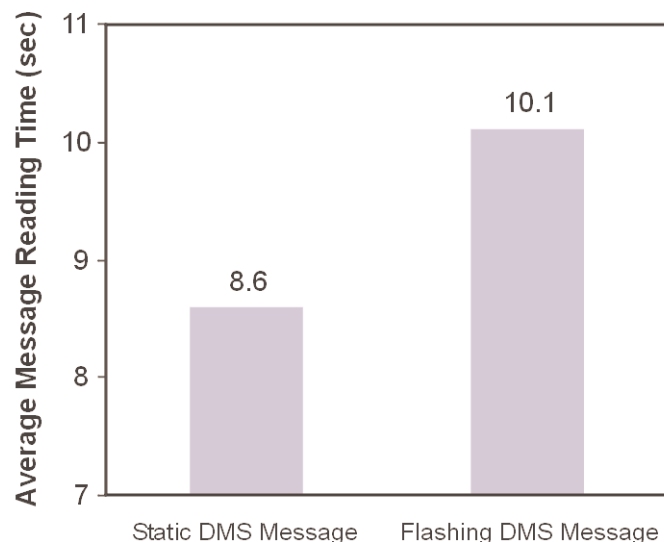


Figure 2. Flashing a DMS message takes longer to read

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As shown, flashing a DMS message results in significantly longer reading times than when the same DMS message is not flashed. This means that less information

can be presented on flashing messages. Meanwhile, researchers also found that the technique does not necessarily suggest to motorists an increased urgency or importance of the message. Consequently, TTI



researchers recommend that this technique not be used as part of DMS operating practices statewide.

The Researchers Recommend . . .

The research conducted as part of this project has yielded specific recommendations about more than 40 different abbreviations and combinations of abbreviations typically considered for use on DMS. Additional recommendations about appropriate terms and operating practices were also developed, as noted below:

- Actual days of the week (e.g., TUES – FRI) should be used when the message is displayed for a work activity that will occur within the upcoming week.
- Actual days of the week (e.g., WED THRU TUE) should also be used in place of the term “FOR 1 WEEK.”
- The message term “WEEKEND” should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight.
- When displaying current travel times on DMSs, the time-of-day that the travel time was measured should be included in the message

(i.e., “TRAVEL TIME TO DOWNTOWN - 20 MINUTES AT 7:20 AM”).

- The word “EXIT” should be used when referring to an exit ramp on a freeway (i.e., “EXIT CLOSED”); the word “RAMP” should not be used when referring to an exit ramp on a freeway.
- The route or interstate designation (I, US, SH, FM) should always be used along with the number when referring to a roadway.
- The term HEAVY CONGESTION can be used to indicate conditions that involve more than 35 minutes of delay or downstream operating speeds that are less than 25 mph, and the term CONGESTION can be used to convey less severe conditions.
- DMS operators should use one-frame messages whenever possible and should limit the use of two-frame messages to only those situations for which the information cannot be kept to a single frame.
- Single-frame DMS messages should not be flashed in an attempt to give them additional attention and target value.
- DMS operators should not flash one line of a single-frame message in order to increase its target

value and attention.

- DMS operators should not present redundant information on a two-frame DMS message (i.e., keeping two lines of the message the same and changing the third line).
- When it is necessary to split a message on a DMS, no more than two frames should be used.
- DMS operators can choose either of two options for displaying a two-frame message on portable DMSs: either displaying each frame for four seconds or displaying each frame for two seconds.
- It is possible to rely on the lane control signal (LCS) to indicate which lanes are blocked or closed and utilize the DMS to provide other key information (what is the problem, how far downstream the problem is located, etc.). However, redundant information about lane status should be presented on a DMS in conjunction with LCS if no other important information is available for motorists. These recommendations have been combined with a number of other recommendations developed in past research into a set of DMS operating guidelines.



For More Details . . .

The research results, recommendations, and operating guidelines are documented in Reports 1882-1, *Texas Driver Understanding of Abbreviations for Dynamic Message Signs*, and 1882-2, *Improved Dynamic Message Sign Messages and Operations*

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TxDOT Implementation Status February 2001

By John Bassett, P.E.

It appears that many of the research recommendations have or could be implemented immediately. Some of the recommendations may require further review by the Traffic Operations Division.

The DMS operating guidelines will be a useful reference tool for TxDOT personnel. DMS signs are a critical part of Intelligent Transportation Systems (ITS) implementation and their use will continue to increase. These guidelines will help to provide uniformity and maximize their effectiveness.

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YOUR INVOLVEMENT IS WELCOME!

This research was sponsored by the Texas Department of Transportation in cooperation with the Federal Highway Administration. The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation (TxDOT) or the Federal Highway Administration. This report is not intended to constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. The engineer in charge of the project was Dr. Conrad L Dudek, P.E. #24320.